Techno Medcare Glucose and Health Monitoring System Using IOT

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Abstract:- Monitoring vital signs and stress levels plays a pivotal role in healthcare, yet challenges such as limited access to medical professionals, high consultation expenses, and infrastructure upkeep pose barriers to widespread monitoring. This paper proposes a streamlined solution by introducing an electronic health wearable capable of monitoring vital signs and glucose levels through IR sensors, alongside a stress monitoring headband. Additionally, the system integrates reminders for sedentary behavior and hydration, and features fall detection mechanisms using vibration motors and gyro sensors. To bolster accessibility, individuals can consult healthcare professionals via chat and video calls to review their health metrics. Moreover, appointments with doctors can be conveniently pre-scheduled, reducing consultation expenses and circumventing the need for extensive medical infrastructure. This approach offers a promising avenue for efficient and economical monitoring of vital signs and stress levels, thereby enhancing healthcare accessibility.

Keywords:- *Telehealth, Glucose Monitoring, Electronic Health Wearable, Stress Monitoring, Fall Detection.*

I. INTRODUCTION

Advancements in technology have ushered in a new era of smart healthcare, revolutionizing traditional medical practices through digitalization and data integration.

The Healthcare system now increasingly integrates IoT technologies, creating a connected ecosystem of devices, sensors, apps, and network connections. IoT's key role in healthcare lies in its ability to continuously monitor patients analyzing metrices for early detection and responses in critical care settings like ICUs. Real-time data transmission enables clinicians to promptly address abnormalities such s oxygen saturation, weight and blood sugar levels. Thus not only enhances hospital- based monitoring but also empowers patients with home monitoring options, reducing the need for frequent hospital vital and potential saving lives. Additionally, IoTs continuous monitoring aids in early disease detection, crucial in today's world frequent health crises enabling timely intervention and mitigation measures.

Furthermore, in today's world, characterized by frequent outbreaks and health crises, early disease detection is paramount.

II. LITERATURE SURVEY

The Aside from increasing accuracy, the maingoal of creating medical diagnostic and instrumentation devices is to make them easier to use and more accessible and reasonably priced.Blood sugar level is an important factor to take into account while doing any type of medical examination. Elevated or irregular blood glucose levels are concerning since they may indicate the existence of diabetes. Therefore, it becomes essential to regularly check the blood sugar level. Traditionally, needles and strips are needed to do these utilizing technologies that breach the skin's barrier. The intrusive procedure is not only dangerous for your health, but it also costs money to replace the strips, which is a significant expense. A quantifiable relationship between the levels of glucose and of using infrared spectroscopy.[1]

Non-invasive blood glucose monitoring with infrared (IR) light has proven to be a useful and reliable method for monitoring blood sugar levels while engaging in daily activities. This technique depends on the variable rates at which blood with various glucose content absorbs infrared light radiation. Here, we introduce an affordable finger probe for measuring glucose that integrates fuzzy logic with an arduino and a Clarke error grid. The gadget was designed to deliver non-invasive,painless blood glucose readings using an infrared sensor. We calibrated and connected physical and electrical values by converting the electrical impulses that represented blood glucose levels into mathematical formulae.[2]

Aside from increasing accuracy, the main goals of creating medical diagnostic and instrumentation devices are to make them easier to use and more accessible. and reasonably priced. Blood sugar level is an important factor to take into account while doing any type of medical examination. Elevated or irregular blood glucose levels are concerning since they may indicate the existence of diabetes. Therefore, it becomes essential to regularly check the blood sugar level. Traditionally, needles and strips are needed to do this utilizing technologies that breach the skin's barrier. The intrusive procedure is not only dangerous for your health, but it also costs money to replace the strips,

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which is a significant expense. A quantifiable relationship between the levels of glucose and of using infrared spectroscopy.[3]

