A REVIEW ON E-BIKE VIBRATION AND SOUND IMITATING MODULE

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ABSTRACT

These days there have been rising cases in road accidents involving e- vehicles, street animals and pedestrians. This is mainly due to the fact that e-vehicles are not able to produce sounds on their own as conventional vehicles do. So we have taken this problem statement and decided to make a module that can replicate the sound and vibrations.The aim is to build a device that can be easily installed on an e-vehicle and has the ability to imitate both the sound and vibration of the conventional vehicle at different speeds. Hence resulting in safer roads. A sound and vibration of the conventional vehicle is sampled at different speeds and the sound will be sampled using a mic kept at a distance from the vehicle. The vibration can be measured using an accelerometer. Sound can be produced using a pair of Stereo speakers and the vibrations can be replicated using a motor. Implement an independent module that can be installed in an electric vehicle that will add the sound and vibration compatibility as that of the conventional vehicle. In order to trace the live path GSM/GPRS module is used.

Keywords: *Sound , Vibration , Arduino Uno , GSM Module , GPS Module , SD Card, Speaker , Smartphone, Embedded C , LCD Display.*

I. Introduction

An Electric vehicle during the last few decades environmental impact of the petroleum based transportation infrastructure along with peak oil has let to renewed interest in an electric vehicles. An electric vehicle run either partially or fully on electric power using energy stored in batteries while petrol and diesel vehicle use an internal combustion engine(ICE).Though the electric vehicle (EV)market in India is in a nascent stage, the government efforts to improve the infrastructure and offer incentives mean that the share of e-vehicle is estimated to grow to 12% of passenger vehicle by 2025-2026.The growth prospects notwithstanding, there are several challenges facing the EV segment which heighten the comparison with other fuel vehicle. Rising fuel prices was one of the main reason why many people got attached to electric vehicles, as compare to petrol vehicle an electric vehicle offer good in return, they are not that expensive to maintain .The running cost of the electric vehicles is also very low. Electric vehicles are quieter than gasoline cars and this has both pros and cons. An electric motorcycle with the visual appeal of a powerful fuel-powered bike, capable of producing an equally intimidating sound pattern to add unique USP to the otherwise quiet electric motor.

The thud and deep sound of the motorcycle engine are like music to the ears of purists. That deep resonating sound when you cruise on a long stretch of the road, and as you push the accelerator the sound becomes more low-pitched. With the gradual shift to electric motorcycles, the definitive sound of the motorcycle engines has been lost since the electric motors produce very little or no perceivable sound at all. This can be a major put-off for motorheads who are fueled by the sweet sound of fuel- powered engines. Automotive designer Lin Yu Cheng however wants to fix this with this jaw- dropping electric motorcycle design. Quiet EVs have prompted concerns about pedestrian safety. Since they are so quiet, it's harder for children, animals, or the visually impaired to recognize when an EV is nearby.

Since 2019, the U.S. National Highway Traffic Safety Administration (NHTSA) has required new EVs to automatically make noise when they are traveling slower than 18.6 miles per hour "to ensure that blind, visually impaired, and other pedestrians are able to detect and recognize nearby hybrid and electric vehicles." Beyond 18.6 mph, road noise emitted by EVs is nearly the same as that of gasoline cars.

In Europe and Australia, electric vehicles must be equipped with an Acoustic Vehicle Alert System (AVAS) that emits noise at speeds lower than 20 kilometers (12 miles) per hour. The AVAS noise in some EVs is external only, so those inside the car may not even hear it.

The threat to pedestrian safety doesn't just affect the blind or visually impaired, however, since inattentive sighted walkers texting in crosswalks may fail to look up from their phones without noticeable vehicle noise. While data is limited, studies suggest a link between pedestrians being distracted by mobile phone use while crossing streets and a rise in pedestrian-vehicle collisions.

The safety of private and public vehicles is a major concern to ensure safety while travelling. Global System for Mobile Communication (GSM) and Global Positioning System (GPS) based vehicle location and tracking system provided effective, real time vehicle location, mapping and reporting this information value and add by improving this level of service provided. The GPS based vehicle tracking system is designed to find out the exact location of any vehicle and intimate the position to the concerned authority about through an SMS. The system includes a GPS modem that it retrieves the location of a vehicle in terms of its longitude and latitude. The system uses geographic position and time information from the GPS. The system has an onboard module that it resides in the vehicle to be tracked and a based station that monitors data from the various vehicles. The onboard module consists of GPS receiver, a GSM modem. This hardware is fitted on to the vehicle in such a manner that it was not visible to anyone. That system sends the location data to the monitoring unit continuously therefore it is used as a covert unit. The location data from tracking system uses to find the location and to give the information to police when the vehicle is stolen. This gives an edge over other pieces of technology for the same purpose. The system automatically sends a return reply to that particular mobile indicating the position of the vehicle in terms of latitude and longitude when a request by user is sent to the number at the modem. A program has been developed that it is used to locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google map. The system allows to track the target anytime and anywhere in any weather conditions. This system is user friendly, easily installable, easily accessible and can be used for various other purpose.

The current design is an embedded application. It is continuously monitor a moving vehicle and report the status of vehicle on demand. For doing an Adriano is interfaced serially to a GSM modem and GPS receiver. A GSM modem is used to send latitude and longitude of the vehicle from a remote place. The GPS modem gives the data i.e., the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output, but only the National Marine Electronics Association NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from the place of the vehicle’s position is demanded. An EEPROM is used to store the data received by GPS receiver. That is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by SMS. And an optional 16x2 LCD is also used for displaying status messages or coordinates. It has used GPS module GY-NEO6MV2 and GSM module SIM 900A.The hardware interfaces to microcontroller are LCD display, GSM modem and GPS receiver. In order to interface GSM modem and GPS receiver to the controller, a MUX is used. The system automatically sends a return reply to that particular mobile indicating the position of the vehicle in terms of latitude and longitude when a request by user is sent to the number at the modem. A program has been developed that it is used to locate the exact position of the vehicle and also true navigated track of the moving vehicle on Google map.

II. Problem Statement

As we know the E-vehicle is on demand nowadays, because of their some huge advantage so many people are used it but other side there have been rising cases in road accident involving e-vehicles, street animals and pedestrians. This is mainly due to the fact that e-vehicles are produces very less sounds compare to conventional vehicles do. So we have taken this problem statement and decided to make a module that can replicate the sound and vibrations. Hence resulting in safer roads.

III. Proposed work

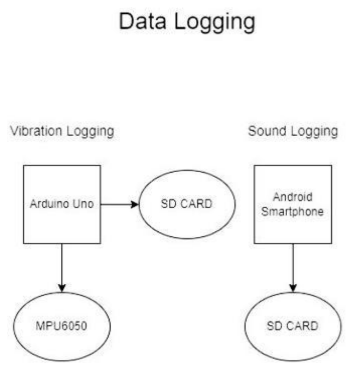
- As per Government electric vehicles should produce some kind of sound either by natural or artificial means for altering pedestrians and people nearby according to a new set of norms proposed by the Central Government Automotive Industry Standard Committee (AISC).
- Data collection on bicycles is very challenging compared with other modes of transport because of the limited space available to install the sensors. Therefore, some specific ways of sensing data from bikes are focused. A device used by the rider (e.g. their smartphones or a cycling computer).
- Accelerometers handle axis-based motion detection which can be used in many fields. Tectonic proposed a software architecture for generic human activity recognition by analyzing accelerometer data. The all designed and implemented a prototype for recognizing various bicycling states using a smartphone-based accelerometer and the Hidden Markov model. Using accelerometers for detecting the road condition is also explored.
- All used smartphone based accelerometer and gyroscope for road surface condition estimation and analysis. In the positioning system, the accelerometer is also a key technology proposed an indoor localization system via smartphone-based accelerometer.
- The Data Collection Module collects the information which relates to the e-bikes. When the system starts up, it starts to pair with the HMI through Bluetooth. After the paring is done, e-bike side would check the torque sensor for the trigger. After it is triggered by pedaling, all data monitors would be started. The accelerometer data is sampled 50 times per second. The GPS location is recorded one time per second. The continuous raw record data of this module comprises time, GPS point, power assistant mode and the accelerometer series data which would be joined into a data frame. These data frames would be sent to the RAAS Computation Module firstly and be saved into the local DB. The purpose of the Vibration Analysis Component is to analyze the accelerometer data series and convert it into a useful vibration information. To detect the vibration on cycling, we have chosen 50 Hertz for the accelerometer sampling frequency, which is considered to be a good trade-off between saving energy and acquiring enough data series. When receiving the accelerometer data series, we calculate the magnitude of three axis acceleration by the Quadratic mean.
- The collected data is extracted into parameters as the input to the Mode Switch Function. Each parameter has its own threshold which is chosen by our pre-experiment. By using these thresholds, these numeric values can be processed with linearization. The basic idea of our system is that the vibration is positively related to the speed of the e-bike, so the Mode Switch Function reduce the speed when the vibration is too high and increase the speed when the vibration is low. Due to this concept, our system put the road awareness in the highest priority which the system detects the vibration magnitude is high or not. If it is high and the velocity is also high, the system decreases one level of the power assistance. It is because in this situation means the speed is too high, so the vibration is also higher. On the other hand, when the vibration magnitude is low, if torque is on high means the rider needs more power assistance. For the detailed information.

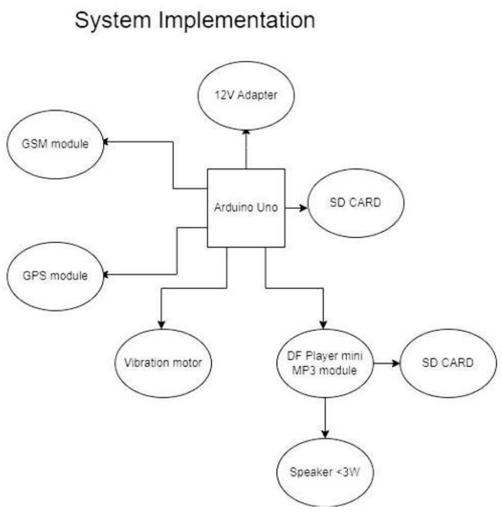
IV. Block Diagram

The project has two parts –

1. **Data logging part** - Where the sound and vibration of the conventional vehicle is sampled at different speeds. The sound will be sampled using a mic kept at a distance from the vehicle. The vibration can be measured using an accelerometer.

2. **Module Development** - The sound can be produced using a pair of Stereo speakers and the vibrations can be replicated using a motor. The sound and vibrations would be different at different speeds.





V. Conclusions

An independent module that may be placed in an electric car to enhance sound and vibration compatibility to the vehicle, hence boosting road safety. The results show that the pavement vibration statistics are impacted by the test cars' travel speed and the position where the vibration monitoring instrument is mounted. The number of monitoring iterations is also an important factor in collecting accurate vibration data. The accuracy of the pavement vibration data obtained from the smartphone application in both test cars is Acceptable. Furthermore, the pavement vibration monitoring approach utilising smartphone applications is correlated with per values, indicating that this technique is accurate and acceptable for future road pavement monitoring Activities.. It also offers an accurate indicator of the quality and performance of the pavement. Furthermore, this study work attempts to present several pavement monitoring approaches that may be employed by researchers and transportation organisations with acceptable levels of accuracy.

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A REVIEW ON IOT-BASED ENVIRONMENTAL MONITORING USING LORA TECHNOLOGY

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ABSTRACT

This paper presents an IoT-based environmental monitoring system that utilizes LoRa technology for wireless communication. The system is designed to collect and transmit environmental data, such as temperature, and humidity, from the rural area to a central server for analysis and visualization. The proposed system consists of three main components: sensor nodes, a LoRa gateway, and a cloud-based server. A sensor node is fixed in a specific location and equipped with sensors to collect environmental data. The collected data is transmitted wirelessly to the LoRa gateway using LoRa technology. The LoRa gateway acts as a bridge between the sensor nodes and the cloud-based server, receiving and forwarding the collected data to the server viathe internet. The cloud-based server receives the collected data from the LoRa gateway and then processes it. The proposed system offers several benefits, including low power consumption, long-range wireless communication, and support for a large number of devices. It can beused in various applications.

Keywords: *Battery, TP4056,Solar Panel, ESP8266, DHT11,LoRa SX1278, OLED Display*

1. Introduction

The Internet of Things (IoT) is revolutionizing the way we interact with the world around us. With the growing demand for environmental monitoring solutions, IoT-based technologies arebeing widely used to collect and analyze data from the environment. The system's functionality relies entirely on the internet, which limits its usability when internet connectivity is unavailable. To overcome this obstacle, a wireless sensor network architecture is proposed that does not require internet connectivity or network infrastructure such as GSM, CDMA, or LTE. Thisnetwork consists of nodes and a gateway and aims to transmit sensor data efficiently over a wide range without internet connectivity.

In this paper, we present a detailed study of IoT-based environmental monitoring using LoRa (Long Range) technology. LoRa technology is a low-power, long-range wireless communication technology that has emerged as an ideal solution for IoT-based environmental monitoring systems. The proposed system uses a network of wireless sensor nodes, which are capable of measuring various environmental parameters such as temperature and humidity. This wirelesssensor network consists of a LoRa module, which makes this project possible. The LoRa module fabricating along with a microcontroller (ESP8266), transceiver. sensors (DHT11), and power source can make this network a pioneer for the accessing of data remotely from any- where such as places like rural areas, forests, Farming, Monitor Transportation on National Highways where there is no network access, surveillance, and monitoring for security, etc. and it comes with additional features like low power consumption. The data collected by the sensor nodes is transmitted to a central gateway through LoRaWAN (LoRa Wide Area Network) pro- tocol. The gateway then processes the data and sends it to the cloud for further analysis.

This paper discusses the design and implementation of an IoT-based environmental monitor- ing system using LoRa technology. We also present a comprehensive evaluation of the system's performance, including its accuracy, reliability, and power consumption. Our findings show that the proposed system is an effective solution for real-time environmental monitoring applications, with the potential for use in a range of domains, including agriculture, smart cities, andindustrial monitoring.

2. Literature Review

Olakunle Elijah, Sharul Kamal Abdul Rahim, Vitawat Sittakul, Ahmed m. al-Samman, Michael Cheffena, Jafri Bin Din, and Abdul Rahman Tharek "Effect of

Weather Condi- tion on LoRa IoT Communication Technology in a Tropical Region: Malaysia" In IEEE Access,Volume.9, 2021 [1]

The above research paper "Effect of Weather Condition on LoRa IoT Communication Technology in a Tropical Region: Malaysia" was published in IEEE Access in May 6,2021.The authors of the paper, Olakunle Elijah, Sharul Kamal Abdul Rahim, Vitawat Sittakul, Ahmedm. alSamman, Michael Cheffena, Jafri Bin Din, and Abdul Rahman Tharek, The paper exam- ines how weather conditions in tropical regions affect the LoRa link in a LoRaWAN setup. It investigates the influence of onboard temperature, atmospheric temperature, relative humidity, and solar radiation on the LoRa communication link. Additionally, the study includes an analysis of how rain conditions affect the LoRa link.

Syazwan Essa, Rafidah Petra, M. Rakib Uddin, Wida Susanty Haji Suhaili, Nur Ikram Ilmi "IoT-Based Environmental Monitoring System for Brunei Peat Swamp Forest" In International Conference on Computer Science and Its Application in Agriculture (ICOSICA),2020 [2]

The above paper states research on "IoT-Based Environmental Monitoring System for Brunei Peat Swamp Forest" was published in International Conference on Computer Science and Its Application in Agriculture (ICOSICA), and a brief about the paper is -

The Peat Swamp Forest is a highly susceptible area to forest fires, especially during hot and dry seasons, which can spread quickly and become difficult to control. To mitigate the impactof forest fires, an IoT-based solution has been proposed to monitor the forest more effectively. This involves using a monitoring system consisting of sensor nodes that collect data on im- portant parameters such as temperature, water level, and soil moisture. The data collected is transmitted via a gateway and can be monitored in real-time on a dashboard.

To ensure the accuracy of the data collected, the water level sensor underwent several software tests before deployment. The in-house testing confirmed that each sensor node was capable of collecting and transmitting data to the dashboard, where it could be viewed remotely by the public.

By implementing this IoT-based monitoring system, better data collection, coordination, and decision-making can be achieved to help reduce the consequences of forest fires. The collected data can be used to detect changes in temperature, water level, and soil moisture in real-time, which can help to prevent and control fires. This technology enables forest managers to take timely and effective measures to minimize the risk of forest fires and protect the ecosystem.

V.Raju, Mrs.T.Surya Kavitha, "An Environmental Pollution Monitoring System using LoRa"Published in International Journal Of Technical & Scientific Research - Vol.6, Is- sue II, 2017 [7]

This paper describes the limitations of existing automated environmental pollution monitoring systems and introduces a proposed system that overcomes those limitations.

Conventional environmental pollution monitoring systems are complex in operation, expensive, and not portable. In contrast, the proposed system is smaller in size, economical, more accurate, and less complex to operate. The system is designed to monitor toxic gases in remotelocations or areas, making it suitable for those who have cattle or sites in such areas.

One of the key benefits of the proposed system is its ability to provide real-time values of toxic gases, which can be accessed on a personal computer (PC) continuously. This enables profes- sional supervision and monitoring of environmental pollution in remote areas. The system is also suitable for people who are struggling to acquire data from their required remote areas, providing them with a feasible solution. Overall, the proposed environmental pollution monitoring system is a smarter, more efficient, and cost-effective solution to the limitations of conventional systems. Its smaller size, porta- bility, and real-time monitoring capabilities make it a highly desirable option for those who require accurate and continuous monitoring of toxic gases in remote locations.

Zhi-Yang Su, Yi-Nang Lin, Victor R. L. Shen "Intelligent Environmental Monitoring System based on LoRa Long Range Technology" Published in IEEE Eurasia Conferencein 2019. [6]

This research paper "Intelligent Environmental

Monitoring System based on LoRa Long Range Technology" was published in IEEE Eurasia Conference in 2019. The authors are . Zhi-Yang Su, Yi-Nang Lin, Victor R. L. Shen.

The objective of this research is to create an efficient environmental monitoring system utiliz- ing Long Range (LoRa) transmission technology with low power consumption. The system will be deployed in a densely populated large-scale campus. The system will employ sensors placed at different locations to collect data on various environmental parameters such as tem- perature, humidity, suspended particles, carbon monoxide, carbon dioxide, wind speed, appar- ent temperature, and ultraviolet light in both indoor and outdoor environments. The communi- cation protocol for the transmission technology will be LoRa 915 MHz, utilizing the transmis- sion module LRM001 developed by Liyatech. An industrial computer will function as the Gate- way, and data from the different detection points will be analyzed through C# Windows Forms. Hourly data will be uploaded to Microsoft Azure SQL Server. Finally, using ASP.NET tech- nology, the Server end will publish the website with the assistance of Google Map API to display the different detection stations' locations, enabling users to investigate the environmen-tal quality trend and carry out further analysis using Big Data.

3. Methodology

Efficient operations for low-power, wide area networking (LPWAN) are crucial for scaling the Internet of Things (IoT) to hundreds of billions of devices. One of the challenges in IoT de- ployment is the lack of connectivity in some areas where there is no internet or mobile network. To overcome this challenge, wireless sensor monitoring using LoRa technology can be used to transmit directional information over long distances without consuming much power.

