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Secure IOT Assistant Based Systems for Alzheimers Disease

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ABSTRACT: An innovative IoT-based secure system is proposed for early detection and monitoring of Alzheimer's disease. The system employs a combination of sensors, including a pulse sensor and a temperature sensor, interfaced with an Arduino Nano microcontroller. The pulse sensor continuously monitors the individual's heart rate, while the temperature sensor tracks deviations in body temperature, as fluctuations in these vital signs can indicate early stages of Alzheimer's disease. Real-time data from the sensors are processed and analyzed within the Arduino Nano, leveraging programmed algorithms to detect patterns or irregularities associated with the disease. The proposed model is capable of classifying the detected face images into two categories: family members and non- family members using by Convolutional Neural Network (CNN).

KEYWORDS: Nano microcontroller, Sensors, IOT-based system, Fluctuations, Real time data, Levaraging algorithms, Convolutional Neural Networks.

I. INTRODUCTION

A medical diagnosis is a pivotal aspect of healthcare, representing the initial step toward understanding and addressing a patient's health concerns. It involves a comprehensive process wherein healthcare professionals employ a multitude of tools, including patient history, physical examinations, diagnostic tests, and their clinical expertise, to identify the nature and cause of an individual's health condition. The process of medical diagnosis is often multifaceted and requires a systematic approach. It commences with the patient-doctor interaction, where the patient describes their symptoms, medical history, and any relevant information. This exchange forms the basis for the physician's initial assessment, guiding them toward further investigations. Detecting Alzheimer's disease involves a series of assessments encompassing medical history, cognitive tests, imaging, and sometimes, laboratory tests.

II. RELATED WORK

G. Palacios-Navarro[1] There are conventional screening instruments for the detection of cognitive impairment, but they have a reduced ecological validity and the information they present could be biased.

This study aimed at evaluating the effectiveness and usefulness of a task based on an activity of daily living (ADL) for the detection of cognitive impairment for an Alzheimer's disease (AD) population.
Chima S. Eke[2] The successful development of amyloid-based biomarkers and tests for Alzheimer's disease (AD) represents an important milestone in AD diagnosis. However, two major limitations remain.
Rozita Jamili Oskouei[4] the Internet of Things (IoT) has become a new technology that aims to facilitate life and help people in all aspects of their lives. This technology is used for smart homes, smart grid stations, smart agriculture, health systems, transport services, smart cities, etc..
P. Padilla[10] This paper presents a novel computer-aided diagnosis (CAD) technique for the early diagnosis of the Alzheimer's disease (AD) based on nonnegative matrix factorization (NMF) and support vector machines (SVM) with bounds of confidence.

III. PROPOSED SYSTEM

The proposed system employing Alzheimer's disease detection system IoT technology integrates a network of sensors

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and modules designed to monitor vital signs and cognitive patterns in individuals. Utilizing a pulse sensor and temperature sensor, this system collects real-time physiological data, tracking heart rate variability and temperature fluctuations that might indicate irregularities associated with Alzheimer's disease. An Arduino Nano serves as the central processing unit, receiving and analyzing data from the sensors. The processed information is displayed on an LCD screen, providing immediate feedback to caregivers or medical professionals. Additionally, a buzzer can be activated to alert caretakers in case of critical deviations in vital signs or unusual patterns. Moreover, the inclusion of a GSM module allows for remote monitoring and notifications.

A. SOFTWARE IMPLEMENTATION

The deep learning based face detection process implements for Alzheimer patient's known/unknown family members. And also provide an alert message about unknown family member is detected.

The figure 3.1 states that the pulse sensor and temperature sensor gather real-time data related to heart rate and body temperature. The Arduino Nano collects this data at regular intervals. The Arduino Nano processes the incoming data, comparing it against predefined thresholds or patterns associated with Alzheimer's disease symptoms. For instance, it may look for irregularities in pulse rate or unexpected fluctuations in body temperature.