Continuous glucose monitoring (CGM) devices that are non-invasive and precisely assess blood glucose levels have been developed over the last few decades. Even while the traditional finger-prick approach is correct, it is too unpleasant and inconvenient to use frequently. Teststrips are not cheap. Despite the introduction of non-invasive and minimally invasive CGM systems to the market, these devices are costly and necessitate finger-prick calibrations. Given the high prevalence of diabetes in low- and middle-income nations, a non- invasive glucose monitoring gadget that is both affordable and user-friendly is desperately needed. The non-invasive glucose monitoring technologies and the associated studies are briefly covered in this review study. Three technologies are covered: enzymatic, transdermal, and optical. The study focuses on NIR (near infrared) technology.[4]

The sophisticated devices may either be worn or implanted in the users‟ bodies to continually examine their wellbeing. But due to the availabilityof several sensors and communication systems, standardization has become a key issue. This survey paper presents the state of-art research relating to the various sensors and communication models that are used to provide home based monitoring. The small sensor nodes with IoT and its influence on every patient‟s life in reducing their anxiety of risk when they are inaccessible to medical support are studied. This study helps the researchers in choosing the best available protocolsto implement in health-care devices. The contribution to the development of smart cities anddata from home or at work for smart health care is discussed. The key findings of this study are the benefits of 5G technology for smart health care, as the most often utilized communication method in the literature to date is 4G.

The objective of this work is to design and develop a real-time IoT based health monitoring and heart attack prediction system that integrates vital signs sensors, location sensors, ad-hoc networking and web portal technology to allowremote monitoring of patient‟s health status and to predict the heart disease through various machine learning techniques. In this work it has ensured the correct and efficient transmission of the vital signs data to the Thing-Speak server through the internetvia a given access point (AP) and notified the user of the same through the GSM module. A heartattack prediction system is also developed to predict the probability of heart attack from the available parameters. The novelty of the proposed work is that it takes the advantage of both the IoT and machine learning technology to monitor and predict the diseases. [6]

In this paper, we provide a literature survey ofwork conducted on elderly fall detection using sensor networks and IoT. Although there are various existing studies which focus on the falldetection with individual sensors, such as wearableones and depth cameras, the performance of these systems are still not satisfying as they suffer mostly from high false alarms. Literature shows that fusing the signals of different sensors could result in higher accuracy and lower false alarms, while improving the robustness of such systems. We approach this survey from different perspectives, including data collection, data transmission, sensor fusion, data analysis, security,and privacy. We also review the benchmark data sets available that have been used to quantify the performance of the proposed methods. The survey is meant to provide researchers in the field of elderly fall detection using sensor networks with a summary of progress achieved up to date and to identify areas where further effort would bebeneficial.[7]

So, the proposed innovative project to dodge such sudden death rates by using Patient Health Monitoring that uses sensor technology and uses internet to communicate to the loved ones in caseof problems. This system uses temperature and heartbeat sensor for tracking patients‟ health. Both the sensors are connected to the Arduino-uno. To track the patient health microcontroller is in turn interfaced to an LCD display and wi-fi connection to send the data to the web-server (wireless sensingnode). In case of any abrupt changes in patientheart-rate or body temperature alert is sent about the patient using IoT. This system also shows patients temperature and heartbeat tracked live data with timestamps over the Internetwork.[8]

The mobile and remote stress monitoring, alleviation and management system, whose features are: Firstly, it is wearable and inexpensive, which uses only one wearable stress monitor sensor and a mobile phone-based application (Android OS) to monitor stress. Secondly, deStress quantitatively assesses the user‟s stress level continuously, not just classifies the users into stressed or non-stressed state. Thirdly, deStress provides a system for stress monitoring andmanagement, through which the stress data could be recorded, analysed and shared with medical professionals. Last but not least, a novel adaptive respiration-based bio-feedback approach is implemented to alleviate stress. To the best of our knowledge, deStress is the first telehealth system dedicated to mobile and remote stress monitoring, alleviation and management. Extensive experimentare conducted in 30 persons to demonstrate the feasibility and effectiveness of deStress, and the result shows that the stress level assessment ofdeStress correctly indicates the mental states of theusers, and under the guidance of deStress the users could alleviate their stress level dramatically.[9]