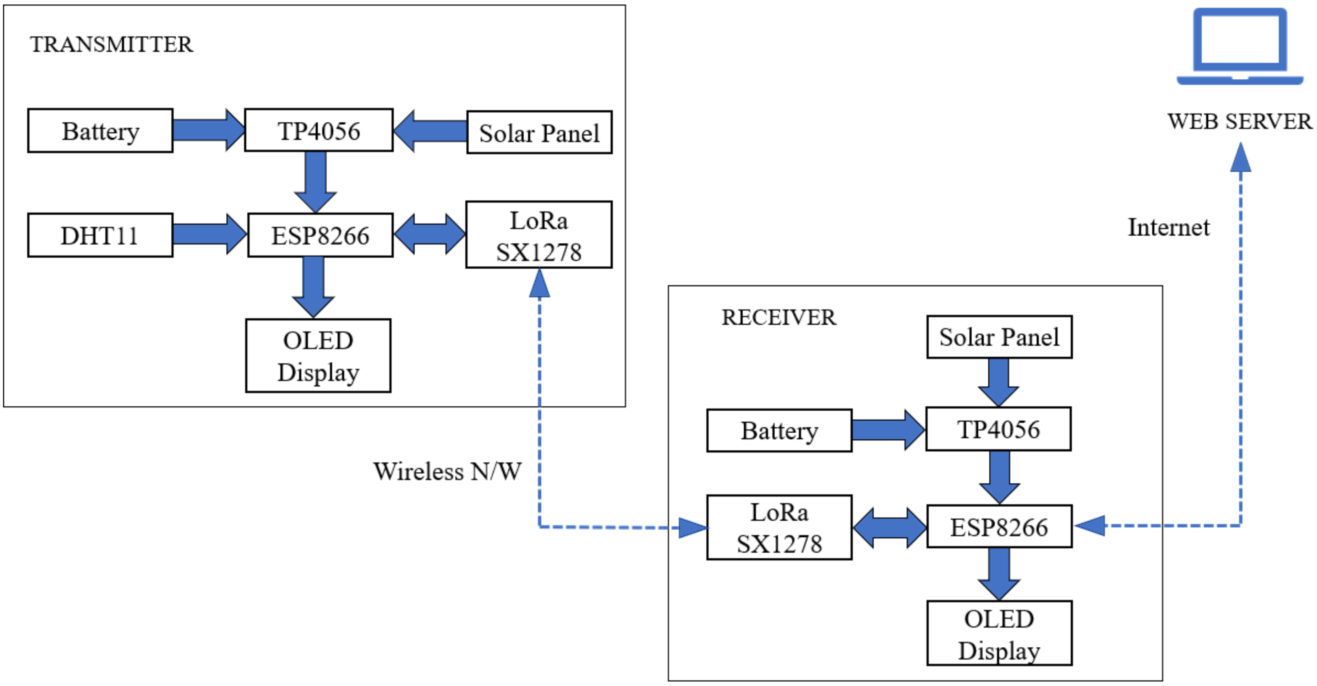
The wireless sensor monitoring system comprises remote sensors that detect and gather data such as temperature and humidity from a low network area. The data is then sent to a transmitter LoRa module, which uses LoRa technology to transmit the data over long distances to a re- ceiver LoRa module located in an area with internet connectivity. This setup creates a gateway that connects to the cloud, allowing the information to be remotely accessed from any device and from anywhere using a web application. The data is updated in real-time and stored securely in the cloud.

This solution is ideal for applications where traditional cellular networks are unavailable or cost-prohibitive, such as in remote or rural areas. It enables IoT devices to transmit critical data without the need for a stable internet or mobile network connection, making it an efficient and cost-effective solution for IoT deployments.

Block Diagram

The Block Diagram describes the process of data transmission from a sensor in the environment to the cloud or web server through a LoRa (Long Range) communication system. Here is a detailed elaboration:

The process begins with the receiver section, where a sensor is deployed to collect data from the environment. The sensor (DHT11) detects temperature and humidity. The sensor detects changes in the environment and converts them into an electrical signal.The electrical signal from the sensor is then fed into a microcontroller, in this case, the ESP8266. The microcontroller is a small computer that can process data and control other devices. It receives the data from the sensor and prepares it for transmission. The next stage involves the transmitter, which in this case is a LoRa transmitter. LoRa is a wireless communication technology designed for long-range transmissions with low power consumption. The transmitter takes the data from the microcontroller and sends it to the LoRa network. The LoRa network is a collection of gate- ways that receive the data from the transmitter and relay it to the cloud or web server. The data is transmitted over long distances, making it ideal for applications where traditional wireless technologies may not work. The data received by the cloud or web server is then processed, analyzed, and stored for future reference. This data can be used for various purposes, such as monitoring the environment tracking assets, or analyzing patterns in user behaviour.



Advantages & Disadvantages

There are several advantages to using IoT-based environmental monitoring using LoRa technology:

1. Long Range: LoRa technology offers long-range connectivity up to several kilometers, making it an ideal choice for environmental monitoring systems covering a large area.
2. Low Power: LoRa technology uses low-power consumption, which allows devices to operate on a single battery charge for several years, making them easy to maintain and reducing the cost of replacing batteries.
3. High Scalability: IoT-based environmental monitoring systems using LoRa technology can support a large number of devices, making them highly scalable and suitable for large-scale deployments.
4. Real-time Data: Environmental monitoring systems based on IoT technology can pro- vide real-time data on environmental conditions, which can be used to make informeddecisions.
5. Cost-Effective: LoRa technology is relatively inexpensive, making it an attractive op- tion for deploying environmental monitoring systems in remote areas or where cost is a factor.
6. Easy Deployment: IoT-based environmental monitoring systems using LoRa technology can be quickly deployed without requiring significant infrastructure or specializedskills.
7. Data Analytics: IoT-based environmental monitoring systems generate vast amounts of data, which can be analyzed to identify patterns and trends. This information can be used to improve environmental management and decision-making.

While there are several advantages to using IoT-based environmental monitoring using LoRa technology, there are also some potential disadvantages:

1. Limited Bandwidth: LoRa technology uses narrow bandwidth, which limits the amount of data that can be transmitted at once. This can be a limitation in certain applications that require a high volume of data to be transmitted.
2. Interference: LoRa technology operates on unlicensed frequency bands, which can lead to interference from other devices or networks operating on the same frequency.
3. Limited Security: IoT-based environmental monitoring systems using LoRa technology may have limited security features, making them vulnerable to cyber-attacks or data

breaches.

4. Distance Limitations: While LoRa technology can transmit over long distances, obsta- cles such as buildings or terrain can affect the signal strength and range.
5. Limited Functionality: LoRa technology may not support all the features required for some environmental monitoring applications, such as real-time video or audio monitor-ing.
6. Dependence on Gateway Infrastructure: LoRa technology requires a gateway infra-structure for communication with the internet. If the gateway infrastructure fails or is unavailable, the system may not be able to transmit data.
7. Reliance on Battery Power: While low power consumption is an advantage, IoT-based environmental monitoring systems using LoRa technology rely on battery power. If the batteries are not maintained or replaced, the system may fail.

Conclusion

In conclusion, the IoT-based environmental monitoring system using LoRa technology has proven to be a reliable and effective solution for the real-time monitoring of environmental factors. The system has been designed to collect and transmit data from multiple sensors in remote areas to a centralized server, providing valuable insights into environmental conditions and helping to inform decision-making processes. The LoRa technology used in this project has demonstrated its ability to transmit data over long distances while consuming minimal power, which makes it an ideal choice for monitoring environmental factors in remote areas. The use of LoRa also enables the system to operate without the need for traditional internet connectivity, which further enhances its versatility and reliability. The system has been tested and validated in a real-world setting, and the results have shown that it can accurately monitor and report on a range of environmental factors, including temperature and humidity. The data collected by the system can be used by environmental scientists, policymakers, and other stake-holders to make informed decisions and take action to improve environmental conditions. Overall, the IoT-based environmental monitoring system using LoRa technology has the po- tential to revolutionize the way we monitor and manage our environment. With further devel- opment and deployment, it could play a significant role in preserving and protecting our natural resources for future generations.

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REVIEW ON IMAGE QUALITY IMPROVEMENT IN KIDNEY STONE DETECTION ON COMPUTED TOMOGRAPHY IMAGES

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ABSTRACT

The need for computer-aided medical diagnostics has grown in recent years as the population's need for medical care has risen. Because to advancements in imaging technology, Computed Tomography (CT) image-based diagnosis has become commonplace due to its cheap cost, reliability, and noninvasive nature. Images of the anomaly, such as a tumour, cyst, stone, etc., are analysed using feature extraction, analysis, and pattern recognition methods to locate the problem. The imaging technique of kidney-urinary-belly computed tomography (KUB CT) has the potential to enhance kidney stone screening and prognosis. Effective computer-assisted medical diagnosis from KUB CT kidney images utilising contrast-limited adaptive histogram equalisation is the subject of this study (CLAHE). Segmentation, feature selection, reference database size, computational efficiency, etc. are all important variables in the success of computer-aided medical diagnosis, which is an integration of CS, IM, PR, and AI approaches. In medicine, a tool called computer-aided diagnosis (CAD) aids in the interpretation of medical pictures. Diagnostic imaging procedures including mammography, CT scans, MRI scans, X-rays, and ultrasounds generate a great deal of data, which the radiologist must carefully examine and interpret quickly. The capacity to generate speckle noise using Non-Sub sampled CT, followed by objective diagnosis with our suggested method, has been in high demand due to recent breakthroughs in the fields of information technology and medical imaging.

Keywords: *renal calculi, kidney stones, computed tomography, image processing*

I. Introduction

The prevalence of kidney stones is clearly on the rise across the globe. Kidneys are bean-shaped organs. They may be found on both sides of the spine, under the ribcage and below the belly button. The kidney is around the size of a human hand. The kidneys' principal job is to filter blood. They keep physiological fluids from being too acidic or alkaline by filtering out trash. They also maintain adequate amounts of electrolytes. Once blood enters the kidneys, the organs begin performing functions such as filtering out waste and regulating the body's salt, water, and mineral levels. After being purified, the blood is reabsorbed into the body via the kidneys, while the waste products are sent through the pelvis and out of the body through the ureters. Almost 10% of the total volume of every kidney stone is composed of these small filters. Nephrons are the cells responsible for filtering blood. Kidney failure may occur if the kidney's blood supply is suddenly cut off. Congenital kidney defects like kidney stones prevent urine from draining properly. Renal calculi stone, struvite stone, and stage horn kidney stones were all studied.

Researchers have made an impressive contribution to the field of nephrolithiasis detection by developing many algorithms to pinpoint the location of the kidney stone. The categorization of urinary calculi using a neural network has shown promising results. Concretion disease, which causes kidney stones, is on the increase across the world, and most people with it are unaware they have it since it takes time for the condition to produce noticeable harm to their organs. The kidneys, which are often found on each side of the spinal column, may have the form of a bean. The kidney's primary role is to regulate blood electrolyte levels. Kidney stones form when cysts or other congenital abnormalities prevent urine from draining properly. Kidney stones of varying compositions, including struvite, stag horn, and renal calculi, were studied. A solid concretion or crystal may develop in the kidneys as a result of the minerals in the urine, a condition known as concretion. By analysing CT scans, doctors are able to detect urinary calculus and take the necessary steps to have it surgically removed, such as breaking the stone into tiny pieces so that it may travel through the urinary system without causing any problems. A ureteral blockage occurs when a kidney stone is at least 3 millimetres in diameter. The discomfort originates in the lower back and spreads down the leg to the groyne. Urinary stones may be categorised according to their chemical make-up, their location in the urinary tract (nephrolithiasis, ureterolithiasis, or cystolithiasis), or both.

The kidney calyces (both minor and major) and the ureter are other potential locations for the stone. Compared to other medical imaging modalities, computed axial tomography has the lowest background noise, allowing for the most precise diagnostic findings. Chronic renal disease is a major health risk. That's why it's so important to spot calculus early on. Having a definitive diagnosis of urinary calculus is crucial for the outcome of any necessary surgical procedures.

Hence, providing an effective stone detection system requires automated detection to include picture filtering as one of its first and most crucial processes. Segmentation and morphologicalanalysis will then be used to automatically identify the stone, reducing the chance of an incorrect identification due to differences in the expertise of the judge. Numerous experts in the area of nephrolith identification have presented different techniques for locating the kidney stone in MRI scans. Many academics stress the need of accurate and powerful segmentation. One school of thought argued that reliable stone identification relied on robust and efficient segmentation.

When the CT image has been cleaned up and enhanced, the area of interest may be extracted. Renal stones are inorganic deposits that form in the kidneys and are composed of a variety of substances, most often calcium and acid. Most people with kidney stones don't feel much discomfort in the early stages, and the condition gradually worsens over time. In order to do successful surgery, it is essential to locate concretion precisely and accurately. CT scans showing a nephrolith are sometimes undetectable by humans.

As a result, we favoured AI-based, digital image processing-based automated methods for detecting kidney stones in CT scans (ANN)The production of crystals in the urine due to substance concentration or other factors is known medically as renal calculus, or kidney stone formation. Kidney stones may affect anybody at any age; in fact, the majority of instances go unnoticed till severe stomach discomfort is experienced or an odd urine colour is seen. Moreover, kidney stone patients often present with nonspecific symptoms including fever, discomfort, and nausea.

Early identification of kidney stones is crucial for intervention and appropriate medical therapy. Kidney stones, especially if they repeat, reduce renal function and cause the kidneys to shrink. It also affects the likelihood of a person being diagnosed with chronic kidney disease or chronic renal failure. Due to its asymptomatic character, however, it is often detected in patients undergoing medical examination for other illnesses, such as cardiovascular diseases (CVD), diabetes, and other medical problems related to the urogenital apparatus [1]-[3].

The most reliable methods of screening for and diagnosing kidney stones include ultrasound imaging, CT, and X-rays performed by intravenous pyelogram (IVP). The most popular method of screening for kidney stones in hospitals is computed tomography (CT), which offers three-dimensional images of the organ or area of concern.

Improvements in CT technology are crucial for doctors and patients because of how easily and quickly kidney stones (and their pathology) may be detected in both asymptomatic and symptomatic individuals [4, 5]. The discipline of computer science, which has found both immediate and future use in medical technology improvements, is aware of the need to contribute to CT screening development, in particular by improving diagnosis in the kidney-urinary-belly (KUB) region for kidney stone identification. Using digital image processing and image analysis methods on KUB CT scans, this research group created an automated kidney screening tool. The study's specific contributions are as follows: (1) a method for delineating ROIs in digital KUB CT scans; (2) a method for segmenting ROIs and ROI objects in digital KUB CT scans; and (3) a method for detecting ROI objects (kidney stones) in digital KUB CT scan images, with information on their size and location.

II. Literature Review

Manoj B**et al**. [1]Stones in the kidney are the most prevalent medical problem people experience nowadays. It is impossible to treat and maintain health without first obtaining an accurate diagnosis of the ailment. Several imaging techniques are proposed as potential ways for detecting kidney stones. In this study, the authors present a system that can automatically identify kidney stones by using deep learning models. Computed Tomography (CT) images from a publicly available dataset are used in the research. These data sets were designed specifically for use with deep learning algorithms. When investigating the effectiveness of several deep learning models, it was discovered that the VGG series was the most advantageous. Using the VGG16 architecture, we were able to achieve a 99% detection rate for kidney stones. Moreover, the stratification K-fold cross validation technique was used to assess the model's efficacy. Moreover, Gradient-weighted Class Activation Mapping (or Grad-CAM) is used to identify the kidney stone's location. To summarise, in this setup, we first run the CT image via a VGG model server to be classified, then we use Grad-Cam to locate the region of interest, and lastly, an expert verifies the outcome.

Merve Karaman et al. [2]Kidney cysts, lesions, and stones may all be more easily identified with more precise identification of renal areas in abdomen CT imaging. In this research, automated kidney identification is achieved by the application of the machine learning algorithm Aggregate Channel Features (ACF).

During the training phase, negative picture samples are extracted automatically. The AdaBoost classifier is used to generate the ACF in an alternating fashion over the course of N iterations. Negative samples are discarded at each stage and collected alongside the positive ones. Effectiveness of the research is evaluated using the confusion matrix and k-fold cross-correlation techniques. The ACF is used to train the k-fold-split data set based on the positions of the labelled items.

The confusion matrix may be used to calculate recall, precision, and F1 scores, all of which are useful in evaluating performance. The obtained data demonstrates that the suggested approach is capable of identifying specific locations inside the kidneys.

Suresh M B et al [3]Stones in the kidneys are a hard accumulation of salt and minerals, most often calcium and uric acid. Most people with kidney stones don't realise they have them until it's too late, hastening the decline of their kidneys and other organs. The correct localization of a kidney stone is essential for surgical removal. Most ultrasound pictures will include speckle noise that cannot be manually eliminated. This study discusses the difficulties associated with kidney stones, as well as methods for detecting them via the use of image processing methods. Processes such as pre-processing, segmentation, and Morphology Analysis. The effectiveness of procedures is determined when their output parameters are studied and assessed..

Harsh Dave et al [4]The ultrasound area of interest presents difficulties because to the wide variety of textures and sounds present. Ultrasound scans are the gold standard for diagnosing kidney problems, especially stones. The current research effort in automatic ultrasonic object identification follows this similar line of inquiry. A programme has been developed that can identify the ultrasound image's stone location for the doctor. The recommended stone presence evaluation technique will help the practitioner choose the optimal site. Locations where stones are possible quarry targets for the extraction function. A wide variety of indicators, including dissimilarity, angular momenta, entropy, and correlation, are used. For the purpose of training image dataset classification, the KNN classification is utilised. About 91% accuracy may be expected from the classification system as a whole. Furthermore, the confusion matrix will evaluate the proposed system's complexity and precision.

Objectives

The primary goal of this work is to enhance the identification rate of kidney stone issues using imaging techniques by increasing their accuracy and sensitivity. To better detect kidney stones in ultrasound images using median filters to boost detection rates in terms of accuracy and sensitivity, this study compares and contrasts supervised, unsupervised, and semi-supervised learning methods and presents the results of existing research employing each strategy. Achieve a more efficient approach of data analysis by automating the model-building process.

The primary goal is to use pre-existing models to sort data into meaningful categories; the secondary goal is to use those models to forecast future events. The goals of this research are: To examine and apply pre-existing learning algorithms, such as those for classification, regression, structured prediction, clustering, and representation learning; To draw conclusions about the efficacy of these algorithms. The purpose of this study is to use CT scan results to determine whether or not a patient has a urethral stone and, if so, where the stone could be located inside the urethra.

Methodology

A subfield of machine learning, "deep learning" consists of what amounts to a three-layer neural network. Although these neural networks can "learn" from massive amounts of data, they still fall short of the capabilities of the human brain. More hidden layers may assist optimise and adjust for accuracy, whereas a single layer neural network may still generate approximative predictions.

CT, which stands for "computerised axial tomography scanner," is an electronic radioactivity image process in which a narrow beam of x-rays is focused on a patient and rapidly shifted around the frame, carrying signals that are processed by each machine's computing to encourage cross-divided countenances or "slices" of the body. These cross-sectional images, often known as tomographic figures, provide more information than conventional x-rays. Each slice is then digitally "shapely" pieced together to generate a three-dimensional representation of the patient's anatomy that may be used for precise labelling and sectioning of normal structures and abnormalities.

In contrast to conventional radiology, which utilises a robust and quick radioactivity tube, a CT scanner uses a power-driven radioactivity starting that rotates inside the circular gap of a donut-shaped form known as a base. A CT scan entails the patient lying on a bed that slowly moves around the stage, all the while a television set spins around them, emitting tiny x-ray photons via the screen. As a kind of corrective film, CT scanners make use of a variety of mathematical radiation detectors that are positioned in a direction perpendicular to the radioactivity source. Detectors collect the x-rays after they have left the subject and

send them on to a computer. The patient's frame, methods, and tissues, as well as some abnormalities the doctor is worried to detect, may all be seen in a 3D exact copy of the patient created by spreading image slices independently or shapely together for a single piece.

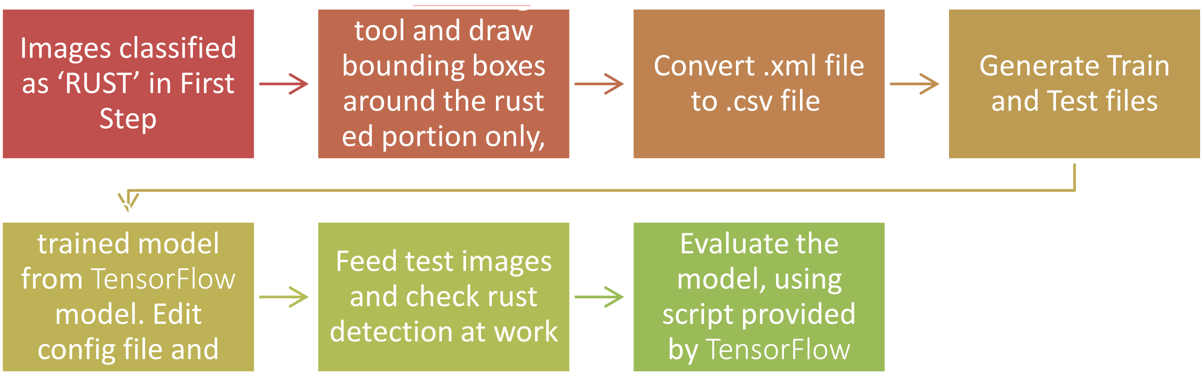
To better detect kidney injuries and illnesses, CT scans of the kidneys may give more accurate information than standard kidney, ureter, and bladder (KUB) X-rays. Examining one or both kidneys using a CT scan is an excellent way to spot abnormalities like tumours or other lesions, obstructive disorders such kidney stones, congenital deformities, polycystic uropathy, and fluid collection around the kidneys (and hence the site of abscesses).