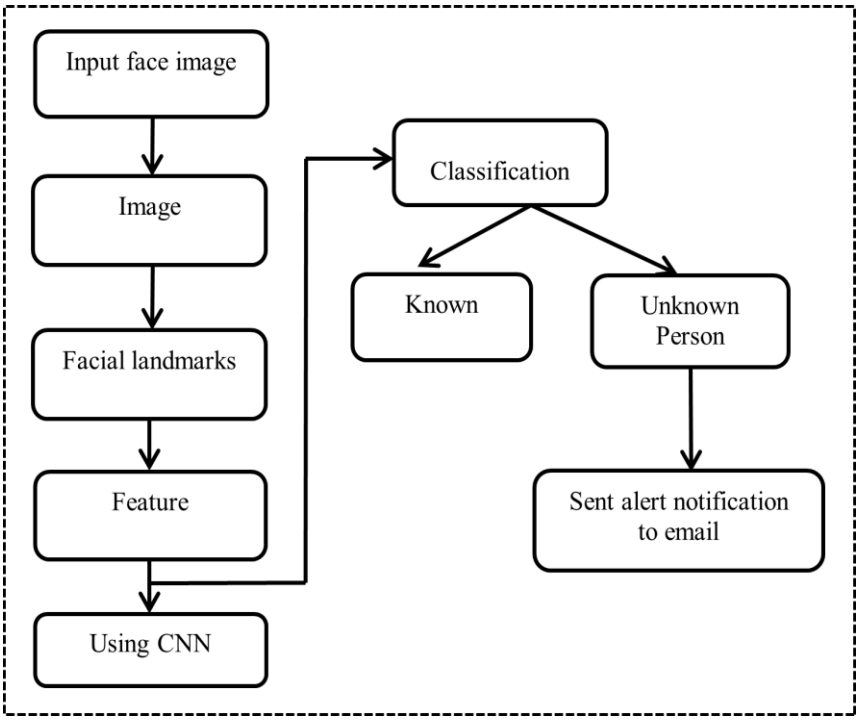

Fig 3.1 Face recognition Module

The deep learning technique used to known/ unknown family members. The web camera is used to capture the human face. The captured face is processed by using image processing method. First, the captured face is processed with data augmentation methods such as resizing, rotation, and noise removal. Then it is converted to grayscale which as black and white image. The facial landmarks are detected andfeatures are extracted which is used to detects the person. The face classification process used to deep learning based Convolutional Neural Network (CNN). This method is used to classify the known/ unknown family members. If unknown family face is classified, then send alert notification through mobile number to their family members.

B. HARDWARE IMPLEMENTATION

Hardware implementation of IOT Module is shown in figure 3.2. It contains of Temperature Sensor, Pulse Sensor, Buzzer, LCD, GSM Module- SIM 800.

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Temperature Sensor: LM35 sensor uses the basic principle of a diode, whereas the temperature increases, the voltage across a diode increases at a known rate. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature. Temperature sensor basically measures the heat/cold generated by an object to which it is connected.