In this way, fall detection from video camera images presents some advantages over thewearable sensor-based approaches. This paper presents a vision-based approach to fall detection and activity recognition. The main contribution of the proposed method is to detect falls only by using images from a standard video-camera without the need to use environmental sensors. It carries out the detection using human skeleton estimation for features extraction. The use of human skeleton detection opens the possibility for detecting not only falls but also different kind of activities for several subjects in the same scene. So, this approach can be used in real environments,where a large number of people

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may be present at the same time. The method is evaluated with the UP-FALL public dataset and surpasses the performance of other fall detection and activities recognition systems that use that dataset. [10]

There are multiple indicators of an individual's aptitude and personality which cannot be deciphered visually through the eye. Technology can play a vital role for finding out the essential information when an individual is in different situations. Using the amalgamation of concepts like Electrodermal Activity, Pulse Rate Sensing, Emotion and Sentiment Analysis, an individuals stress as well as emotional state, underdifferent scenarios, can be identified. This information can provide meaningful insights for evaluating the characteristics of an individual. These insights can be beneficial in analyzing how individual acts under various circumstances which will eventually help companies and governmentagencies in applications like recruitment, investigation, and lie detection process, to name a few. This will add a layer of security from theperspective of technology for human well-being.[11]

III. PROPOSED SYSTEM

A. Prelude

The main purpose of the project is to provide remote monitoring of health status and realtime care support to patients all over the world. Anelectronic health glove will be developed which has essential health sensors to monitor the health parameters of the patients like glucoselevel,heartbeat, body temperature, SpO2 and stresslevels. Here the stress level is measured using a specialized GSR sensor which is attached to the electronic health glove. A mobile application isdeveloped to view the health reports. A dedicated ESP32 cam is used to provide facial stressdetection for the patients. Both video and audio chat support with the doctor is provided in ourapplication. Personalized pharmacy support isprovided to the patients for medicine delivery.

B. Flow Chart

The below flow chart depicts the workflow of Personalized Healthcare Assistance and Monitoring System. The connection is established between the microcontroller and server through theWi-Fi module. Heart rate, Glucose levels, SpO2,temperature and stress values are measured using MAX30102 and GSR sensor. The microcontroller reads the values and displays it on the mini-OLED display. Health parameters are then uploaded on Google sheet database and the health stats of the patient is display in the mobile application.