Categories of Images They come in shades of red, green, and blue, thus their name. Each each pixel in a digital picture may be assigned a specific colour, making such an image a "colour" image. The colour shown by a pixel is determined by a numerical value assigned to it. This number is qualified by three additional digits that specify the color's breakdown into its component red, green, and blue. This method may be used to represent any hue that can be seen by the naked eye. One may express the degree to which a colour has been broken down into its component hue, value, and intensity by using a number between zero and 255. Example colour codes for common colours include: white (R = 255, G = 255, B = 255), black ((R, G, B) = (0,0, 0), and hot pink (R = 0, G = 0, B = 1). (255,0,255).

Image in grey The value of each pixel in a grayscale digital picture is a single sample; that is, the image conveys just intensity information.

Pictures of this kind, commonly known as black and white, consist entirely of grayscale values (from 0-255), with black(0) representing the lowest intensity and white(255) representing the highest. A computer picture with just two potential values for each pixel is called a binary image. Any two colours may be used to create a binary picture; however, black and white are the most common. Foreground colour refers to the hue used for the image's foreground elements, whereas background colour describes the hue used for the image's background elements. You may also hear binary pictures referred to as bi-level or two-level images. This indicates that there is just one bit for each pixel (0 or 1). Black and white, monochrome, and monochromatic are common terms for this idea, although they may also be used to refer to any picture with a single sample per pixel, including grayscale. Formats like.txt,.xlsx,.pdf,.csv,.png,.gif,.tiff, .jpg, .jpeg, and.jpeg are used to represent images.

Block Diagram



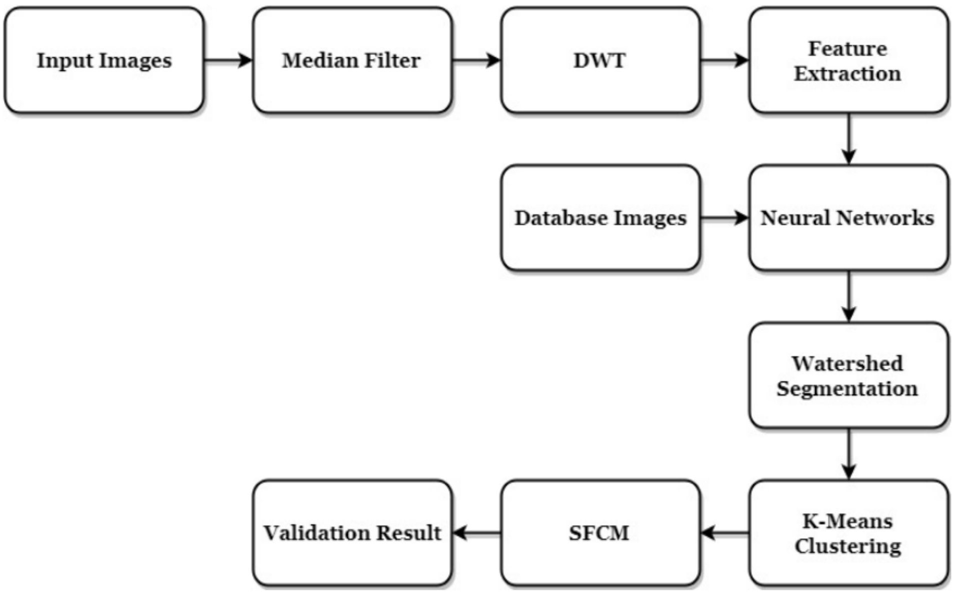


Fig 1. Block Diagram of Kidney Stone Detection System

To put it simply, kidney stones are generated from the minerals in urine. Environmental and genetic factors work together to cause the development of these stones. Causes include being overweight, consuming an unhealthy diet, regularly taking certain medications, and dehydration. People of all different colours, creeds, and nationalities may have kidney stones. Blood tests, urine tests, and imaging scans are just some of the ways this kidney stone may be detected and diagnosed. CT scans, ultrasound scans, and Doppler scans each have their own unique scanning methods. These days, automation is being applied in the healthcare industry. Several previously unrecognised issues have arisen as a direct consequence of computerised diagnosis, such as the need for reliable and correct results and the usage of suitable algorithms. Medical diagnosis is inherently difficult and subjective. A neural network, a kind of soft computing, has been shown to be superior to other approaches since it can diagnose illness by learning and then partial detection. In this study, we use two neural network algorithms—feature extraction and watershed—to the problem of kidney stone detection. Two methods are utilised initially for data training. Hospitals and labs may benefit from the information collected from the blood reports of people who have kidney stones

Image Processing

It might be a way to digitise an image and manipulate it digitally to improve the quality of the picture or derive valuable information from it. As the noise might corrupt the binary zones created by simple thresholding, morphological image processing is used to get rid of such defects. The opening and closing processes aid in the smoothing of the picture. Grayscale photos may also be processed using morphological procedures. It's made up of many non-linear procedures that pertain to the structure of a picture's characteristics. It is numerical numbers, not the sequence of pixels, that determines the outcome. This method compares neighbouring pixels in a picture to a tiny template called a structuring element, which may be put in a variety of positions within the image. An basic building block of matrices, having a 0 and 1 value set.

Conclusion

Using the suggested technology, kidney stones have been detected by preprocessing the ultrasound picture. The generated picture underwent a morphological examination. The final picture was useful in pinpointing the precise spot where the stone was found. Then, the produced stones' shapes and structures were determined using an edge detection approach.

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DOMESTIC WATER QUALITY MONITOR &DISTRIBUTION CONTROL

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ABSTRACT

This paper describes an IoT (Internet of Things)-based smart water quality monitoring (SWQM) system. Water is a significant resource for individual humans and their existence. Water plays a vital role in our human society, and in India, 65% of the drinking water comes from underground sources, so it is mandatory to check the qualityof the water. This device tests water samples and analyses the data to determine the quality of the water. It also provides an alarm to a remote user if there is any deviation in the water quality parameter.

Keywords: *IoT, NodeMCU ESP8266, Arduino, pH sensor, TDS sensor, Solenoidal valve.*

Introduction

Water is an integral part of human life. Today, it is observed that water is scarce everywhere. Moreover, water, particularly water used for drinking, must be of high quality. Water is distributed throughout society and the area via an underground pipeline. These underground pipes cannot be monitored or inspected easily for any breakage or damage caused by any means. To overcome this water quality and alert the concerned authorities in case the water quality is bad. for the above-water quality parameter from time to time to make sure it's safe and in real-time. The Central Pollution Control Board (CPCB) has established a series of monitoring stations for water body quality on either a monthlyor yearly basis. This is done to ensure that the water quality is maintained or restored to the desired level, so it must be monitored regularly. Water quality monitoring helps in evaluating the nature and extent of pollution control required and the effectiveness of pollution control measures.

Water quality monitoring systems need to quickly identify changes in the quality of the water and report the same to officials for immediate action. The system is designed for continuous onsite sensing and real-time reporting of water quality data, where the official can access the data on a smartphone through the Internet. Our proposed system uses multiple sensors to measure the parameter, measures water quality in real-time for effective action, and is economical, accurate, and requires less manpower.

Traditional water quality evaluation strategies involve analyzing water samples collected by hand at various locations throughout the laboratory. Although these strategies are effort-intensive, time consuming, expensive, and do not provide real-time information concerning water quality that could be essential in making decisions about safeguarding public health, they are informative about the chemical, biological, and physical properties of water [1–5]. There is a need to develop new approaches that take advantage of Internet-based tools to control water quality due to the decline in the efficiency of current strategies. There has been a substantial development of Internet-based technologies to manage and control water utilities. However, the number of monitoring sensors that must be installed and calibrated across a wide area is large; therefore, such technologies are quite expensive. Also, the employment algorithm for these technologies must be suitable for a specific area. Based on the above problems, the present work has proposed an IoT-based system that is cost-effective for managing potable water in real-time. For this reason, Arduino is the main controller used in this system, along with a specialized IoT module to ensure the sensor information from the key controller can be accessed or visualized on mobile phones through Wi-Fi or via cloud computing.

Literature Survey

S. Gokulanathan, N. Prabhu, and T. Venkatesh, "A GSM-based water quality monitoring using Arduino, [1]" This paper highlights that because of the population's rapid growth and the need to supply water for agriculture, industry, and personal use, water supplies are becoming scarcer and their qualityis declining. The rivers in India are getting polluted due to industrial waste and the discharge of untreated sewage. to eliminate problems associated with manual water quality monitoring (2019).

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Nikhil Kedia, entitled "Water Quality Monitoring for Rural Areas: A Sensor Cloud-Based Economical Project. [7]" The paper was presented at the 1st International Conference on Next Generation Computing Technologies (NGCT-2015) in Dehradun, India, in 2015. The role of the government, network operators, and villages in guaranteeing adequate information dissemination is highlighted in this study, along with the full range of water quality monitoring methods, sensors, embedded design, and information dissipation mechanisms. It also explores the sensor cloud domain. While automaticallyimproving the water quality is not feasible at this point, efficient use of technology and economic practices can help improve water quality and increase awareness among people (Sept. 2015).

Jayti Bhatt and Jignesh Patoliya, "Real Time Water Quality Monitoring System, [6]" This paper describe a new technique for real-time water quality monitoring using the IOT (Internet of Things) that has been proposed to ensure the supply of drinking water is safe. In this research, we demonstrate the architecture of an IOT-based system for real-time water quality monitoring. This system comprises a few sensors that detect many aspects of water quality, including temperature, conductivity, dissolved oxygen, pH, and turbidity. The microcontroller processes the sensor-measured values before transmitting them over the Zigbee protocol to the Raspberry Pi, which serves as the core controller. Finally, using cloud computing, sensor data can be viewed on internet browser applications (21 February 2016).

Vaishnavi V. Daigavane and Dr. M. A. Gaikwad, "Water Quality Monitoring System Based on IoT, [12]" This paper describes how water pollution is one of the biggest fears of green globalization. The quality must be continuously monitored to guarantee the delivery of safe drinking water. This study describes the design and creation of a low-cost system for real-time IOT water quality monitoring (internet of things). The system employs several sensors to measure the physical and chemical properties of the water (2017).

Methodology

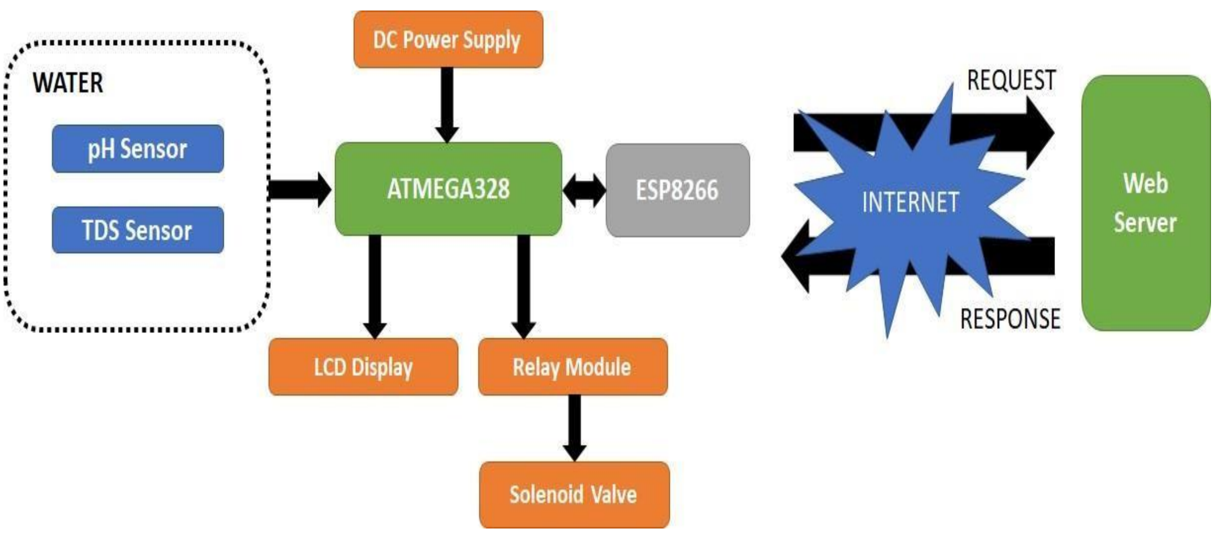


Fig no. 1

The entire system's architecture is based in large part on IOT, a recently popularised concept in the field of development. The main components are divided into two categories: hardware and software. The hardware component includes sensors that assist in measuring real-time values, an Arduino atmega328 that transforms analog values into digital ones, an LCD that displays sensor output, and a Wi-Fi module that connects the hardware and software. In terms of software, we created an application using embedded C.

At the initial stage of construction, the PCB is designed, and components and sensors are mounted on it. When the system is turned on, DC is supplied to the kit, Arduino, and WiFi. Water parameters are examined one by one, and the LCD shows the results. The app that came with the hotspot provides the precise value that is shown on the kit's LCD. As a result, when the kit is placed near a body of water and WiFi is available, we can view its real-time value on our Android phone from any location and at any time.

ESP8266 is capable of functioning frequently in industrial environments, due to its wide operating temperature range. The chip offers reliability, compactness, and robustness with highly integrated on-chip features and minimal external discrete component count.

Antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters, power management modules, a 32-bit Tensilica processor, common digital peripheral interfaces, and more are all included in the ESP8266. Our ESP8266 contains every one of them in a single, compact package.

ESP8266, a device designed for mobile devices, wearable electronics, and Internet of Things activities, uses a combination of several different technologies to achieve low power consumption. The power-saving armature features three modes of operation active mode, sleep mode, and deep sleep mode. This allows battery-powered devices can operate for longer.

A Ten Silica L106 32-bit RISC processor, with an ultra-low power need and a top clock speed of 160 MHz, is integrated into the ESP8266 microcontroller. Operating System for Real-Time (RTOS)and Wi-Fi stack allow about 80% of the processing power to be available for the development and programming of stoner operations.

With antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power operation modules built-in at the SOC level, ESP8266 modules can be simply integrated into space-constrained devices, due to their small size.

ESP8266 modules can work with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or as autonomous MCUs with an RTOS-based SDK that can natively run connectivity applications. In both operation modes, customers can take advantage of using features like out-of-box cloud connectivity, powerless operation, and Wi-Fi security support, including WPA3.

Virtual RISC (AVR) microcontroller. It supports 8-bit data processing. atmega328 has 32KB internal flash memory.

1 KB Electrically Erasable Programmable Read-Only Memory is available in the ATmega-328 (EEPROM). This property shows if the electric Power supplied to the microcontroller is removed, even then it can store the data and can provide results after supplying it with the electric power. Moreover, the atmega328 includes a 2 KB Static RAM (SRAM). Other characteristics will be explained later. atmega328 has several different characteristics which make it the most popular device in today's market. These features consist of advanced RISC architecture, accomplishment, consumption of little energy, real timer counter having a separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS, etc. more information regarding the atmega328 will be provided in this section.

Hardware

Node MCU ESP8266

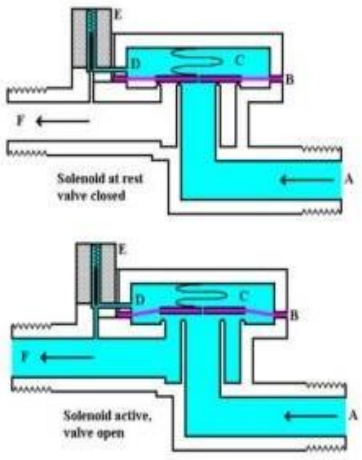
The ESP8266 Wi-Fi Module is a tone-contained SOC with an integrated TCP/IP protocol stack thatcan give any microcontroller access to your

Wi-Fi network. The ESP8266 is capable of either hosting an application or unpacking all Wi-Fi networking functions from another application processor. An AT command set firmware is pre-programmed into each ESP8266 module. The ESP8266 module is a commercial board with a huge, and ever-growing community.

1. ARDUINO

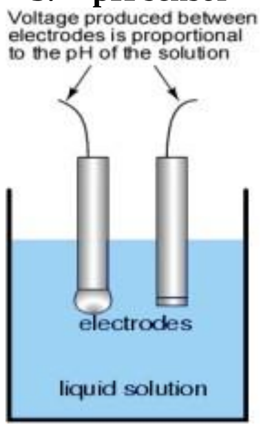
A microcontroller board called Arduino is based on the ATmega-328P. it has 14 digital input/output pins (of which 6 can be based on PWM output), 6 analog inputs, a 16MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. Everything required to support the microcontroller is included in it. Arduino software (IDE) where the reference version of Arduino now develops to newer releases. The UNO board is the first in a line of USB Arduino boards and serves as the platform's benchmark; for an extensive list of current past or outdated see the Arduino index boards.

2. Solenoidal valve



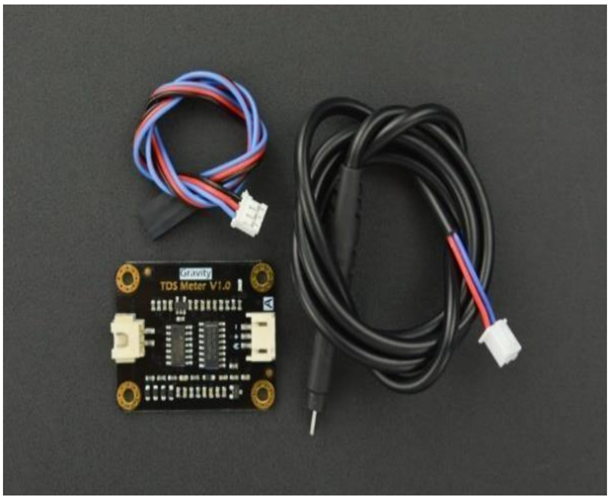
The solenoidal valve and the valve are controlled by sending the digital signal through the relay contact. Digital 1 represents the turning ON of the valve and digital 0 represents the turning OFF of the valve. The digital 1 represents the coil is energized and the valve is opened and the digital 0 represents the coils de-energized and the valve is closed. The procedure is controlled by the relay setup. The relayis used to control the valve by turning ON and OFF by the command given by the Arduino.

3. pH sensor



The two electrodes submerge in the solution, the reference electrode potential is constant with the changing hydrogen ion concentration. The pH is used to test the quality of water in the tank. This is automatically observed for the good water resource to produce to the consumers by day-to-day life. The pH sensor is used to check the pH range of water to be. The pH range varied from 0 to 14 the value range of 0 to 6 is acidity, Alkalinity ranges from 9 to 14, while clean water has a value between 7 and 8.

4. TDS Sensor



Measuring the temperature in a difficult environment such as chemical storage, deep soil, and mines is not an easy task and most temperature sensors cannot withstand external heat and environmentconditions. It can measure a wide range of temperatures from -55Cto-125C.

Conclusion

Thus, the sensors will be managed by the distribution team. The distribution team's manpower has been reduced. The water quality is observed and maintained in this project, leakage detection can be identified in this project, and the central office can control the whole setup using the Arduino-based system for domestic water quality monitor and distribution control. The water crisis can be reduced, and the future usage of water can be maintained by the management and distribution teams.

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MULTICLASS BRAIN TUMOR DETECTION USING CONVOLUTIONAL NEURAL NETWORK AND SUPPORT VECTORMACHINES

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ABSTRACT

Clinical diagnosis now plays a bigger part in modern medicine. The worst disease in the world, brain cancer, is a major concern in the field of medical imaging. Early and accurate diagnosis of brain tumours using magnetic resonance imaging may improve evaluation and prognosis. In order for radiologists to discover brain tumours using computer-aided diagnostic procedures, medical images must be identified, segmented, and classed. An automated method is urgently required since radiologists find the laborious and error-prone process of manuallyidentifying brain tumours to be inefficient. As a result, a method for precisely identifying and classifying brain tumours is presented. There are five steps to the suggested procedure in terms of the materials and procedures used.The first step is to stretch the original image's linear contrast in order to identify the image's edges. The second stage involves designing a deep neural network architecture specifically for the goal of segmenting braintumours. A modified MobileNetV2 architecture is trained using transfer learning in order to extract features. Finally, a multiclass support vector machine (M-SVM) and a controlled entropy-based approach were used to choose the best features. Lastly, utilising M-SVM for brain tumour classification, images of meningioma, glioma,and pituitary are categorised.

Keywords: *Brain tumour, segmentation, deep learning, and linear contrast stretching are all used in biomedical image processing.*

I. Introduction

The most expensive cancer type at the moment is brain cancer, with patients paying primitive costs. Because specific cell types grow quickly, brain tumours can appear in people of any age. A brain tumouris an unnatural tissue development that appears in the brain or central spine and impairs regular brain function [1]. According to their location, size, and surface area, these large tumour cells can be categorised as malignant (cancerous) or benign (non-cancerous) [2]. The terms "primary" and "secondary" tumour locations describe the most recent growths of cancer cells. When cancer cells are considered benign, it is said to be in the primary tumour location. Only proper surgery or radiation therapy [3] can effectively treat the pretentious patient's tumour. Monitoring the growth of brain tumours is essential for patient survival because they constitute a threat to healthy brain tissue [4].