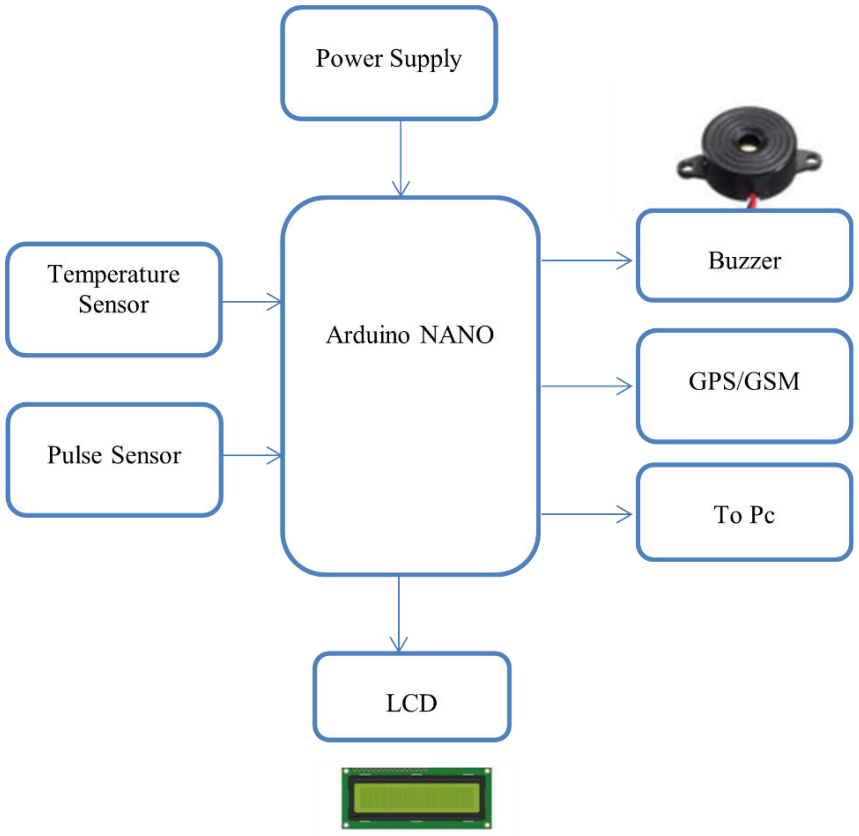

Fig 3.2 IOT MODULE

Pulse Sensor: The Heartbeat rate information knowing is very useful while doing exercise, studying. But, the heartbeat rate can be complicated to calculate. To overcome this problem, the pulse sensor or heartbeat sensor is used. An alternate name of this sensor is heartbeat sensor or heart rate sensor.
GSM Module- SIM 800: SIM800L GSM/GPRS module is a miniature cellular GSM modem from Simcom, which can easily interface with any microcontroller to give the microcontroller GSM functionality, and allows for GPRS transmission.
LCD: An LCD (Liquid Crystal Display) is used to present real-time health data to the user or healthcareprovider. It can show heart rate, body temperature, environmental conditions, and other relevant information. It offers a user-friendly interface for interaction with the system.
Buzzer: A buzzer is often used to provide audible alerts and notifications. In a healthcare monitoring system, it can be employed to sound alarms in case of critical health events, such as a sudden change in heart rate or body temperature.

IV. RESULT AND DISCUSSION

As in Building upon the core capabilities of the IoT-based Alzheimer's detection system, the integration of facial recognition technology adds an additional layer of security and personalized care. The system maintains a database of faces that are already known and trusted, likely comprising caregivers, family members, and close friends. The figure 4.1 shows the adding a person in database. This database serves as a reference point for the facial recognition system

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Fig 4.1 Adding person data in database

As individuals approach the patient's vicinity, the sensor continuously scans their faces, capturing images for comparison with the database. If a face matches an entry in the database, the system recognizes it as a familiar person and displays a reassuring message, such as "Already face info saved". It is shown in figure
4.2. This provides a sense of security and familiarity for the patient.

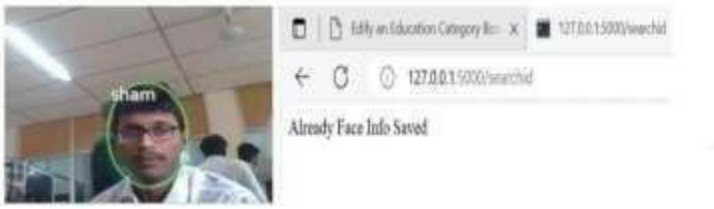

Fig: 4.2 Identifying the person as know are unknown person

The figure 5.3 shows the tracking and monitoring model for alzheimer patients. Alzheimer patients is monitoring, as the activities are monitoring and stored in the database that can be used for analysis and develop a good treatment solution for these patients. At the same time, these improved services can be utilized for the old people at the doorstep with the help of IoT. The various types of IoT devices are used for the health monitoring of these patients for the accuracy of information regarding their health.

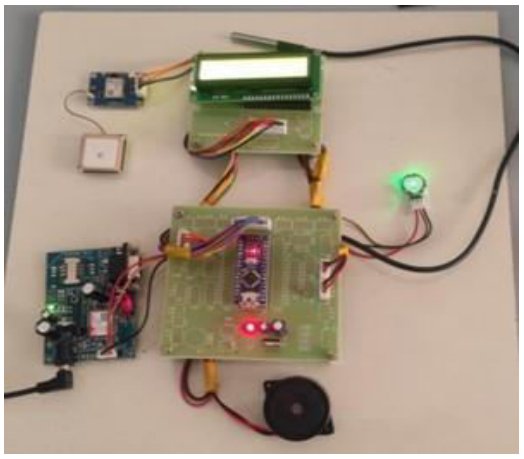

Fig: 4.3 Tracking and monitoring the Alzheimer patient

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The critical part of any application or Alzheimer patients is monitoring, as function of the activities are monitoring and stored in the database that can be used for analysis and develop a good treatment solution for these patients.
At the same time, these improved ser-vices can be utilized for the old people at the doorstep with the help of IoT. The GPS track the Alzheimer patient and the temperature sensor show the patient temperature it display on the lcd screen Buzzer intimate a alarm sound the temperature is increase Pulse sensor show the pulse rate.