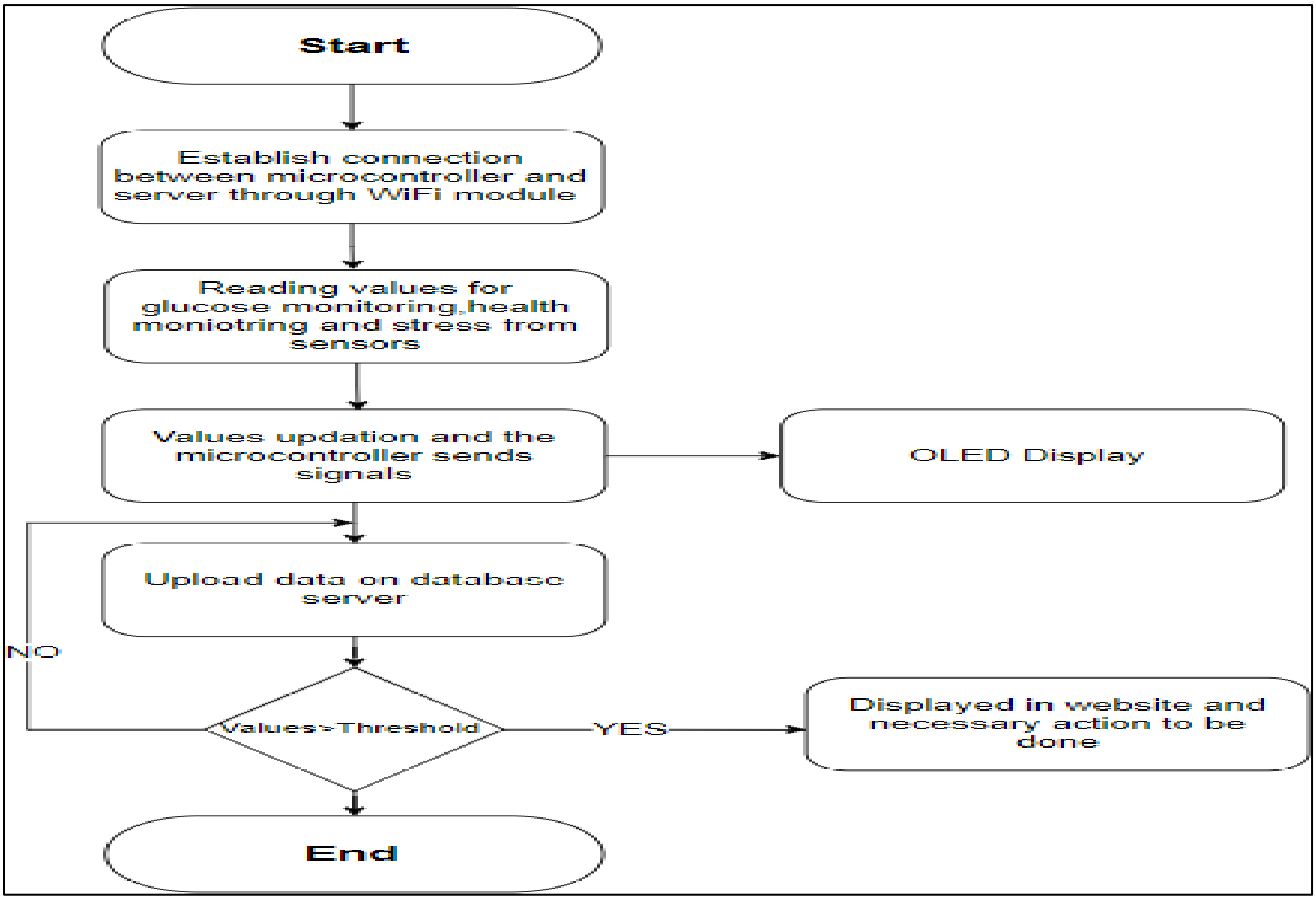

Fig 1: Flow Chart for the Glucose Monitoring System using the IoT

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C. Block Diagram

Fig 2 represents the block diagram of Techno medcare Glucose monitoring system using IoT. The vital health parameters like glucose, heart rate, SpO2, temperature and stress levels are measured using electronic heath glove and stress monitoring head band. The microcontroller sends the health data to the google sheet database using Wi-Fi.Health stats of the patient can be viewed by both doctor and patient using Technomedcare mobile application. Audio/video chat consultation and prescription services are present in the application.

Gyro sensor is fitted in a case with GSMmodule. The case is attached with the head band for detecting fall in patients and providing SMS alerts to emergency contact person. Specialized ESP 32camera is used for facial stress analysis.