Meningiomas are tumours that can spread to the brain and spinal cord. Three meningeal layers make up the tumours themselves [5]. Meningiomas frequently present as lobar masses with asymmetrical shapes and distinct borders [6]. Meningioma survival rates vary depending on the patient's age, the location and size of the tumour, as well as other variables. Meningioma signs and symptoms include limb weakness, recurrent headaches, and excessive clinginess. Benign meningioma tumours have a diameter of less than 2 mm, whereas malignant meningioma tumours can have a diameter of up to 5 cm [7]. The majority of malignant meningiomas can be cured with early detection and treatment.

Magnetic resonance imaging (MRI) has emerged as one of the most popular methods for diagnosing brain cancer because numerous distinct MRI types can be employed for this purpose [8]. It is vital that brain tumours are accurately detected and treated since they can be fatal. The only approach to prevent putting people at danger is to find the condition in its early stages via a complete brain scan. Various MRI techniques, each with a different settling time, can be used to identify various types of brain tissue [9]. Brain tumours may be challenging to detect using a single MRI modality due to their variable formand location. Contrasting data from several MRI techniques is essential when trying to find tumours [10]. T2-weighted MRI can be used to define areas of edoema, resulting in clear image areas; T4-Gd MRI can reveal a bright signal at the tumour edge when contrast enhancement is utilised; and FLAIR MRI can use water molecules to suppress signals to distinguish cerebrospinal fluid (CSF) from areas of edoema.

Due to the structural complexity and unpredictability of brain tumours, high volatility, and inherent properties of MRI data, such as tumour size and form fluctuation, calculating area, assessing uncertainty in segmentation area, and tumour segmentation are difficult tasks [11]. Manual tumour segmentation takes time to create, and because tumour forms and shapes vary, doctors may see discrepancies in segmentation results. Gliomas and glioblastomas, on the other hand, are more difficult to distinguish from meningiomas [12]. Therefore, it is essential to offer an automated segmentation solution to make this time-consuming process easier.

When done manually, finding and monitoring brain tumours takes a lot of time, and mistakes frequently occur [13]. We need to figure out how to switch out manual processes for automated ones. The current methodologies, which rely on labelling techniques to identify sick regions of the brain and are unable to detect internal peripheral pixels, are incompatible with processes for detecting brain tumours. Because the contrast agent can clearly show the afflicted location, we prefer MRI to CT scans (CT). Thus, a wide range of methods are used to diagnose brain cancer using MRI modalities.

According to their emphasis on feature fusion, feature selection, or the underlying learning mechanism, the numerous approaches that have been put out in recent years for the automatic categorization of brain tumours can generally be divided into two categories: machine learning (ML) approaches and deep learning (DL) approaches. In ML techniques, the foundations of classification are feature extraction and feature selection [14, 15]. Deep learning approaches, on the other hand, might learn by manually extracting traits from images. Convolutional neural networks (CNNs), one of the most recent deep learning (DL) algorithms, stand out for their amazing precision and are frequently utilised for MRI analysis and other types of medical image analysis [16,17,18]. Transfer learning can help to alleviate some of these issues [19], but when compared to classic ML methods, they still persist. These drawbacks include the necessity for a sizable training dataset, high time complexity, poor accuracy for applications that only have access to limited datasets, and expensive GPUs that ultimately raise the cost to the user. Also, choosing the appropriate deep learning model may appear like a difficult task if you are familiar with enough parameters, training methods, and topologies. Among the machine learning- based classifiers that have been utilised for brain tumour classification and identification are Support Vector Machine (SVM), Random Forest (RF), fuzzy C-mean (FCM), Convolutional Neural Network (CNN), Nave Bayes (NB), K-Nearest Neighbor (KNN), and Decision Tree (DT).The CNN implementation is simpler to use because of its lower computational and spatial complexity. These classifiers in general have drawn a lot of interest from academics because of the small training dataset required, the affordable processing power, and the ease with which untrained people may use them.

These are some of the anticipated benefits of the cutting-edge method of segmenting and categorising brain tumours.

We use a linear contrast stretching technique in this pre-processing stage to improve the edge features of the original image; created a 17-layer convolutional neural network (CNN) architecture with a focus on brain tumour segmentation; We employed transfer learning from MobileNetV2 that had been adjusted to obtain the datasets needed for deep feature extraction; The CNN implementation has lessened computational and spatial complexity. In order to do this, we employ an entropy-controlled technique for feature selection, in which the best features are selected based on the entropy value. The final attributes are classified using a multi-class SVM classifier; the stability of the suggested methodology is validated through a detailed statistical analysis and comparison with cutting-edge methods.

II. Related Works

Brain cancer is frequently diagnosed using MR imaging in contemporary medical settings [8, 14]. The detection and classification of brain tumours are closely examined in this section.

Recent years have seen a plethora of studies on the detection, segmentation, and categorization of brain tumours. The medical community still emphasises the topic's relevance despite several publications highlighting its importance [20, 21, 22]. The strategy for identifying and defining brain tumours is presented in this paper. For the purpose of diagnosing brain malignancies, brain images can be differentiated using either generating or discriminating approaches [17, 23]. Maqsood et al. demonstrated fuzzy logic-based brain tumour identification utilising the U-NET CNN architecture. [4]. It made use of U-NET CNN classification, fuzzy logic-based edge detection, and contrast enhancement. In order to do this, we first apply a contrast enhancement technique to the source images for pre-processing. Next, we employ a fuzzy logic-based edge detection technique to discover the edges in the contrast-enhanced images. Finally, we apply a dual tree-complex wavelet transform at various scale levels. Brain imaging uses deconstructed sub-band pictures to create characteristics that are then classed using the U-NET CNN classification method to distinguish between meningioma and non-meningioma. The proposed method performed significantly (98.59%) better than a number of state-of-the-art algorithms.

An improved dice score of 0.79 was obtained by Sobhaninia et al. [24] after they trained a CNN model for segmentation using brain MRI utilising a LinkNet network and combined several views. Adaptive neuro-fuzzy inference categorization is the method used by Johnpeter et al. [25] to discover and classify malignancies in brain MRI, however this network appears to be quite advanced. In our method, cancer regions were increased using histogram equalisation without performing edge detection on brain images. 98.80% of the time, the work that was produced was accurate.

BrainMRNet is a network that was developed by Togacar et al. [26] using the modulo and hypercolumn approach. Prior to being transferred to the attention module, the original photographs underwent pre- processing. The attention module, which manages the image's focal regions, directs how the convolutional layer interprets the image after receiving it. The convolutional layers of the BrainMRNet model extensively employ the hypercolumn technique. Since the attributes obtained from each succeeding layer were preserved in the array tree of the final layer, this strategy allowed us to raise accuracy to 96.05%. Kibriya et al. [27] developed a method for categorising brain tumours based on the fusion of numerous features. We employ huge data extension on the pre-processed images after first using the minimum-maximum normalisation strategy on the original photographs to address the data problem. The support vector machine (SVM) and k-nearest neighbour (KNN) classifiers worked together to produce the final output with accuracy of 97.7% using data from the deep CNN models GoogLeNet and ResNet18. A CNN created by Sajjad et al. [28] may be used to identify and categorise brain tumours. By segmenting the brain tumours with a Cascade CNN algorithm and categorising them with a modified version of VGG19, the authors were able to attain an accuracy rate of 94.58%. Using brain MRI data, Shanthakumar [29] used watershed segmentation to localise tumours. This segmentation strategy, which takes use of a predetermined labelling scheme to attain this outcome, increased the accuracy of tumour segmentation to 94.52%. According to Prastawa et al. [30], it is possible to distinguish tumour areas in brain MR images. While having an 88.17% success rate, this method can only pinpoint the exterior, aberrant limits of the tumour area—not the internal boundary. Gumaei et al. [31] proposed a hybrid feature extraction method based on an extreme learning machine that has been regularised for the classification of brain tumours (RELM). The min-max normalisation contrast enhancement strategy is used for preprocessing, a hybrid PCA-NGIST method is used for feature extraction, and the RELM method is used for classifying brain tumours. This task's overall accuracy was 94.23%. A fine-tuned pre-trained VGG19 model boosted results when used to contrast- enhanced magnetic resonance imaging (CE-MRI), according to Swati et al. [32], who reported an average accuracy of 94.82%. Kumar et al. [33] proposed a brain tumour approach with an average accuracy of 97.48% after addressing the issue of overfitting utilising the ResNet50 CNN model and global average pooling. Medical image analysis has received a lot of attention as a result of these revolutionary developments. Veeramuthuet al.

[4] suggested categorising brain images using machine learning and studying brain architecture.

Multi Level Discrete Wavelet Transform makes it simpler to break the image down and then extract its properties. A PNN-RBF training and classification strategy is employed to categorise the severity of the sickness in the brain image. Sanjeev and colleagues developed the hybrid strategy [5]. This combined approach uses a support vector machine (SVM) to categorise various forms of brain tumours, a genetic algorithm to reduce the feature set, and discrete wavelet transformation (DWT) to weed out unnecessary information. Gopal et al [6]. proposed a method based on feed forward backpropagation of the neural network to improve the efficiency of motor imagery categorization (FFBPNN). There are numerous methods for categorising medical images, including artificial neural networks (ANN), fuzzyclustering methods (FCM), support vector machines (SVM), decision trees (DT), K-Nearest Neighbors (KNN), and Bayesian classification. This ANN is an illustration of supervised learning, together with SVM and KNN. The Self-Organizing Map and K-means clustering are two examples of unsupervised learning techniques that can be used to organise data into useful groups.

Yet, the transition from hand-crafted to machine-learned characteristics has been gradual. Before AlexNet's innovation, a number of techniques for learning features were in use. Bengio et al. [7] will analyse the methodologies in-depth. Examples include dictionary approaches, picture patch clustering, and main component analysis. Moosaet al.[8] will use CNNs that have been taught from scratch after their work is finished, under a part titled Global Training of Deep Models. The more superficial models are not included in this examination as we are more concerned with the fundamental ones. applying conventional feature learning methods to images of health.

The findings of a study on medical image analysis that focused on deep learning were published by Shen et al. in 2017 [10]. They undoubtedly cover a lot of area, but we think certain important details have been missed. Brain tumours are classified and identified from MR images using medical image segmentation, which is crucial for quick treatment planning. Techniques for Classification in MRI.

The number of brain tumours is high. The main diagnostic method for assessing brain tumours is to image the brain using magnetic resonance imaging (MRI). An arbitrary property or the judgement of a radiologist are frequently used by traditional machine learning approaches to classify a brain tumour. In this study, we employ ensemble modelling on brain MRI data to discriminate between benign and malignant tumours using the SVM & CNN classifier [5].

Moreover, threshold-based segmentation management results in hazy boundaries and edges when it comes to the detection of brain tumours.

A deep learning model was developed using Resnet-50 and TL for identifying and diagnosing brain tumours. Their experiments' accuracy percentage is 95%. Fivefold crossvalidation was achieved using block-wise based transfer learning. 95 percent precision Using a benchmark dataset created from T1-weighted MR images, their technology (CEMRI) was put to the test. MRI brain scan classification utilising Google's neural network design. A 98% classification accuracy rate was attained. A approach based on support vector machines is used as a classifier [7]. The applications of CNN include feature extraction and classification. In this structure, two completely connected layers and two convolutionallayers are employed.

They shifted into deep learning mode to explore the MR data. Using the suggested method, 98.71 percent of MRI scans could be classified correctly. The results were startling despite the limited samplesize of the study. The plans provided by CNN were exact in every way. ResNet50 and InceptionV3 both achieved 89 percent accuracy, while VGG also attained 96 percent accuracy. 75% accuracy [8] According to CNN, contemporary structures are made to operate with 98.24 percent accuracy while moving at breakneck speeds. CNN multi-scale analysis of brain tumour MRI data is strongly advised. They put the proposed model to the test on a collection of MRI pictures and discovered that it correctly classified the images 97.3 percent of the time [9]. The CNN model collects pertinent data for feature extraction using two convolutional layers and two fully connected layers to classify brain tumours. They successfully classified brain tumours 97% of the time [10].

To classify MRI scans of the brain into healthy and pathological categories, researchers used a transferlearning approach and the convolutional neural network ResNet34 model [20]. They employed a technique for enhancing data photographs of brain tumours are normal or not to enhance the quantity of images and achieve 100% accuracy [11].

The Gray Wolf Optimizer's optimization approach was integrated with the ANN model (GWO). They were successful in classifying data with an accuracy of 98.91% using GWO-ANN. They displayed a deep CNN network that was trained using ResNet-50 and brain MR [12]. The model's accuracy rose to 97.48% with the aid of the suggested data enhancement technique. A Capsnet CNN model with 90.89% accuracy was proposed using training data from a brain MRI [13]. The accuracy of an ensemble model made up of three different convolutional neural network classifiers was 98% [14].

The study discovered that brain tumour classification could benefit from transfer learning. The CNN used for this assignment was one of four possible CNNs with the architectures DenseNet-2, VGG-16, VGG-19, or ResNet-50. To distinguish between three different forms of brain tumours in this experiment, we used FigureShare to analyse 3064 MRI data. Using a public test bed, the generated model was improved. The findings showed that the freely accessible Figshare dataset encouraged knowledge sharing.

The ResNet-50 model's development was a success.

Generally 99.02 percent or less. The scientists continued using the same information from 2020 and resumed up where they left off in an effort to increase the diagnosis precision for brain cancer. Two completely connected layers and two convolutional layers are recommended for CNNs' feature extraction and classification, respectively [16]. This CNN system was able to identify 97.39% of brain cancer patients with accuracy. The data at hand allowed researchers to categorise several brain tumour subtypes. KNN, ANN, RF, and LDA were among the classifiers that were used. Using the KNN model and the NLBP feature extraction approach together, accuracy of 95.56 percent was achieved [17]. It is necessary to get past the drawbacks of the aforementioned transfer learning techniques—intrusiveness, complexity, and susceptibility to sampling errors—when dealing with a brain to recognise and categorise tumours. There is a paucity of systematic study on the reliability and efficacy of such approaches. Transfer learning models have been created as a result for use in the diagnosis and categorization of malignant brain tumours. Tumor types were identified using a quicker region-based CNN and images were categorised using deep learning, a powerful and distinctive classification technique (faster R-CNN). The description of the real behaviour of brain tumours by Khairandish et al.

[1] presents a clear picture of this stage and does so with the help of numerous approaches and the analysis of research studies utilising a variety of criteria. The dataset, suggested model, performance ofthe suggested model, and type of methodology employed in each study are all taken into considerationwhen conducting the evaluation. The percentage of studies with accurate results ranged from 79 to 97.7%. They used the algorithms K-Nearest Neighbor, K-Means, Random Forest, and Convolutional Neural Network in that order (highest frequency of use to lowest). Here, a convolutional neural network provided the best level of accuracy, ranging from 79 to 97.7%. A brand-new, innovative technique was created by Someswararao et al. [2] for locating malignancies in MR images. through the use of machine learning methods, namely the CNN model in this study. In this study, a computer vision issue to automatically crop the brain from MRI data was paired with a CNN model classification challenge for identifying whether or not a subject has a brain tumour. Other methods employed included K-Means Clustering and Convolutional Neural Networks, with the latter providing the highest accuracy of about 90%. A new CNN-based approach that can distinguish between various brain MRI images and categorise them as tumorous or not was proposed by Choudhury et al. [3]. The model's f-score was 97.3 and its accuracy was 96.08%. The model produces results in 35 epochs using a CNN with three layers and minimal pre-processing. The purpose of this

study is to highlight the importance of machine learning applications for diagnostic and predictive therapy. Support vector machines, convolutional neural networks, k-nearest neighbour, boosted trees, random forests, and decision trees were other methods used. The proposed methods are expected to be highly effective and precise for the detection, classification, and segmentation of brain tumours. Precision that is automatic or semi-automatic.

Using certain methods is the only way to accomplish this. In this study, data was identified and categorised using CNN and a suggested automatic segmentation method. Other techniques include genetic algorithms, support vector machines, convolutional neural networks, and conditional random fields. At a rate of approximately 91% and 92.7% accuracy, CNN has the highest efficiency. In [1] To analyse MRI images in this study, we combine GLCM characteristics with a multilayer perceptron neutron. Between the input and output layers, the network is forwarded using one or more layers with MLP. The proposed approach uses this neural network technology for segmentation with thresholding, feature vector extraction with GLCM by stating the four angles-energy, entropy, contrast, and variance, and model learning. images that have undergone filtering or equalisation before being thresholded Data reduction includes the process of extracting features from data. A neural classifier uses the collected properties as training data. The proposed ISO algorithm is tested using 20 head MRI scans. Segmentation is used to eliminate the tumour areas from the entire image once the histogram has been equalised, enabling a more precise evaluation of the tumor's position within the MRI. In order to place a call, the retrieved images are also used.

In this study, we employ the Support Vector Machine (SVM) method to identify brain tumours in MRI data. Statistically-based supervised learning is accomplished using the Support Vector Machine (SVM). using DWT to depict a picture. Using a Simulink model, SVM classification is performed. In this article, a prototype that combines quick performance with outstanding detection accuracy is demonstrated using support vector machines (SVM). Prior to classifying tumours, the right images for analysis must be selected (known as "pre-processing"). The following stage is feature extraction after the tumor's dimensions and shape have been determined. The training of a support vector machine is then done using the image data. SVM classification is then performed using the DICOM format. Finally, a tumour diagnosis is made. It is established that the predictive values (PPV) are 81.48 percent positive and the negative predictive values (NPV) are 82 percent. Five genuine negatives, 22 genuine negatives, five genuine positives, and five genuine positives were present.

In [3] In this paper, we detect MRI pictures using the CNN technique. MRI scans are used to identify brain tumours, and they are processed to improve accuracy. A convolutional neural network's foundation consists of neurons and convolutional layers (CNN). Clustering, which is a technique for locating naturally existing groupings in massive data sets, can be used to more concisely characterise the behaviour of a system. Cluster analysis seeks to expose hidden patterns in massive datasets. Patch extraction is utilised in imaging to find the cancerous spots. The architecture of CNN is designed to take advantage of a picture's two-dimensionality as an input. Post-processing for MRI scans includes the processes of segmentation, detection, and extraction. A benefit of the system is better segmentation. MRI scans have an accuracy rate of 88%. Accuracy is increased when a neural network is used.

In [4] Recurrent neural networks are used in this study to identify the MRI pictures (RNN). The BP NN activation function was initially utilised to scale up and down the network nodes. The log sigmoid function was used to increase the hidden layer's node count to 270 and subsequently decrease it to 230.

Eventually, a 300 node increase has allowed us to achieve the best RNN performance. We employ an Elman network for maximum effectiveness. The quantity of performance errors grows together with the number of nodes. Elman networks were shown to be faster and more precise than other ANN systems when utilised in the recognition process. Our ratio was 76.47% compared to Elman's 88.14%.

III. Problem Statement:

There are many difficulties with image segmentation and classification, such as the absence of a standard model that can be used everywhere. choose the appropriate strategy for each situation, nevertheless. Building a good reputation is difficult. Hence, there isn't a technique for categorising and recognising pictures that is widely acknowledged. For AI vision systems, it continues to be a major obstacle. The strategy ignored the categorization of images depicting various clinical diseases, illness categories, or disease stages. It is susceptible to overfitting due to the system's large proportion of pure nodes.

In order to automatically detect brain tumours using MRI scans, developers presented a deep learning approach. They then examined the outcomes to see how well it performed.

The Contribution of Proposed Work:

- The image is improved by employing an unique boosted adaptive anisotrophic diffusion filter.
- Segmentation is carried out twice. The first step is brainsection; the tumour area is isolated using a hybrid deformable model with a fuzzy method and a superpixel-based adaptive clustering.
- The features are isolated based on texture and tetrolet transform, and the retrieved features are integrated using Harish Hawks optimization technique.
- The proposed method aims to differentiate between typical brain tumours and aberrant brainMRI images using the CNN classifier.

Tumors are collections of brain tissue that has developed incorrectly and may have fatal effects on thecentral nervous system.