V. CONCLUSION

Detecting Alzheimer's disease using IoT and a combination of sensors like pulse sensors, temperature sensors, an LCD, a buzzer, an Arduino Nano, and a GSM module is a ground breaking approach. This innovative system offers real-time monitoring and early detection capabilities, enhancing the quality of life for both patients and caregivers. By continuously monitoring vital signs like pulse rate and temperature, anomalies can be detectedand flagged. The integration of an LCD and buzzer provides immediate feedback and alerts, while the Arduino Nano acts as the central processing unit for data analysis and decision- making. Furthermore, the inclusion of a GSM module enables remote communication, allowingcaregivers or medical professionals to receive instant notifications about any concerning changes in the patient's health status. This system not only aids in early detection but also facilitates timely medical intervention, potentially slowing the progression of Alzheimer's disease and improving the overall care provided to patients. Overall, this IoT- based Alzheimer's detection system showcases the potential of technology in revolutionizing healthcare, offering a proactive approach to managing and addressing the challenges posed byneurodegenerative diseases. Its ability to provide real-time monitoring, timely alerts, and remote accessibility can significantly impact the lives of individuals affected by Alzheimer's and their caregivers, ultimately contributing to better outcomes and improved quality of life.

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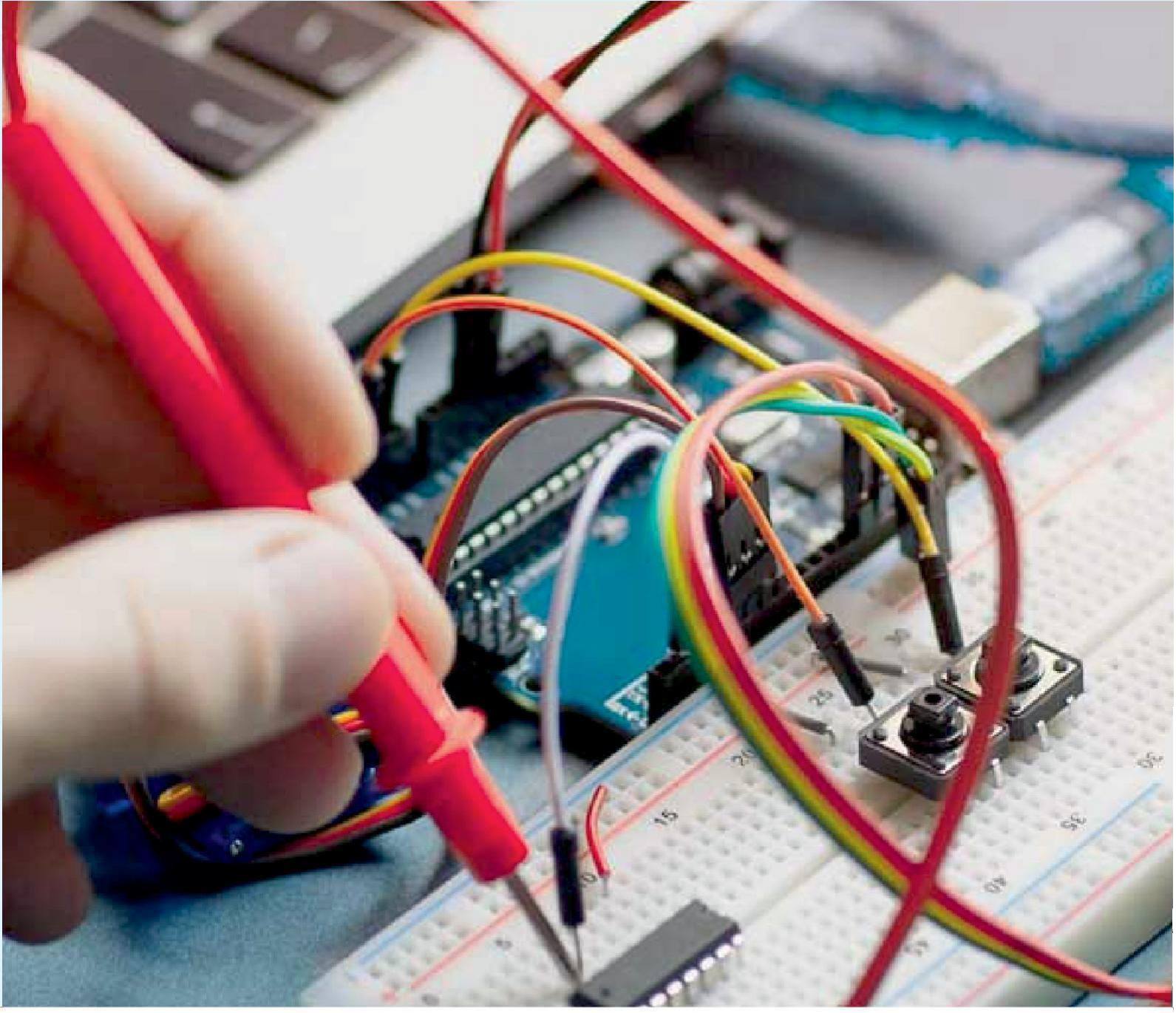

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