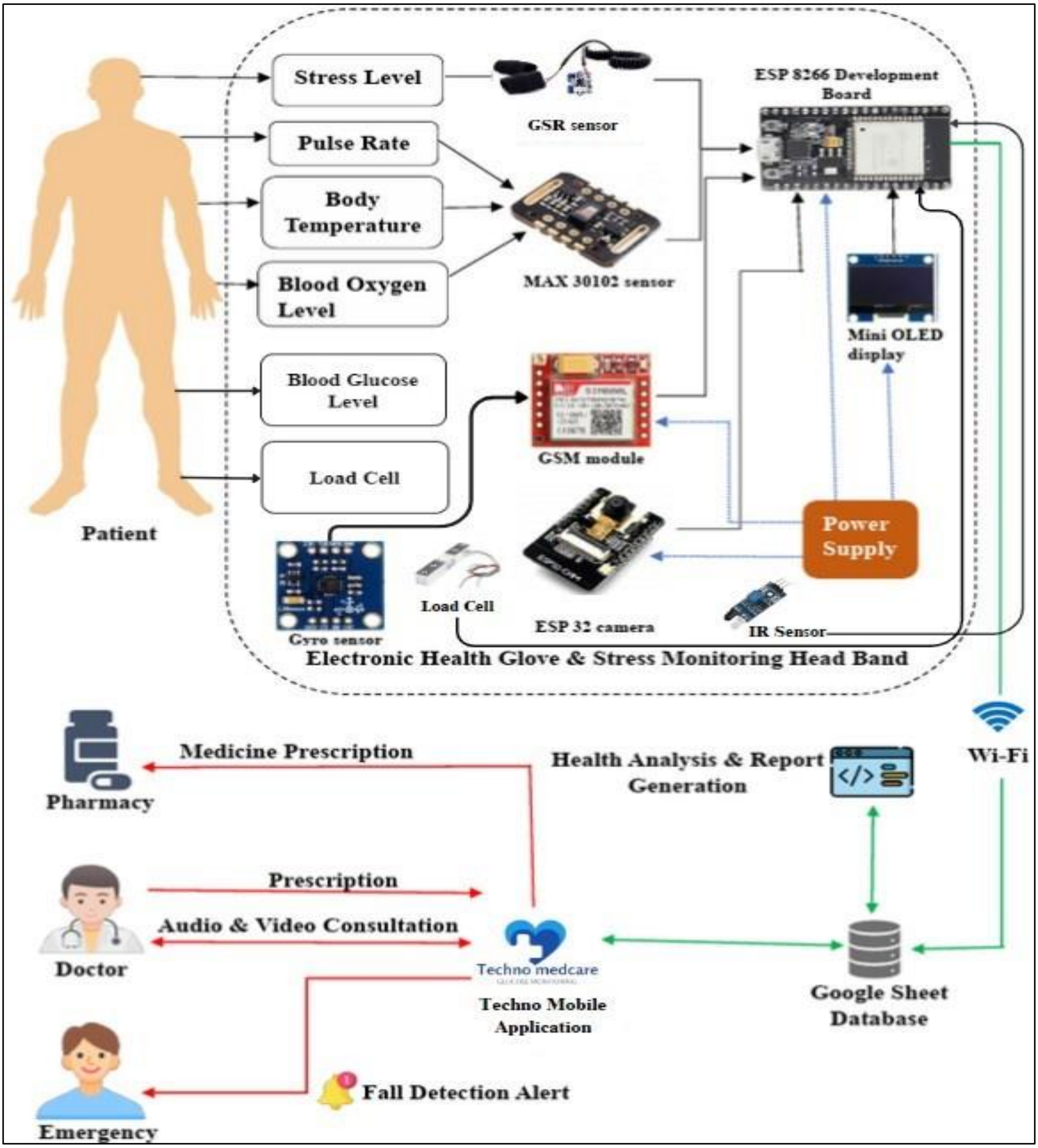

Fig 2: Block Diagram of Health Monitoring System

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D. Hardware Setup

The hardware section consists of various components such as ESP 8266 Node MCU, MAX 30102 sensor, GSR sensor, Gyro sensor, SIM800L GSM module, Mini OLED display and ESP 32 camera.