Atypical mental talents could also result from the growth of tumour cells. Important to keep in mind is the fact that numerous tumour types cause the slow growth and eventual demise of brain cells [1]. The survival rate and range of treatment options for those with brain tumours, however, both significantly increase if they are discovered at an early stage. Benign tumours pose less risk and grow more slowly, but it takes a lot of time and effort to classify them using a lot of MRI scans. Magnetic resonance imaging can be used to produce high-quality medical images (MRI). This imaging technique is frequently used by medical practitioners to identify brain disorders. demonstrating the evolution of cancers over time. MRI images are crucial to automatic medical analysis [2]. By giving anatomical details, they enhance the visual image of the different parts of the brain. Using MRI pictures, researchers have created a variety of methods for locating and categorising brain tumours. There are several different approaches, ranging from more conventional medical image processing to advanced machine learning techniques.

Deep learning (DL) is a type of machine learning that allows computers to learn on their own from unstructured and unlabeled data. With their reliance on hierarchical feature extraction and data- driven self-learning, deep learning (DL) techniques and models have recently demonstrated their efficacy in resolving a wide range of challenging problems that demand a high degree of accuracy. Deep learning has been applied in fields like pattern identification, object detection, voice recognition, and decision-making, among many others [3]. The vast amount of training data needed is DL's biggest challenge. For instance, there aren't enough publicly available medical datasets in the healthcare industry to be used for deep learning model training.

The fundamental cause of this is the worry about the security of personal information. As a result, transfer learning has been actively used in the medical field to compensate for the lack of data. This is an illustration of transfer learning, where a deep learning model that was initially trained for one problem is later used to address a different one. When there aren't enough training data, this is frequently done [4]. The deep learning model we develop in this study uses transfer learning to recognise and categorise brain tumours in MRI data. Three pre-trained deeps are all that are required to build the suggested model.

- Here, we demonstrate an entirely automatic method for locating and categorising brain tumours that is based on CNN. We employ trained models to further extract deep data from brain MR images. We evaluated three pre-trained models as well as an ensemble of these pre-trained and CNN models using a dataset of brain MRI images with two classifications (normal/tumor).

- The current study uses transfer learning and densenet121 and densenet169 on Kaggle datasets to differentiate between benign and malignant brain tumours. The benefits of MRI include improved tumour detection, categorization, and growth rate estimation.

Data Pre-processing step

The amount of the training dataset must be prepared, which is crucial for deep convolutional neural networks. The Picture Data Generator from Keras TensorFlow was used to create the model's initial iteration.

The image dataset is enriched with random adjustments to provide the proposed system with a sufficient number of MRI images for training (rotations, height and breadth shifts, brightness changes, etc.). The properly chosen data augmentation parameters will ensure that the proposed classifier never sees the same image again.

Data augmentation:

The final effectiveness of deep convolutional neural networks exhibits a substantial association with the number of datasets used during training. We add more MRI images to the original dataset in order to improve the proposed system's training on MRI images. (shifts, scale modifications, and brightness) Using Keras' ImageDataGenerator function, TensorFlow is changed. What was done to the data to make it more accurate so the suggested classifier can identify things correctly. Nobody will ever look like you again. The generalisation abilities of the model are enhanced by this approach.

Rezing and Crope:

The first step in this procedure is to remove the brain from the background of the photograph [19]. To identify a bounding box's extrema, the method demonstrated here makes use of OpenCV. It's important to keep in mind that the size of the MRI images used in this study varies depending on where they were acquired. The images are scaled down to 64x64x1 to guarantee uniformity.

Data Spiliting:

We break down the data into more manageable categories for this analysis. In three phases, the proposed method will be evaluated, confirmed, and improved. a thorough schooling case study. The first subset can be used to fit the model. Here, almost 80% of the entire dataset is presented. The remainder has disappeared. The system will undergo 80% each of testing and validation.

Convolutional Neural Network:

Because it has become more adept at categorising photos, CNN is well-known. CNN automatically gathers features based on the information provided to it. It has connections between each layer that are feedforward in a well-known DL architecture. These networks are able to learn sophisticated functions that a basic neural network cannot [20] thanks to deep design. Computer vision, which is the brains underlying CNN, can be used to categorise objects, keep an eye on activity, and provide images for medical use. Because it has an inbuilt filter, its preprocessing is less complex and smaller than that of other neural classifiers.

The following elements make up a typical CNN architecture:

The classification procedure includes the steps of

(i) Convolution,

(ii) Pooling,

(iii) Activation,

(iv) And a dense layer.

Transfer Learning Transfer learning

(TL) is a deep learning technique that combines an existing model that has been trained on a sizable dataset with a new model that has been developed on a different dataset to address the same issue. With more data than with fewer, CNN often performs better. TL can be helpful in CNN scenarios with little datasets. In recent years, the field of TL has grown, with applications in areas such as object recognition, medical imaging, and image classification [21]. To train the algorithms and enable the extraction of valuable properties, large datasets like ImageNet were used. Applications that make use of smaller data sets, such MRI scans of the brain, are widespread. Shortening the time needed to finish training is one of the advantages of TL. procedures, staying away from tight fits, training with less data, and inspiring better performance. The CNN model training has ended. In our investigation, DenseNet121, DenseNet169, and Efficientb0 were all used.

IV. Conclusion

The science and new businesses have extensively researched dense convolutional layer neural networks (CNNs) for categorization. Analyze the performance of a deep neural network model in this research study for a classification method related to the diagnosis of brain cancer. The modification made to the ResNet model demonstrates how much more effectively medical data can be analysed using the deep learning method utilised in natural image processing. The proposed technology was created with the purpose of locating brain tumours in MRI scans of the brain. To recognise the tumour component from the brain image, an unique boosted adaptive anisotrophic diffusion filter is employed in many rounds of noise removal. The malignant part is removed during segmentation. The suggested system makes use of textural feature extraction. CNN classifiers are used for classification; the proposed system had an accuracy rate of 98.3%. Further improvements will involve working with the intricate perfusion-based MRI pictures.

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STUDY AND IMPLEMENTATION OF USB DRIVEFOR WIRELESS DATA TRANSFER

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ABSTRACT

This paper explores the study and implementation of an USB drive for wireless data transfer, using the ESP32 microcontroller. With the increasing demand for convenient and portable data storage, USB drives have become a popular choice for individuals and organizations a like. However, the use of cables to transfer data limits their versatility and can be some in certain situations. To address this issue, this paper discusses the use of wireless technology, specifically WiFi, to enable wireless data transfer between a USB drive and other devices. The paper begins by discussing the components required for the implementation of wireless data transfer, including the ESP32 microcontroller, which is used for both WiFi connectivity and USB communication, and the TP4056 lithium battery charger, which allows for portable and rechargeable power. The paper then provides a detailed overview of the design and implementation of the system, including the software and hardware components used. The highlights the potential applications of this technology, such as in situations where cables are impractical or inconvenient, such as in presentations or demonstrations. Additionally, the paper discusses the limitations and challenges of this approach, including the potential for signal interference and security concerns. Overall, this paper provides a comprehensive overview of the study and implementation of a USB drive for wireless data transfer, highlighting the benefits and limitations of this approach, and providing insightinto the potential applications of this technology.

Keywords: *USB, Wireless, Wi-Fi, Pendrive, Data Transmission, ESP32, TP4056.*

Introduction

The proposed system consists of an ESP32 microcontroller, which offers both Wi-Fi connectivity and USB communication. The TP4056 lithium battery charger is used to provide rechargeable power to the portable USB drive. The system's design enables the ESP32 to connect to the local WiFi network and create a hotspot for other devices. This setup allows the user to transfer data wirelessly from the USB drive to other devices, without the need for cables. One significant advantage of this approach is that it enables greater mobility and convenience in data transfer, which can be particularly useful in situations where cables are not practical or are inconvenient. For example, it can be used in presentations, demonstrations, or other settings where mobility is necessary. Furthermore, the system's rechargeable battery capability means that it can be used for extended periods without the need for an external power source, making it even more portable.

However, there are some potential limitations and challenges with the wireless approach. One concern is the potential for signal interference, which could lead to a loss of data or a decrease in transfer speeds. Furthermore, security is another potential issue, as wireless connections are vulnerable to hacking and other malicious attacks. Despite these challenges, the use of wireless technology for USB drives has significant potential applications in various settings. For example, it can be used in educational settings, where students can wirelessly transfer their projects to their teachers for grading. It can also be used in corporate settings, where employees can transfer data wirelessly to their colleagues, without the need for cables. Overall, this paper provides a comprehensive overview of the study and implementation of a USB drive for wireless data transfer, highlighting its potential benefits and limitations. It is hoped that this technology will continue to develop and become even more widespread in the future, allowing for greater convenience and mobility in data transfer.

I. Literature Review

Abhijeet Ashish, Gaurav Gautam and Arjun Sahi in the paper, “Data Communication Via Bluetooth Between Pen drive Using ARM [1]” explored that using pen drive ; one can share data directly from pen drive to pen drive without need of a PC. This is very effective process which can save time as well as effort of user.It will make user comfortable to share data easily. To work with this pen drive we need a small power supply to the pen drive almost 9-volt DC power supply.

Tushar Sawant, Bhagya Parekh and Naineel Shah, in their paper“ Computer Independent USB to USB Data Transfer Bridge [2]” achieved computer independent data transfer , from one USB flash drive to another. Being portable and battery operated is an added advantage of their system. It is an embedded solution to a practical problem. Olga Mordvinova , Julian Martin Kunkel and Christian Baun, in the paper “USB Flash Drives as an Energy Efficient Storage Alternative [3]” analyzed inexpensive flash drives and conventional hard drives with a focus on energy efficiency. Their goal was to decide whether replacing hard driveswith USB flash drives is a reasonable and economic way to build energy-efficient servers. Evaluation showed that despite the high throughput of hard disks, flash drives have a better performance per joule. Rohan Kulashresta, Rajeev Ranjan and Shreyas Barati, in their paper “Wireless Data Transfer Of USB Devices Using WiFi Technology [4]” explained an idea of Wireless means of data transfer for USB devices without using USB cables and ports of PC. So, by this device we can easily transfer our data directly from pen drive to computer systems or smart phones and vice versa.

Alexander Maier, Andrew Sharp, Yuriy Vagapov in their paper “Comparative Analysis and Practical Implementation of the ESP32 Microcontroller Module for the Internet of Things [7]” discusses the ESP32, a low-cost, low-power system on a chip microcontroller with Wi-Fi and Bluetooth capabilities. It compares the ESP32 with other IoT modules, highlights its technical features, and provides an example of its practical implementation as a portable wireless oscilloscope. The ESP32 is available in various form-factors, making it suitable for hobbyist, educational, industrial, and small-sized solutions. Overall, the ESP32 is expected to play a major role in designing future IoT systems and embedded projects.

Monika T. Shinde1, Mr. Ramchandra. K. Gurav2 in their paper “USB to USB Data Transfer using Raspberry Pi and ARM [8]” explain designing a portable system for data transfer between USB devices using Raspberry Pi and ARM7. It allows for graphical display of the file transfer progress and can connect to multiple USB devices. The system is compact and does not require a computer or laptop. Linux provides added security, and it can be battery or power supply operated. The project caters to the need for portable data transfer.

B. Naresh Kumar Reddy, N. Venktram and T. Sireesha in their paper “An Efficient Data Transmission by Using Modern USB Flash Drive [9]” propose a touch screen LCD pen drive with Wi-Fi, Bluetooth, USB, and memory card slots. This device enables direct data transfer between USB flash drives without involving a computer. It also has an internal battery for charging and is capable of transferring data up to 16GB. Implementing an operating system and processor to the USB flash drive is a challenge. This device eliminates the need for extra cables and makes data transfer convenient and portable.

II. Block Diagram

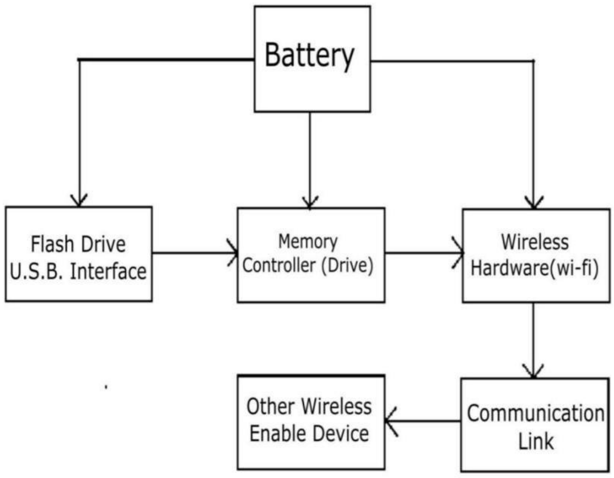

Fig. 3.1 Block Diagram Of Wireless Pendrive

III. Hardware Description

1. ESP32

Fig. 4.1 Wi-Fi Module ESP32-S2-SOLO

The ESP32 is a microcontroller-based system that provides WiFi and Bluetooth connectivity, making it an excellent choice for IoT projects. With its dual-core processors and low power consumption, it is a popular choice for developers and makers [15]. The ESP32 is based on the Xtensa LX6 processor core, which can run up to 240 MHz and supports multi-threading. It also has many built-in peripherals, including SPI, I2C, UART, ADC, and DAC, as well as a capacitive touch sensor, a temperature sensor, and a hall sensor, and a built-in amplifier for external speakers [16].

It has 520KB of SRAM, 4MB of flash memory, and supports various programming languages, including the Arduino IDE, MicroPython, and ESP-IDF. With its low power consumption, the ESP32 is well-suited for IoT projects, and it can operate in low-power modes to save energy. It hasa deep sleep mode that can reduce power consumption to as low as 10 µA [17].

The ESP32 is used in many applications, including home and industrial automation, wearables, smart agriculture, and DIY projects. There are many development boards available for the ESP32, such as the ESP32 DevKitC and ESP-WROVER-KIT boards, which offer even more versatility and flexibility for developers and makers [15] [16].

2. USB

Fig. 4.2 Male USB Connector

A key design objective for USB was usability, and the result is an interface that is enjoyable to use for a variety of reasons:

One interface for many devices: USB is adaptable enough to do almost any common PC peripheral task.

One interface handles several peripheral functions rather than requiring a different connection and cable type for each one [11].

Automated configuration: The operating system recognises a connected USB device and loads the necessary software driver. The operating system could ask the user to input a disc containing driver software the first time the device connects, but other than that, installation is automatic. Before utilising the gadget, users are not need to reboot [11].

Simple to connect: Hubs make it simple to add USB ports without wireless options to a standard PC's many USB ports: Although USB was initially a wired interface, there are now technologies that allow for wireless connections with USB devices without opening the PC [11].

3. Flash Memory

Fig. 4.3 Flash Memory Storage

A specific kind of EEPROM chip is flash memory. It has a column and row grid with two transistors at each intersection in each cell (see image below). A thin oxide layer separates the two transistors from one another. The floating gate transistor is one of the transistors, and the control gate transistor is the other. The control gate is the only point of contact between the floating gate and the row, or wordline. The cell has a value of 1 while this link is active.

The floating-gate transistor behaves like an electron gun as a result of this charge. The thin oxide layer gains a negative charge when the excited electrons are forced through and trapped on the other side of the layer. The control gate and the floating gate are separated from one another by these negatively charged electrons. The amount of charge moving through the floating gate is monitored by a unique gadget called a cell sensor. A value of 1 is assigned if the flow through the gate exceeds 50% of the charge. The value decreases to 0 when the charge passing through falls below the 50% threshold. All of the gates are fully open in a blank EEPROM, giving each cell a value of 1.

4. TP4056

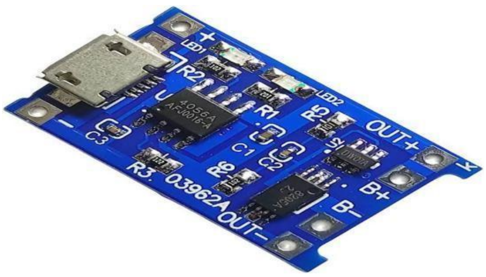

Fig. 4.4 Charging Module

The TP4056 is a linear charger designed for single cell lithium-ion batteries. It features a low external component count and a small SOP package, making it ideal for portable applications. The internal PMOSFET architecture eliminates the need for a blocking diode, and prevents negative charge current. The charger regulates the charge current to limit the die temperature during high power operation or high ambient temperature [16]. The charge voltage is fixed at 4.2V, and the charge current can be programmed with a single external resistor. The TP4056 terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached. It also includes features such as current monitoring, under voltage lockout,
automatic recharge, and two status pins to indicate charge termination and input voltage[17]. The TP4056 is able to charge single cell Li-Ion batteries directly from a USB port and has a preset 4.2V charge voltage with 1.5% accuracy. It also includes soft-start limits to limit inrush current. The TP4056 is available in an 8-lead SOP package, with an optional radiator that needs to be connected to GND [16].

5. Lithium Polymer Battery

Fig. 4.5 Lithium Polymer Battery

Lithium-Polymer batteries used in this research have a total of three cells, where the battery charging process will be carried out individually or each cell. The capacity of the Li- Po battery used is 1800mAh. Where for constant current is regulated at 0.8A and for constant voltage is regulated at voltage of 4.2V. [13].

A LiPo (Lithium Polymer) battery is a type of rechargeable battery commonly used in various electronic devices such as smartphones, drones, and RC cars. It is a type of lithium-ion battery that uses a polymer electrolyte instead of a liquid electrolyte, making it more lightweight and flexible in shape [14].

LiPo batteries have a higher energy density compared to other rechargeable batteries, which means they can store more energy in a smaller size. They also have a high discharge rate, making them ideal for high-performance applications that require a lot of power quickly. However, LiPo batteries require special handling and care due to their sensitivity to overcharging, overheating, and punctures, which can cause them to catch fire or explode[14].

IV. Working

A flash drive is a small, portable storage device that can store and transfer digital data. It uses a type of non-volatile memory called NAND flash memory to store data. The memory cells in NAND flash memory can be programmed and erased electrically, allowing for fast read and write speeds.

To control the NAND flash memory and manage data transfers, a memory controller is used. The memory controller is a small chip that is embedded in the flash drive and communicates with the host device to manage data transfers and ensure data integrity.

To make a flash drive wireless, a Wi-Fi module is added to the device. In this case, an ESP32 Wi-Fimodule is used. The ESP32 is a low-cost, low-power, and highly-integrated Wi-Fi and Bluetooth combo chip that can be used as a standalone device or as a slave device in a larger system.

The memory controller sends data from the flash drive to the ESP32 Wi-Fi module, which then transmits the data wirelessly over the air to another Wi-Fi enabled device. The data is transmitted using a communication protocol such as Wi-Fi Direct or TCP/IP.

To power the flash drive, memory controller, and Wi-Fi module, a battery is used. In this case, a lithium polymer (LiPo) battery is used because of its high energy density and light weight. The battery is charged using a TP4056 battery charger module, which is a small, low-cost module that provides a regulated 5V output for charging the LiPo battery.

Overall, a wireless flash drive provides a convenient way to store and transfer data without the need for a physical connection to a host device. It can be used in a variety of applications, such as file sharing, backup and restore, and media streaming.

V. Conclusions

This review paper has explored the implementation and potential applications of a wireless USB drive using the ESP32 microcontroller and the TP4056 lithium battery charger. The wireless approach allows for greater mobility and convenience in data transfer, making it a useful tool in various settings. However, there are potential challenges, such as signal interference and security concerns. Nonetheless, the benefits of wireless data transfer make it a promising technology with significant potential for educational and corporate settings. As technology continues to develop, it ishoped that wireless USB drives will become even more widespread, enabling greater convenience and efficiency in data transfer.

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IOT BASED CURRENT, VOLTAGE & TEMPERATURE,MONITORING SYSTEM

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ABSTRACT

This project is primarily based on monitoring the voltage of AC-supported equipment and developing an automatic temperature ventilation system that can make a space fully temperate. Additionally, this will protect our appliances from over heating.Using the used Node MCU microcontroller and IP networking for remote access and control it, this project aims to automate machines, You can also use an Android smartphone apps to access while you are not at work. Many electrical and appliance and equipment such as lamps, fans, light and refrigerators, can be controlled by an smartphone, which can also help against over heating. This technology is more valuable in today world in environments where temperature control is big concern. The proposed voltage control scheme has been combined with products such as AC lamp, AC fan, and a DC cooling fan to its feasibility and effectiveness. The use of IoT is increasing day by day; the significance and utilization is on increase with more sophistication. In real world situation the electricity board calculate the bill amounts and passed tothe user mail or EB card

Keywords: *IoT, Node MCU, Microcontroller, Voltage Control, Temperature Sensor, Current sensor LDR*

I. Introduction

As we live in the modern world, we need to do our work more efficiently and smartly. Both a nation's technological and economic development depends heavily on the industrial sector.
The efficiency of the motor depends on mechanical and electrical factors.
Due to this, an induction motor must be continuously monitored for safety and reliability onan industrial scale.
Electrical machines are essential to most manufacturing processes, and these machines are susceptible to faults for several reasons. In the case of an induction motor, engineers monitor the electromagnetic field within and around the machine, along with motor Current, Voltage, and Temperature to detect faults within the machine for condition monitoring.
Various possible faults in Motor are

a) Electrical faults
b) Mechanical faults and
c) Environmental-related faults.

a) In electrical faults, there is an unbalanced supply voltage or current, an overvoltage or Undervoltage, overloading, single phasing, and other problems.
b) Mechanical failures in motors are more common than in other parts of the vehicle,resulting in stoppages, breakdowns, and catastrophic accidents.
c) Environmental-related faults involve ambient temperature, external moisture, andvibrations of the machine.

If not monitored for any fault, induction motors can fail, resulting in downtime for any industry.[1] That's why condition monitoring is important to avoid unplanned downtime. Motor condition monitoring refers to the monitoring of operating parameters of a machine to assist maintenance before any problems arise, we can easily detect the problems and rectify them with the appropriate maintenance teams as we are monitoring the health of the motor using three signals. Using the condition monitoring of an induction motor can reduce maintenance costs, enhance operating efficiency, and decrease motor damage. Using the Internet of Things (IoT) for condition monitoring of induction motors provides data on health conditions, and also allows remote access to the data. An induction motor's health condition can be determined by various sensors that detect winding temperatures, along with Volage and currents Processed by an ESP-32 microcontroller. The Internet of Things is a philosophy in which each device is given an IP address, and everyone can identify the device on the internet using that IP address. It was originally known as the "Internet of Computers." According to surveys, the number of "things" or computers connecting to the Internet would rise at a breakneck pace. The "Internet of Things

II. Literature Review

Motor failures of electrical origin are primarily related to the temperature of the motor and the aging of the insulation, which leads to faults of inter-turn short-circuit, short-circuit between phases, or coils connecting to ground. [1] To prevent premature failure of engines, it is important to use the right motor for loading and keep in mind the ambient temperature during motor operation.

During maintenance, it is essential to check the power quality of the network in order to identify voltage fluctuations, voltage harmonics, overvoltage, and voltage imbalances. Here,use GSM module is made for electric machine monitoring but it was realized that it has some disadvantages which can be overcome by IoT systems. From it was realized that ESP- 32 is a low-cost IoT Wi-Fi module that has a full TCP/IP stack and also possesses an onboard microcontroller.

We are using the Node MCU module which has a Wi-Fi module as well as a microcontroller which helps in programming such devices easily. For data capture, we can use Things peak, IBM, Blynk IoT, amazon web services, etc.

The major challenge in the project lies in the proper integration of multiple subsystems and their successful simultaneous operation. All the subsystems like sensors, microcontrollers, communication with Wi-Fi module and upload to the cloud should work in synchronization.

III. Project Purpose

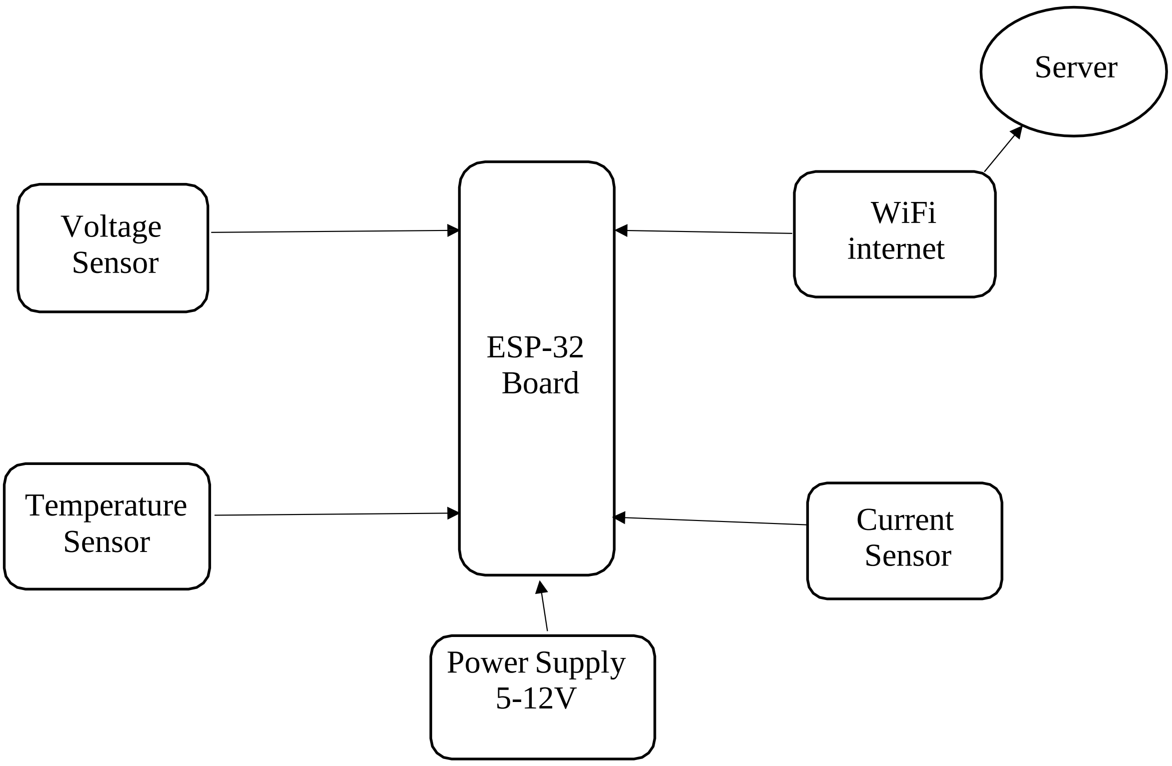
They propose to develop a system to monitor the power & temperature of all types of electronic and electrical Motor and machines. In most industries, Motor and machines do not come with IoT temperature and power monitoring systems, so this is a more sophisticated system to monitor power and temperature. Through the literature review and detailed research in the various industries, it was noticed that there is no such product available that has the property to link with IoT. There are devices that only measure the electrical parameters of an electrical machine, but no such product is being introduced. So, we proposed a device that will remotely measure or monitor the electrical parameters of an electrical machine and this data will be available in the cloud. This will enable the user to access and acquire the necessary details and status of the machine with ease and also take precautionary steps as and when required

The following components are used for the project.

i) ESP-32
ii) Current Sensor - SCT-013
iii) Voltage Transformer - ZMPT101B
iv) Temperature Sensor - DS-18B20
V) Electric Machine – Motor

- Current, Voltage & Temperature Monitoring system using ESP32 & monitor data on the mobile app.
- It monitoring and keeping track records of Machine.
- We select the Temperature sensor, current sensor as well asthe voltage sensor so that the current & voltage can be measured and thus we can know about the power consumption& total power consumed.
- Using the SCT-013 Current Sensor & ZMPT101B Voltage Sensor, we can measure the all required parameters needed for Power and Temperature Monitoring System.
- We will interface the Temperature sensor Current Sensor & Voltage Sensor with ESP32 Wifi Module & Send the data to server.

iv) BLOCK DIAGRAM-



V. Future Scope

In This project, IoT Based Current, Voltage & Temperature, Monitoring System is a great help in Industry Sector. In most industries machines do not come with IoT temperature and power monitoring systems, so this is a more Useful and Upgradable thing for an industry Use to do. We Can Also use it in your home, Office, etc. for monitoring the parameter of particular things or Machines. It can also track Power Electricity Consumption so we can monitor the power meter Electricity Consumption using IoT.

Voltage Sensor

The Voltage Sensor is a simple module that can used with Arduino (or any other microcontroller with input tolerance of 5V) to measure external voltages that are greater than its maximum acceptable value i.e. 5V in case of Arduino. Following is the image of the Voltage Sensor Module used in this project. In our Project, the Voltage Sensor constantly monitors the Line Voltage of the Battery and sends the Data to the Dashboard.

Current Sensor

This sensor operates at 5V and produces an Analog voltage output proportional to the measured current. The output of this current sensor is analogy, so to read it, we can directly measure the output voltage using voltmeter or measure it by using a microcontroller like Arduino through Analog Read pin or ADC pin.In our Project, the Current sensor will constantly monitor the Current.

Temperature Sensor

This is a 1 Meter Long Waterproof, sealed and pre-wired digital temperature sensor probe based on DS18B20 sensor.It is very handy for when you need to measure something far away, or in wet conditions.They work great with any microcontroller using a single digital pin Measures Temperatures from -55°C to +125°C (-67°F to +257°F) ±0.5°C Accuracy from
-10°C to +85°C

VI. Conclusion

Iot Based Current, Voltage & Temperature, Monitoring System was well planned and executed. It was developed by combining features from all of the equipment segments that were used, as well as programming in the C language. Each module's presence has been carefully considered and placed along these lines, enhancing the unit's overall performance. The endeavor has already been successfully realized, thanks to the use of a highly advanced microcontroller and the assistance of emerging technology. We conclude that by implementing these systems we can regulate the voltage of AC appliances and ensure safety with our system. Our project has some advantages, which make the project unique. Its efficient and low-cost design easily can operate, it responds fast for connection build-up, it has a lower power consumption, it is very easy to implement, high reliability, fast responsive output and it has an accurate follow of the given command feature. By all of these advantages it has some limitations also like, internet failure, power failure, a loose connection of wires, the maintenance cost is pretty high and needs an expert, it has limited long term stability, it is touchy to dewing and certain forceful substances, it is hard to utilize howl 0 temperature and it can’t monitor the input value in app.

This system has some good applications, which can be very useful. We can use this kind of project in such kind of farm where always need a constant temperature like a chicken farm, animal farm, fish farm, artificial insemination center, etc. We can use it also in the agricultural sectors; like in a smart greenhouse, in hotel rooms or kitchens, a small factory, and many more. Therefore, this project futuristic, which can be more useful in the coming time.

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FRUIT DISEASE DETECTION USING IMAGE PROCESSING

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ABSTRACT

Researching and detecting fruit diseases in the past depended on the unreliable use of the human eye. It's the fruit's changing hues that stand in for the hand motions. The colour and pattern variations may be indicative of the fruit's genuineness. The next stage of infection identification involves physically monitoring and detecting microorganisms, which is a time-consuming, costly, and less accurate procedure. As a result, a very quick and error-free diagnosis using certain approaches in MATLAB that are more dependable than some other outdated ways is the best choice that can be made. There are symptoms of infection or disease on the plant's fruits, leaves, and lesions. The purpose of this project is to make a correct diagnosis of the condition based on the submitted image. The process of segmenting, preprocessing, extracting features, and labelling pictures are all crucial. Infectious illnesses, such as viruses, fungi, and bacteria, may be transmitted by insects, the weather, and other environmental factors. In this case, we'll be looking at contaminated fruit to determine the cause of the illness. Fruit characteristics like major and minor axes will be extracted from an image in order to classify the infection.

Keywords: *K-Means Clustering, Local Binary Pattern, Multi-class Support Vector Machine, Texture Classification*

Introduction

The development of a reliable recognition system that can compete with human performance is a major goal of computer vision research. When it comes to farming,pictures play a crucial role in the collection and analysis of scientific data. In recent times, photography has been the sole technology utilised to reliably recreate and report such data. Mathematical processing and quantification of photographic data is challenging. The development of computers and microelectronics in tandem with conventional photography has allowed for the creation of technologies for digital image analysis and image processing that successfully sidestep these
issues. This instrument is useful for enhancing photographs captured at various magnification levels, from the microscopic to the telescopic.

Sustainable agriculture relies on the early diagnosis and treatment of illnesses, hence it is essential that the health of fruits and trees be monitored closely. We are unaware of any commercially accessible sensors for monitoring tree health in real time. The most common approach of checking on tree health is scouting, but it may be costly, time-consuming, and labor- intensive. The molecular approach of polymerase chain reaction is used to identify fruit illnesses, but it requires extensive sample and processing.

Fruit infections come in a wide variety and have a major impact on harvest success. Fruit diseases not only lower yields, but can cause varieties to degrade and be removed from production. In order to effectively manage fruit disease vectors, apply fungicides, disease-specific chemicals, and pesticides; and boost production, it is important to identify disease and crop health early on. Experts have always relied on naked eye inspection as the primary method for detecting and identifying fruit illnesses. It might be time consuming and expensive to go to a place with available specialists for consultation in certain poor nations.

When fruit illnesses manifest themselves during harvest, they may cause substantial losses in both production and quality. To provide just one example, the fungal disease in soybeans known as soybean rust has resulted in a considerable economic loss, yet eradicating only 20% of the infection may net farmers a profit of almost $11 million

Certain illnesses that manifest in the fruit may also affect the tree's foliage and structural elements. Finding ways to identify problems in fruit early will help cut down on losses like these and prevent the spread of disease.

The size and colour of fruit has been inspected visually by machine vision, and there has been a lot of effort to automate this process. Nonetheless, because to the significant variety in defect kinds, the presence of stem/calyx, and the naturally variable skin colour between fruit varieties, defect identification in photos remains challenging. Analyzing the data is crucial for determining what preventative measures to take the next year to avoid the same losses.

This work presents a methodology for creating autonomous systems for agricultural process, which may be used to the usage of photographs from faraway farm fields. In order to improve farming processes, many image processing programmes have been created. In order to enter photos, these apps need camera-based hardware devices or colour scanners. We have made an effort to apply cutting-edge image processing and analysis tools to a wide variety of issues in the agricultural sector.

Due to the fast development of computing technology, computer-based image processing is constantly developing and improving. Nevertheless, the specialised imaging systems now on the market, which only need the user to push a few buttons before displaying the findings, are limited in their adaptability and come at a hefty price. Moreover, the processes by which the outcomes are achieved are not easily discernible. Spots on the fruit are a sign of disease, which may cause major losses if not addressed in time.An increased risk of harmful residue levels on agricultural goods owing to pesticide usage for treating fruit diseases has been found as a key cause to ground water pollution. As pesticides are one of the most expensive parts of manufacturing, we need to use them sparingly. As a result, we've tried to provide a method that can detect illnesses in the fruits as soon as they show signs on the developing fruits, allowing for timely and effective therapy.

Apple scab, apple rot, and apple blotch are just a few of the most frequent illnesses that affect apple fruits. Grayish or brown corky patches are scabs on apples. Infected apples will have sunken, brown or black patches that may be surrounded by a crimson halo. Blotch, a fungal disease that manifests as dark, uneven, or lobed margins on the surface of apples, is a common problem.

In this work, we offer an adaptive method for the automatic detection of fruit illnesses from photographs, and we conduct an experimental evaluation of its efficacy. The suggested method consists of three phases: first, pictures of fruit are segmented using the K-Means clustering methodology; second, certain cutting-edge characteristics are collected from the segmented image; and third, fruit illnesses are identified using a Multi-class Support Vector Machine. We demonstrate the value of employing a clustering approach to separate illnesses and a Multi-class Support Vector Machine as a classifier for the automated identification of pathogens in fruit. We have taken into account three distinct apple diseases—apple blotch, apple rot, and apple scab—to verify the efficacy of the suggested method. Experimental evidence demonstrates that the suggested method is effective for detecting and automatically identifying fruit illnesses. To detect defects in fruit, scientists use imaging techniques like magnetic resonance imaging (MRI), x-ray imaging (x-ray), etc., but these methods are prohibitively expensive for farmers to adopt, take up too much space, demand scientific literacy from customers, and negatively affect the research specimens themselves. In addition, doctors rely on their own keen eyesight as the only tool for detecting and diagnosing problems in fruit. In certain poor nations, getting an appointment with a specialist might take a long time and cost a lot of money because of how far away the cities are.As a result, their target audience and potential applications are narrowed. A single pathogen may infect the bark, the leaves, and the branches. Every disease that manifests itself on fruit leaves a telltale mark, either directly on the fruit's surface or inside the shape of a darker area. There's a chance that we can use these peaks to identify early warning symptoms of fruit rot. Expertise and a lot of work go into fruit disease detection.

Literature Review

S Malathy et al. [1] As part of this initiative, this method will be used to detect illnesses that damage fruits and can even identify certain sorts of diseases that target fruits by making comparisons. Because of this, the method employs Convolutional Neural Networks (CNN), a kind of deep learning algorithm often used for evaluating visual imagery, in which pictures serve as input and are then distinguished depending on numerous elements and parameters extracted from it. In the near future, this will greatly assist farmers in increasing agricultural yields. Further research on this method will be conducted using the python programming language. The suggested approach has a 97% success rate when put into practice..

R. Ramya et al. [2] As fruit diseases would have repercussions in the agriculture sector, early diagnosis is crucial. In this work, we focus on utilising Cloud computing to identify and analyse fruit illnesses in plant regions, as well as to store data about agricultural fields and characteristics of farmers, and to retrieve such data, if necessary. Insects, poor soil, and extreme weather all contribute to an increase in fruit illnesses. Images are processed to assess and record information about the plants and their surroundings.

M. Senthamil Selvi et al [3] As agricultural output is crucial to the country's economy. Vegetable and fruit yields are reduced mostly due to plant disease. At least 200 million Indians go to bed hungry every night, yet annual agricultural pest and disease-related losses are estimated at 50,000 crore rupees, according to a poll by India's affiliated chambers of commerce and industry [5]. So, the value of a plant is quite high. Hence, accurate plant disease diagnosis is critical for reducing food loss and enhancing agricultural product quality and quantity. While manual analysis of leaf patterns and identification of the disease are efficient approaches for detecting plant sickness, they are not without their drawbacks. A human being is required to undertake this work by visually inspecting plant leaves to pinpoint the disease's origin. Keeping an eye on a big farm requires more manpower and time. In recent years, several agribusiness establishments and technological advancements have appeared with the express purpose of boosting agricultural output. Despite their significance as an energy source, plants are vulnerable to a wide range of diseases that may lead to significant societal and economic losses. Many plant illnesses manifest visually at first, but may cause severe damage if caught too late. This study has come up with a revolutionary method by using Image Processing (IP) technology, which will be very successful in identifying plant diseases, and so reduce the time spent physically watching the plant process and finding it. Image capture, pre-processing, segmentation, feature extraction, and classification are only few of the steps used to identify illness. The characteristics of an image may be extracted using the histogram of an oriented gradient. By analysing the acquired pictures, we can easily pinpoint the affected area of a leaf.

Yan Qi et al [4] Disease is a major concern in the fruit-growing industry. By identifying fruit leaves, the authors of this article were able to identify and manage fruit disease in the face of environmental complexity, hence increasing fruit output and quality. This research developed a new form of plant disease diagnosis model based on deep learning to address the aforementioned issues. The model first performed image normalisation processing and the MSRCR defogging algorithm to improve the quality of the image, then used the Canny SLIC algorithm based on a gradient to performance . the findings fragmentation of both the data set of disease image, and finally obtained the leaf blades that exhibited the characteristics of disease spots. To conclude the identification process, photos of fruit diseases were fed into an upgraded version of the DenseNet algorithm, which was able to accurately detect and categorise illness characteristics within the images. The model outperformed the gold standard CNN convolutional architecture model with
an average accuracy of 98.98% when applied to data from three different types of fruit diseases: Grape spot anthracnose, Grapevine white rot, and Grapevine anthracnose. This model improved the clarity and reliability of the recognition of fruit disease images in complicated environments, and it may be utilised to aid in the automated detection and recognition of fruit disease.

Mrunmayee Dhakate et al. [5] Pomegranate is one of the most lucrative fruits on the market, and it grows abundantly in several Indian regions. However, the plants get afflicted with numerous illnesses as a result of a number of environmental factors, resulting in the complete destruction of the crop and a very little harvest. Thus, this paper provides a technique for disease identification and classification in plants using image processing and neural networks. Pomegranate infections may be caused by fungi, bacteria, or even the weather, and they can harm both the fruit and the foliage. Bacterial blight, fruit spot, fruit rot, and leaf spot are all examples of such illnesses. There are pictures used for training, others for assessment, and so on. Pre-processing and k-means clustering segmentation are applied to the colour photos. The GLCM technique is used to extract the texture characteristics that are then fed into the neural network. To put it another way, this strategy has a 90% rate of success. In comparison to human grading, the findings are shown to be accurate and adequate, suggesting that this method has the potential to make significant strides towards being one of the most efficient on the market.