Fig 3: Electronic Wearable

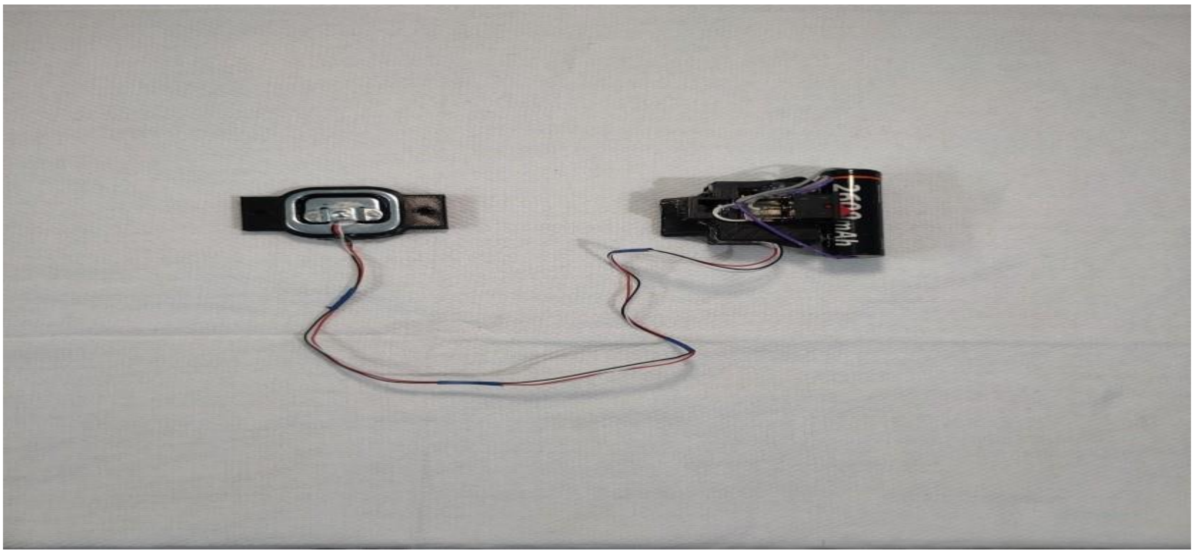

Fig 4: Battery with Weight Sensor

Fig 5: Stress Monitoring Headband

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E. Software Setup

In this project we have developed an android application for the patient to view health tsats and to connect with the doctor.