Methodology

There might be various causes for the decline in fruit production. Yet, a major factor is the presence of infectious illnesses on the fruit itself. It is difficult to foresee how successful the process of determining what kind of illness the fruit has will be. Thus, we urgently want novel approaches and strategies for quick and precise categorization of illnesses that could infect the crops. If fruit diseases aren't spotted early, fruit production might suffer. Incorrect diagnosis of fruit may produce further detrimental effects on the plants or a loss in production of fruit yield when farmers manually check fruits and seek for pesticide recommendations from local authorities of agriculture. A manual inspection is a laborious and time-consuming practise in agricultural areas. Using image pre-processing and machine learning algorithms to determine the nature of a fruit disease and recommend an appropriate pesticide not only saves time but also yields more accurate findings.Grayscale conversion, noise reduction, smoothing, and other picture enhancements are all part of the first step of image processing. After the picture has been preprocessed, it will have its own distinct characteristics and a more refined appearance.Second, features are extracted from a picture by selecting the most important differences in pixel values and passing them on to the input window. Compressing the picture or locating its edges should allow for the extraction of the components.Third, segmentation separates the region of interest from the rest of the picture by cutting it out.At the fourth stage, photos are classified according to their characteristics.Deep Learning Architectures: One of the deep learning methods that has found widespread use in computer vision tasks is the convolutional neural network. Convolutional layers, pooling layers, and fully connected layers are only some of the building pieces that go into making this model, which may be trained using the back propagation technique to learn ever more complex spatial feature systems. Using a CNN model to classify citrus diseases:

Input picture interpretation (1) involves breaking the image down into individual pixels. Because of the presence of colours in the picture, it is often referred to as a three-by-three grid of red, blue, and green.After the first analysis of the incoming picture, the next layer of the convolutional neural network (CNN) is devoted to extracting features from the input matrix.

Within this layer, convolutional operations are performed between the input matrix and the filter grid.Maxpooling layer-3: The convolved feature map is sent to Maxpooling after the convolutional layer learned in earlier CNN model layers is applied to it. The pooling layer reduces the picture lattice's individual parts.At this layer, we apply several filtering operations to the feature map in order to extract the high-level features. Layer after layer, the CNN model hones down on characteristics, with the deeper layers honing in on the most essential details.

The primary goal of the second Max pooling layer is to reduce the number of dimensions so that features may be retrieved more easily. As a sixth layer, the flattening layer flattens the long featured vector produced by the second max pooling layer.

The Activation Functions Module Here is where the images are grouped together. The characterisation of citrus fruit illnesses makes use of information from straightening layers. To this end, we use a SoftMax enactment method to calculate the probabilities of each of the easily identifiable citrus crop diseases. The input image's classification is determined by the probability that is most prominent.

Preprocessing

In order to improve the image data by suppressing unwanted distortions or enhancing some image features essential for further analysis and processing tasks, it is common practise to perform operations on pictures at the smallest level of abstraction in order to accomplish this goal; this is known as image pre-processing. The amount of data included in images is not improved. Its approaches capitalise on the high degree of picture redundancy. As a rule, the brightness values of neighbouring pixels that all represent the same physical item are the same or very close to each other. If a warped pixel can be isolated in the picture, its original value may be calculated by taking the average of its surrounding pixels. The suggested technique involves applying several image pre-processing algorithms to the acquired picture before saving it to an image database.

Input Image: Images of maize fruits with bacterial and fungal diseases, including foliar fruit spot and applefruitspot, are shown. Fruits used in processing are picked at random from the corn field and photographed under erratic lighting. Segmentation begins with preparing the picture by resizing it to 256 by 256 pixels.

Segmentation: Segmenting a picture is a useful technique for isolating key regions for closer inspection. The simple-to-use k-means clustering technique is used for picture segmentation. Segmenting a picture is necessary for separating and retrieving visual objects, regardless of how blurry the boundaries between them are. In order to construct a large number of clusters, clustering requires a wide variety of picture objects that can be reliably isolated from one another. Because of this, we are using a colour picture space transformation. As all colour elements already exist, the employment of a colour space composed of a luminosity layer in constituent and two chromaticity levels in component is logical. Euclidean distance matrices are used to quantify the degree of dissimilarity between two hues. K-means distance measures the distance between samples to determine a class. K-means computes a value for each image cluster based on the position of each pixel in the picture.

K-Mean Clustering: K-means clustering is used to segment photos for analysis and comprehension. A cluster is a collection of elements that are all the same and different from each other. Clustering is the process of dividing a collection of data into smaller subsets that share characteristics based on a predetermined distance metric. Grouping a picture may be done with the help of any features present in the image, such as common forms or textures. K-means
clustering divides the data into the a set number of groups. Initially, the cluster centres are arbitrarily chosen. A next step is to find the centroid of the data set and connect each point in that data set to it. Each pixel is placed in a cluster according to its proximity to the centre of that cluster, as calculated using the Euclidean distance metric.

Block Diagram

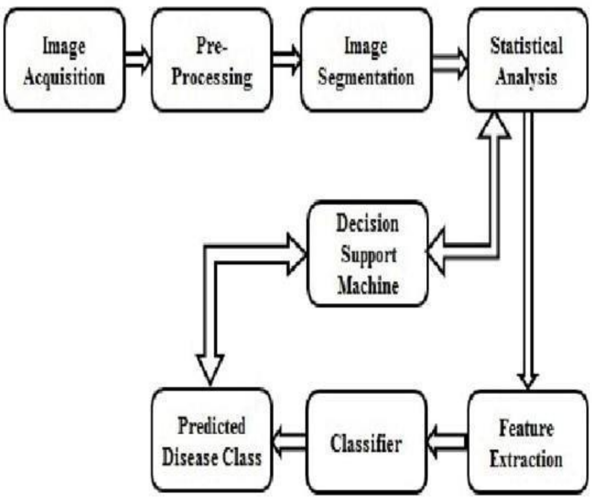

Fig1. Overall Diagram of System Architecture

Shots of fruit are taken using a camera. These pictures have been taken in RGB format (that's Red, Green, and Blue).The RGB fruit picture is converted to a colour space transformation, and then the colour transformation structure is applied to the image.

Pre-Processing of Images A number of methods exist for cleaning up images by eliminating background distractions and noise. The Fruit picture may be cropped to isolate the area of interest, and a smoothing filter can be applied to the remaining image. To do this, histogram equalisation is used to spread the intensities of the photos after they have been processed via colour conversion from RGB to produce greyscale images the process of dividing up an image into smaller parts.

To segment a picture is to divide it into sections that all have the same characteristics. Methods such as means, turning an RGB picture into an HIS model, and so on may be used to do segmentation. For segmentation, the RGB picture is transformed into the HIS model, and then the Boundary and spot detection technique is used. Boundary detection and spot detection are the two primary approaches for locating diseased areas of fruit. Specifically, a boundary identification technique takes into account the 8-way connections between pixels.

By turning all pixels below a threshold to zero and all pixels above that threshold to one, the thresholding algorithm transforms gray-level pictures into binary images.

Below is the algorithm[6]:

Threshold-wise, Split the pixels in half. Next, calculate the average of each grouping.

Multiply the disparity in means by its square multiplying the number of pixels in one cluster by the number of pixels in another The afflicted leaf's coloration changes as a result of the illness. This means that the affected part of the leaf may be identified based on its degree of greenness. Images are broken down into their individual RGB components. Otsu's approach is used to determine the cutoff value. If the calculated threshold for green pixel intensities is not met, the green pixels are masked and eliminated.

SVM stands for "support vector machine" It is possible to do classification, regression, and other tasks by using a support vector machine to create a hyper-plane or collection of hyper-planes in a high- or infinite-dimensional space. Supervised learning models (SVMs) are employed in classification and regression analysis, and their related learning algorithms evaluate data and detect patterns. SVMs are non-probabilistic binary linear classifiers, meaning that given a collection of training examples, each tagged for belonging to one of two categories, the training algorithm will construct a model that allocates fresh instances into one of the two categories.

The majority of the population of India relies on farming for their livelihood. Many problems, such as blemishes on the leaves, arise when farmers are farming crops. A diagnosis of the illness is necessary before preventative actions may be implemented. Currently, farmers and specialists rely on visual inspections of farms to identify leaf diseases in plants. When the land is too big, the high cost of labour is due to the need for a large number of workers to oversee the system and the constant monitoring of plants.As was previously indicated, visual surveillance of farms is both time-consuming and inaccurate. To get around this problem, image processing methods are used to detect leaf illnesses; however, there is currently no appropriate application to correctly categorise the leaf after its photos have been captured and its features have been recognised.There is a wide variety of leaf morphologies that may be used to categories plant diseases. Fuzzy logic, principal component analysis, and the K-Nearest Neighbor Classifier are just a few of the many categorization methods now in use.The leaves of 24 different plant species are used to create these labels, including apples, grapes, potatoes, and tomatoes. labelling of apples as either healthy, scabbed, rotten, or infected. Corn Cercospora label, must be specific Corn rust, corn health, corn blight, and grey spot [11], [13]. Black rot, Esca, healthy, and leaf blight are just few of the grape diseases that may be seen on the labels. Early blight, healthy, and late blight are the three types of potatoes labelled. Common diseases and pests that may be found on tomato plants are listed on the label.In all, there are 31,119 photos in the collection, and they are all either apples, maize, grapes, potatoes, or tomatoes. We utilise 24,000 different pictures. Each picture is reduced in size to 256 by 256 pixels, and then the training and testing datasets are split 80 percent to 20 percent. Next, the CNN model must be trained.

Classification

When it comes to data analysis for classification and regression, support vector machines are a kind of supervised learning model with accompanying learning algorithms. It's true what you've read... In addition, it may be used to the issue of regression. In this approach, we classified photos using an svm algorithm, and we'll examine the effectiveness of these models for classification. In the context of binary classification, a Support vector machine is a potent tool because, after training, it may provide a highly rapid classifier function. Application of SVMs to situations involving three or more classes may be accomplished in a number of ways. Support vector machines are supervised learning models in machine learning, and their related learning algorithms examine data for classification and regression. Dual-class classification is the basis of SVMs. Using SVMs is the conventional approach to multiclass classification. In the assessment of the classifier, the output values that above the threshold are marked as "true," while those that fall short are marked as "false." Binary image categorization is performed via the SVM classifier.

Conclusion

A more technologically dependant future is rapidly approaching. Day after day, we hear from disgruntled farmers who invested much on fertilisation yet still saw their hard work squandered as viruses ate through their crops. There is a severe lack of specialists in this area. As an expert's view may differ from that of a layperson, it is prudent to seek out advice before acting. It was determined that more training samples and tinkering with the SVM's parameters both contribute to better illness diagnosis accuracy. This technique implements a framework for identifying and categorising illnesses that affect fruit. K-Means segmentation is used for the segmentation of the infected area. After that, we use GLCM to extract texture characteristics, and SVM for classification.

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A REVIEW ON SKIN DISEASES DETECTION USING MACHINE LEARNING AND NEURAL NETWORK

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ABSTRACT

The human skin provides the best defence for the body's vital organs. It protects our inside organs from harm by acting as a barrier. Dust, mould, and viruses may all cause deadly infections in this vital organ. Countless individuals all over the globe are afflicted with skin disorders. People endure a lot of pain due to skin conditions like acne and eczema. A minor skin boil may signal the beginning of a far more serious problem, such as an infection that might prove fatal. Some skin conditions are very infectious, and may be passed from person to person even by the simple act of shaking hands or sharing a handkerchief. A correct diagnosis may lead to the right medicine, which in turn helps alleviate the pain of those affected. In this study, we attempted to create a prototype for employing neural networks to identify skin disorders. We opted for a convolutional neural network, or CNN, as our neural network of choice. DNN, short for deep neural network, was used in previous detection efforts. Now you may take a course to learn to spot common skin conditions including hand dermatitis, eczema, subcute eczema, lichen simplex, statis dermatitis, and ulcers.

Keywords: *Skin disease, CNN, image processing, DNN*

I. Introduction

The skin is an integral element of the human body. It protects our kidneys, hearts, livers, and other vital organs from harmful substances and radiation. It's important to take care of this area of the body so that you may have a long and healthy life. Vitamin-D, one of several vitamins produced by the skin, is essential. An infection here would be catastrophic. Different kinds of climate, environmental factors, and even dietary habits may all have an impact on our skin in one way or another. Mathematical, scientific, or economic, identifying the issue is the first step towards a solution. Finding out what's wrong with our skin is the first step in healing it. Fungi may infect the skin and produce a wide variety of skin conditions. Everyday living necessitates lengthy periods of exposure to the sun and/or air pollution, both of which promote perspiration and hence the growth of bacteria, which in turn promotes a foul odour and a variety of skin diseases. Punctuating the skin problem with regular cleanliness practise. However, there are certain concerns that prove to be crucial and need precise medical diagnosis. The identifying device is a product of our own making. Our breakthrough in medicine, which we call Derm-NN, uses CNN in place of image processing. Diseases of the skin may be identified with this convolutional neural network application. This study's prototype classifier determines the kind of skin illness based on an image's analysis and a comparison to its training data, yielding high levels of accuracy. The dermnet dataset was utilised for this evaluation, which also included randomly obtained photos from the internet. Seventy percent of skin illnesses can be correctly classified by our classifier. Here, we've delineated five broad categories of skin disorders. Both the training and testing phases have made use of a subset of our dataset. Disease is a strange physical condition in which the body's normal functions are disrupted as a result of an imbalance in the body's organs. In eczema, the skin becomes inflamed after being attacked by germs, leading to redness, itching, and sometimes blistering [1].

When it comes to computer vision and machine learning, the convolutional neural network has shown to be invaluable. It's a kind of artificial neural network. A large portion of the image processing industry relies on it. It is used for visually imagining and then classifying objects. In this research, we developed a classifier that, given a picture of tainted skin as input and using its stored knowledge, or training data, can identify the image's classification. All the details of the classes, including how well they work and how the results are analysed, are presented elsewhere in the study. So far, skin diseases have not been particularly remarkable. We urge you to do this research in order to raise public awareness of the problem.

The long-term effects of these substances on the skin may be harmful [2]. It's only fitting that, in an age when physicians can virtually examine their patients with the help of Google Glass, skin problems would also be subject to the benefits of digitalization. Here, we offer a mechanical framework that incorporates PC vision methods to enable the patient to get precise data about their skin through a mobile device or computer application.

For this article, we were motivated by a desire to ensure that patients have ready access to information from any location that would allow them to get the timely diagnosis and treatment they need. To begin, they will photograph the infected area of their skin and upload it to our system. When a picture of a disease is sent to the central server, it compares it to a database of five different illnesses and returns the skin's ailment name if there is a match [3].

In this research, five different types of skin illness were identified using convolutional neural networks (CNN): hand eczema nummular, eczema subcute, lichen simplex, Stasis dermatitis, and ulcers. Making this into a self-sufficient system for illness detection and delivering recommendations based on the image analysis report is a viable next step towards finding answers to challenging medical questions.

II. Literature Review

Many reports have appeared in Skin Disease throughout the last decade. Andre Esteva and Brett Kuprel, both board-certified dermatologists, have categorised skin cancers using advanced neural systems for use in clinical and histological research. They first showed how a single CNN could classify skin diseases, and then they set up a process to get from an image with two crucial binary classification labels as the illness to a finished product [4]. Segmentation research of Dr. Bhindhu Vhas has been used to the categorization of medical pictures.

Dr. Vijayakumar has contributed significantly to the discipline through his work in computer vision [6].

Haofu Liao has used deep learning to the problem of universally classifying skin diseases, and his research into the possibility of building a skin disease detection system has been published.

They used a deep learning method to do this [7]. Psoriatic plaque research was presented by Anabik Pal and Akshay Chaturvedi. CNN is the foundation of this method. Multitasking learning [8] They tackled three separate STL (single-task learning) issues. The authors then provide a novel deep learning-based multi-task learning (MTL) framework built on three separate categorization problems. Seven hundred seven (707) photos make up the dataset [9].

Zongyuan Ge and Sergey Demyanov's research into skin cancer led them to develop a method for recognising skin diseases utilising deep saliency characteristics and multimodal learning of dermoscopy and clinical pictures. It was said that there is similarity in numerous skin illnesses, which makes the diagnosis exceedingly difficult for clinical therapy and any order models. As a result, the doctor's process was split in half. Both dermoscopy imaging and initial screening play an important role. Given that, CNN may be used to describe the two processes [10]..

III. Proposed Methodologies

One subsystem of image processing is image compression, another is picture upgrading, and still another is restoration and metric extraction. It helps lessen the amount of memory needed to store a complex image [11]. It is possible to steal the photo. Difficulties with digitalization and other issues may make it necessary to discard the images. Image Enhancement techniques might fix a damaged or outdated photo that was left abandoned. We have done an informative collection assortment, information resizes, information planning, expansion, and finally used the preparation strategy of this model, all after testing and approving the information. This study makes use of image processing capabilities with a custom-built CNN architecture. Later in these subsections, you'll find the skeleton of the building. For the specified 500 images that serve as both the training and testing data, we have calculated the confusion matrix. Accuracy and recall were determined by tallying up the proportions of correct diagnoses, incorrect diagnoses, false positives, and false negatives. The sum of the F1 scores has also been calculated. In order to test and train our data, we have gathered photos of various skin conditions. Separation of concerns around the dataset. During the training and testing phases, we have used separate sets of data. Using a two-way confusion matrix, we demonstrate that the calculated precision-recall values are unquestionable. In addition to the performance rating, the F1 score is also provided.

IV. Background of CNN

In the realm of artificial intelligence, Convolutional Networks are akin to very complex brain networks. This is a Deep Learning computation. One way this is computed is by having the model take an input image and, at that point, assigning importance labels to various views or protests within that picture [12]. This paradigm relies heavily on the illusion of superiority it creates. CNN's architecture takes inspiration from the interconnected networks of neurons found in the human brain. In addition, 2D information image structures have a favoured location. A method of improving slopes is used. Several layers, including convolutional and subsampling layers, make up this model.

V. Dataset Collection

We've taken into consideration trial images of skin disorders from all across the globe. The images came from a website called Dermnet. As a result, we have thought of naturalistic representations of skin infections. It has been observed that the suggested framework produces varying degrees of accuracy with regard to skin diseases. We also have compiled online images. Five different types of eczema (hand eczema, nummular eczema, subcute eczema, lichen simplex chronicus, and stasis dermatitis with ulcers) have been the subject of more than 500 image downloads [13]. At this point, there are two phases: preparation and testing. In the preliminary planning phase, we restrict the trademark features of common image highlights and use that information to create a one-of-a-kind depiction of each characterisation class for five separate groups. Numbing hand dermatitis, Stasis dermatitis, lichen simplex, and ulcers are some of the other categories [14]. These allocated portions of space are then put to use during testing by being used to categorise images by their most notable features.

We enlarged our informational collection so we can stay away from overfitting. So that our important dataset in expanded and it encourages us to group our model. We extended our genuine informational collection utilizing 5 unique techniques.

1. Rotate +90 degree
2. Rotate -90 degree
3. Shading
4. Adding salt and pepper noise
5. Flip Horizontal

VI. Data Preparation

When we compiled our photos, we found that they were all taken with different sized cameras. The height, breadth, and depth of our information index varies widely. In any event, we require a similar information index for training and evaluating our sophisticated neural classifier. That's why we decided on a pixel size of 100x100. The transition to image grayscale occurred as we were getting our model ready. In our PC, we use the less powerful GPU. After expansion, our total photo count has reached 3000. The 2400 images were used for training, whereas the 600 were used for evaluation

VII. Proposed Model

Our idea is to build up a new CNN model, In our model, wehave 13 layers. We also have 4 convolutional layers:

- The first layer has 32-3 × 3 filters and ‘linear’ as anactivation function.
- The second layer has 64-3 × 3 filters and ‘linear’ as anactivation function.
- The third layer has 128-3 × 3 filters and ‘linear’ as anactivation function.
- The fourth layer has 256-3 × 3 filters and ‘linear’ as anactivation function.

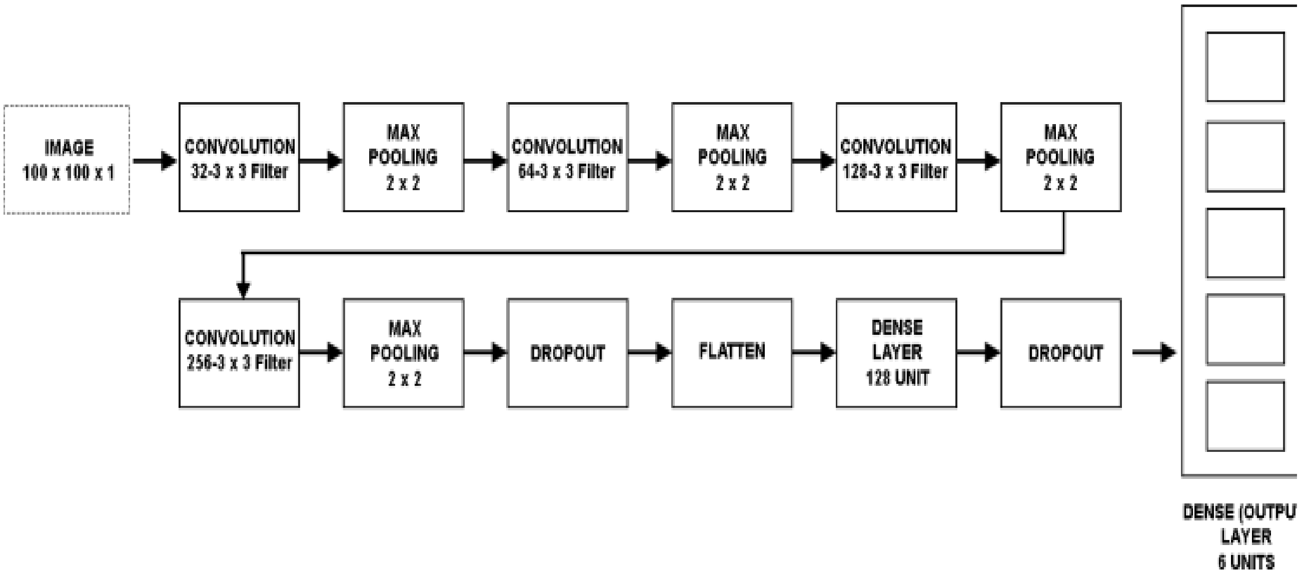

Fig. 1. Proposed CNN Model

Additionally, we may state that the size of 4 max-pooling layers is 2 x 2. Similarly, we have two dropout layers with values of 0.3 and 0.4 for their parameters. Our model includes a layer that has been flattened down. Finally, we have the'straight' and'softmax' thick layer capacities. Both abilities are put to use in initiation rituals. To determine the probability of our five classes, however, we use'softmax' [16].

Training the Model

Our model is compiled using the Adam optimizer. About 80% of the dataset is utilised for training, while the remaining 20% is used for validation. The 2400 photos in our dataset are used for training. That works out to 1920 photos for the training set and 480 for the validation set. With our classifier, we trained the model over the course of 64.40 epochs (batch sizes).

Performance Evaluation

The precision of our preparations refers to how well the model we built to analyse such data performed. The approval precision of a model is its performance on a sample of data from a certain class. The image is a planning and approval schematic with extreme precision.

A mistake on the preparation information index is called a "preparing loss." When the validated data set is handled by the established system and unexpected results are produced, the validation process has failed.

Our test dataset consisted of 600 images, and we used them to calculate accuracy, recall, and F1-score. Therefore, we have a Precession normal of.70, a Recall normal of.70, and an F1-score normal of.69. At last, we're confident in saying that our classifier performs adequately. The following is a table describing these features: It can be seen from the classification report table that the classifier achieved an acceptable level of accuracy of 70%. Our overall accuracy was around 0.93. Sum total recall is 0.88. Overall, we were just

0.73 percent accurate, with an F1-score of 2.45. The data we collected falls into five distinct categories. Understanding the writers and the scope of their work is made possible by reviewing their respective works of literature. In this study, we have used deep neural networks together with a few noble characteristics from the group of image processing. Using the tensor flow medium, Rathod, J., Wazhmode, V., Sodha, A., and Bhavathankar,

P. have devised a method, in which they take a picture of the skin problem and scale it down to a more manageable size, all while maintaining an accuracy of about 70% [17]. They have employed OpenCV, keras, tensorflow, pandas, numPy, etc., as well as some other fundamental libraries, and they have conducted preliminary testing on five different illnesses [17]. Here, we have achieved an overall dataset accuracy of roughly 73%, making this a trustworthy classification source for predicting skin diseases. Our contrasting study article focuses on a distinct group of diseases. Numerous researchers like Wu, Z., Zhao, S., Peng, and others have studied a variety of skin disorders that manifest on the face. There are six types of ailments they've had to cope with. They utilised 344 photos, with a value of 70.8% for class precision [18]. The findings from the other categories of their computation are also rather striking [18].

Conclusion

The camera captured the digital skin disease photographs, and then processing methods were used on the data pictures. One method of image processing is known as image compression, while others include image enhancement, image upgrading, image reclamation, and estimate extraction. In the end, we hope that this model will be developed as a true application of our clinicalscience for public support to patients. Developed countries would benefit greatly from accurate disease diagnosis, since this will allow them to take preventative measures and take meaningful steps towards achieving healthy skin.

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AN APPROACH TOWARDS PREDICTION OF HEART DISEASE USINGK-NEAREST NEIGHBOR IN MACHINE LEARNING

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ABSTRACT

The aim of this project is to implement the heart disease prediction system which can predict future heart disease by analysing data of patient. We can see now a now-a-day so many people all over the world suffering from heart disease. Heart disease is a primary cause of death now-a-days. The planned work consists of an intelligent classification which works on the machine learning algorithms like KNN with the help of data mining techniques, heart disease prediction can be improved. This study aims to use data mining technique in heart disease prediction to detect the accurate result. The data entered by the user is associated with some existing typical datasets to get probability. KNN is used to find the probability.

Keyword: *Heart disease, KNN (k- nearest neighbour), Machine learning, Probability*

I. Introduction

Heart Disease

The human body is made up of numerous organs, all of them have their own functions. Heart is one such organ which pumps blood throughout the body. Now-a-days, the main reasons behind mortality are having a heart disease. So, it becomes necessary to make sure that our system in the human body for that matter must remain healthy. Data mining techniques can be useful in predicting heart diseases. Data mining means to extract information from huge amounts of data. Machine learning is a technology which can help to achieve diagnosis of heart disease before much damage happens to a person. After smearing various algorithms of different domain it can be said that machine learning is showing to be tremendously valuable in predicting heart disease which is one of the most prominent problems of the civilization in today's world. This project helps us predict the patients who are suffering from heart diseases by cleaning the dataset and applying Random Forest KNN to get an accuracy

K-Nearest Neighbor

Nearest neighbor (KNN) is very simple, most popular, highly efficient and effective algorithm for heart disease prediction as per the research paper. In this, we are going to use a K-NN which will predict the presence of heart disease in a patient or not. When the model gets an input as a real-world data, it will predict whether the individual has heart disease or not by calculating the distance between this new hidden data and all other records in which the model gets trained.

II. Requirnments Specification

Functional Requirements

The functional requirement are the activities and the operations that our implementation is supposed toperform, and they are below:
F1: The user have to register themselves in the system to gain access in system.
F2: The user's have to feed the details in the system related to themselves and symptoms they have. F3: After matching the details with the datasets it checks for the disease symptoms.
F4: A report is being generated based on the matched symptoms.

Non-Functional Requirement

We should primarily focus on the performance requirements of our system, in non-functional requirement.
P1: The system should be trained with a good accuracy dataset.
P2: The android mobile/laptop/computer and internet connection is important.

III. Research Methodology

The projects are divided into various modules for easy understanding and coding. The research consists of four terms in which the system runs on. They are namely 1. User registration 2. Questionnaires 3. Checking the probability 4. Generating the report.

User Registration: Logging in, (or logging on or signing in or signing on), is the process by which an individual gains access to a computer system by identifying and authenticating themselves. The user identifications are classically some forms of "username" and a matching "password", and these credentials themselves are from time to time referred to as a login.

Questionnaires: Here the user feed the values in the application form, he/she fills up each and every detail in the form. All these details get saved in the system and from that we can extract the features of the disease. The entered details are matched with the datasets which are saved in the database.

The checking of the system of heart disease: After matching the details with the datasets it checks for the disease symptoms. One feature may match with different disease. So, it's needed to check each and every corresponding feature in order to predict the accurate disease.

Generate report: A report is being created based on the corresponding symptoms. It predicts the disease and send it to user, and finally add some tips/suggestions to the user like nearby hospital detailsand it notifies patient by sending a message alert to patient mobile number.

IV. System Analysis

Activity Diagram

Activity diagram shows the sequential chart of our proposed model means how the flow will be of our system. First, we have to import the patient document, if the data is missing then we have to do data pre-processing, if there will be no missing data then we directly analyse the data. The analyzation is done using train data and test data. After this we have proposed model. In proposed model we have to put the machine learning algorithm after that we can check the accuracy score.

The ample amounts of raw, incomplete and noisy data are present in real-life data. Noise and missing values are common when cleaning collected data. The data must be cleaned of noise and missing values must be filled in order to obtain an accurate and efficient result. Transformation is the process of changing the format of data from one type to another in order to make it clearer and easier.

The database is divided into two sets: training and research. When a data set is split into a training and testing set, the bulk of the data is used for training and only a small part of the data is for testing. To ensure that the training and testing sets are equivalent, Analysis Services are selecting the data randomly. By using similar data for training and research, you can reduce the effect of data inconsistencies and gain a better understanding of the model's characteristics. The test set is a set of observations that are used to calculate the model's results using a performance metric. In last step it checks accuracy of the algorithm which is used to predict the heart disease for the particular patient is exist or not.

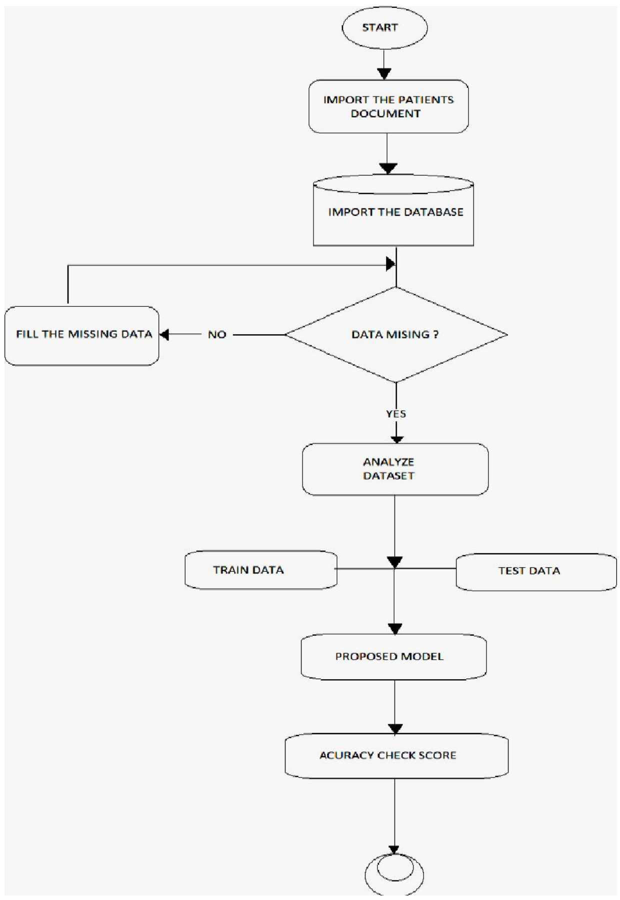

Fig. **Activity Diagram**

Use Case Diagram

The first step from registering the user to the final generating of the report can all be explained easily by using use case diagram. Users register and then they login to their accounts and enter their health conditions and values which were to be stored in the database. Whenever it's needed the data is to be extracted and then it needs to be match with the values and check for the disease and predict the disease and finally a report need to be generated.

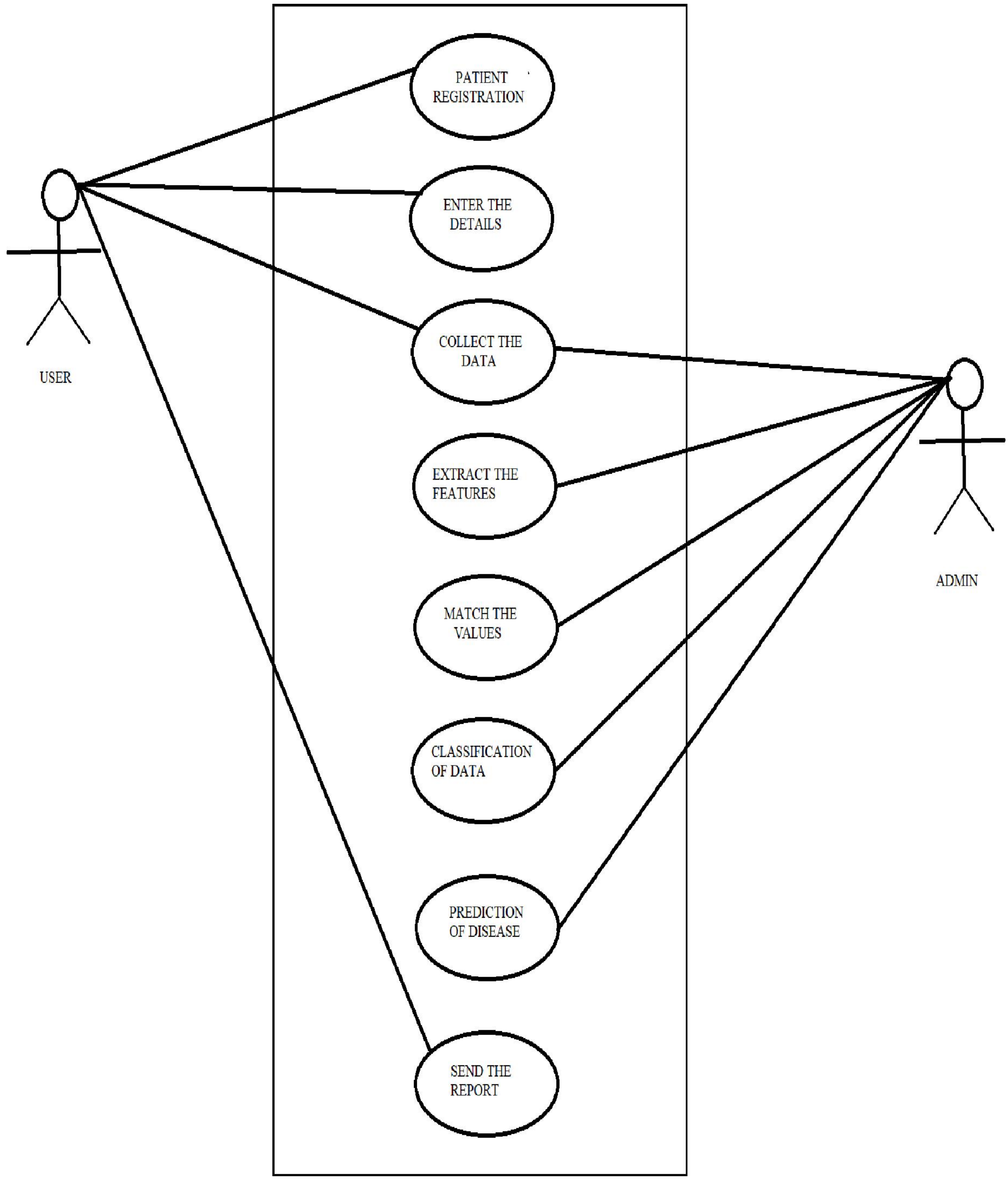

Fig**. Use Case Diagram**

System Architecture

The system architecture provides the working of the system. The working of this system is labelled as follows: Dataset collection is gathering data which contains patient details. Attributes selection process selects the valuable attributes for the prediction of heart disease. After identifying the available raw data resources, they are further selected as per the requirement of the system, cleaned, made into the desired form. Different classification techniques as specified will be applied on pre-processed data to predict the accurateness of heart disease. Accuracy measure used to compare the accuracy of different classifiers used for prediction of heart disease.

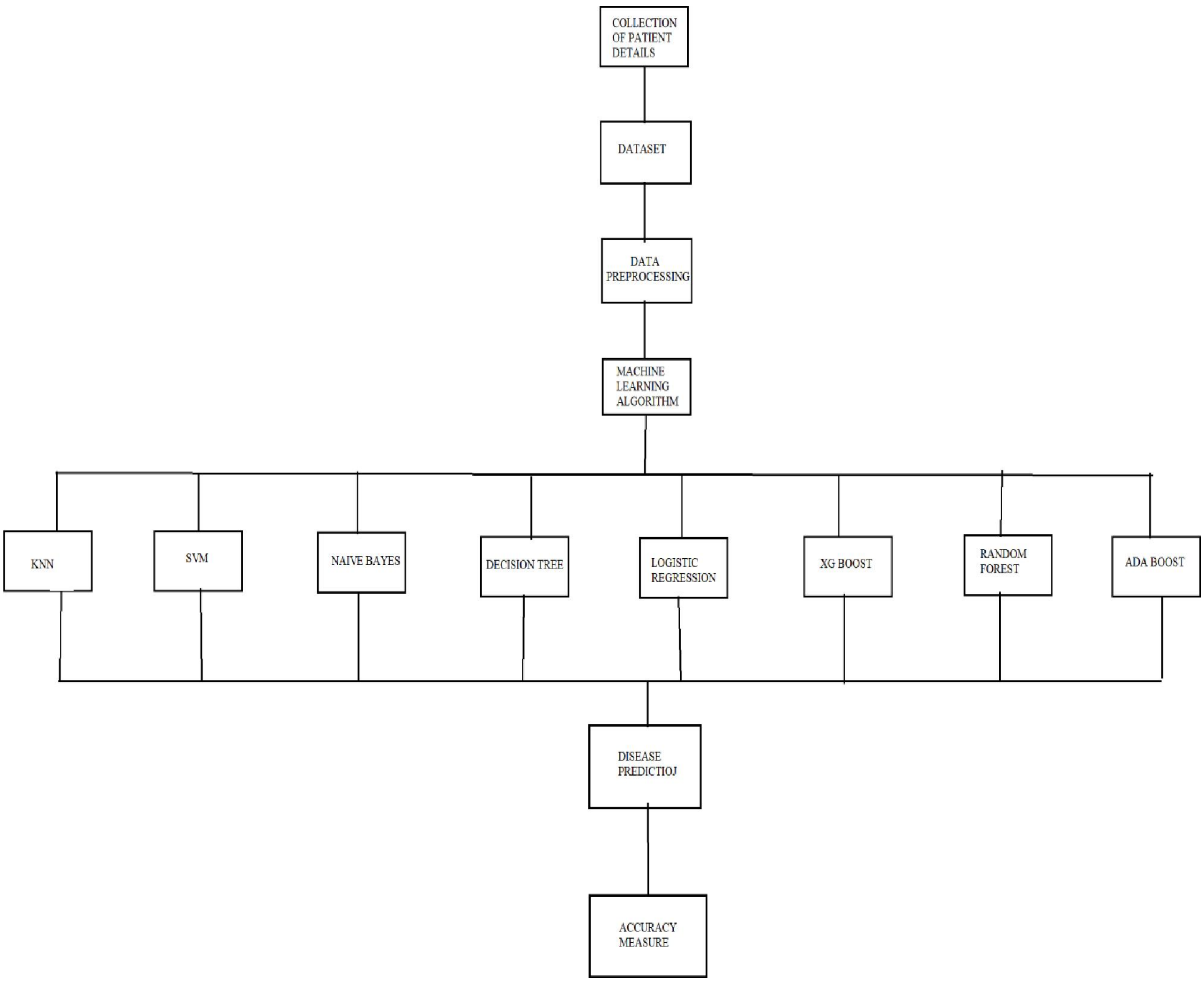

Fig**. System Architecture**

The purpose of this project is that to check whether the user is likely to be diagnosed with any cardiovascular heart disease based on their medical attributes such as age, weight, blood pressure, sugar level, chest pain, cholesterol etc are the major concern to be dealt with heart disease. But it seems difficult to predict heart disease because of several influential risk factors such as diabetes, high blood pressure, high cholesterol, abnormal pulse rate, and many other factors which come under observation. Due to such restrictions, scientists have turned towards modern approaches like Data Mining and Machine Learning algorithms for predicting the heart disease in short time. Machine learning (ML) proves to be effective in assisting in making decisions and predictions from the large quantity of data produced by the healthcare industry for various diseases.

V. Conclusion

We created a web platform by using machine learning techniques to predict the occurrence of heart disease. It determines the prediction performance of every algorithm and apply the proposed system for the area that it needed. The use of more relevant feature selection methods to improve the accurate performance of algorithms. There are several treatment methods for patient, if they once diagnosed with the particular form of heart disease with the help of Machine Learning. It is concluded that system works well and thus it fulfil the end user's requirement. Heart Disease is one of the leading causes of death worldwide and the early prediction of heart disease is important for reducing and handling the sudden death of the patient having the symptoms. The project aims on predicting the heartdisease by using the KNN Algorithm with the help of android application is fulfil during the implementation process. The probability of disease is diagnosis by using certain datasets and the input given by the user, it also gives the nearby hospital details and notices the patient about the disease by using messaging application.

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