Fig 6: Flash Screen of our App

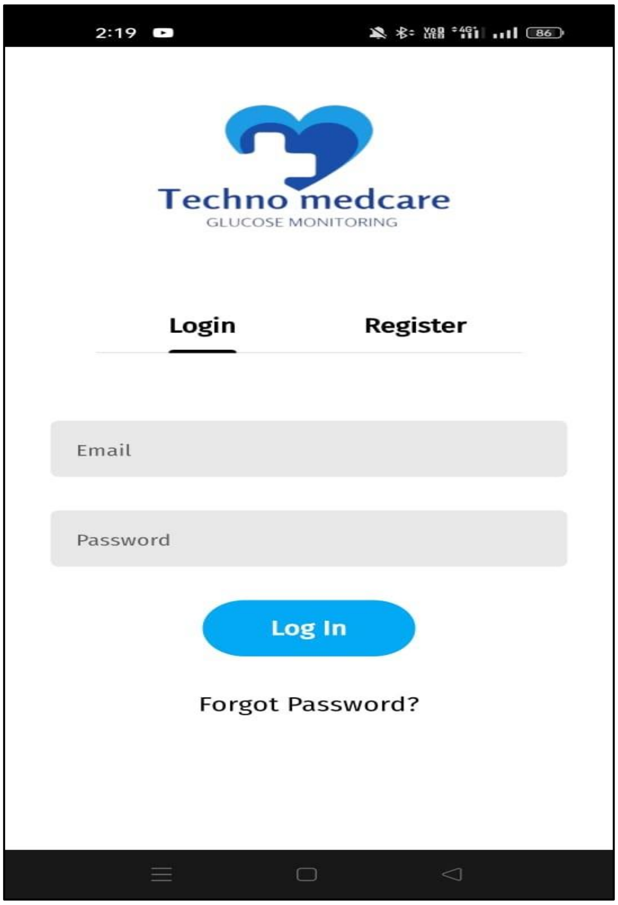

Fig 7: Login Page of our App

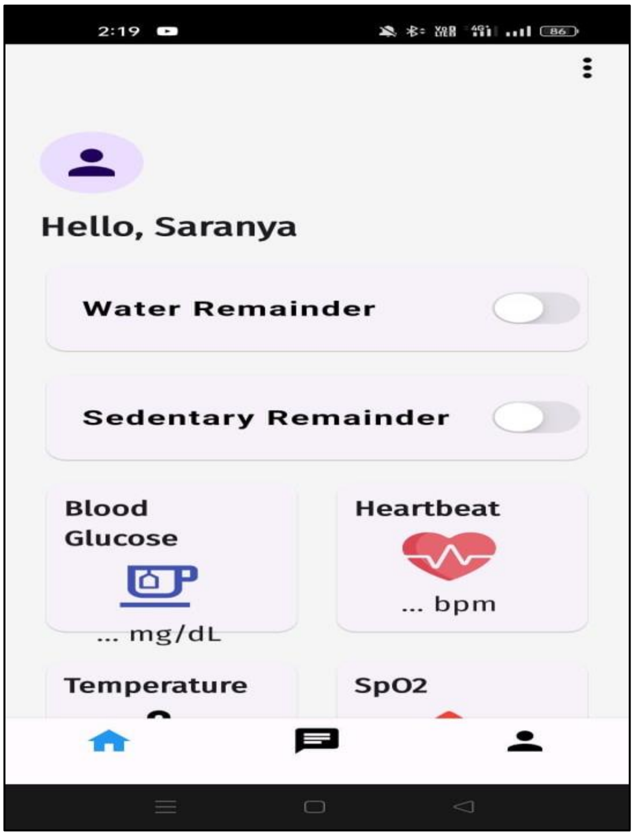

Fig 8: Home Screen 1

F. Doctor Application

In this project, we have developed an android application for the doctor to view health stats and connect with the patient.

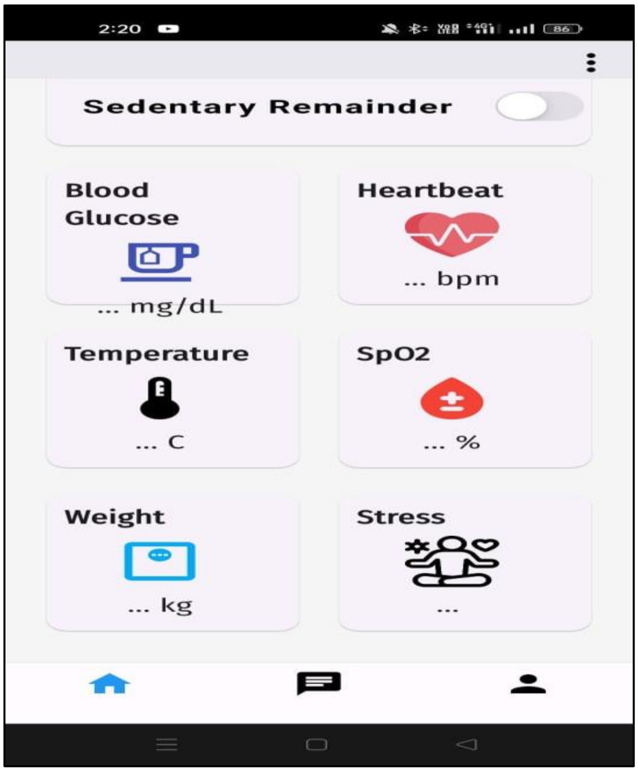

Fig 9: Home Screen 2

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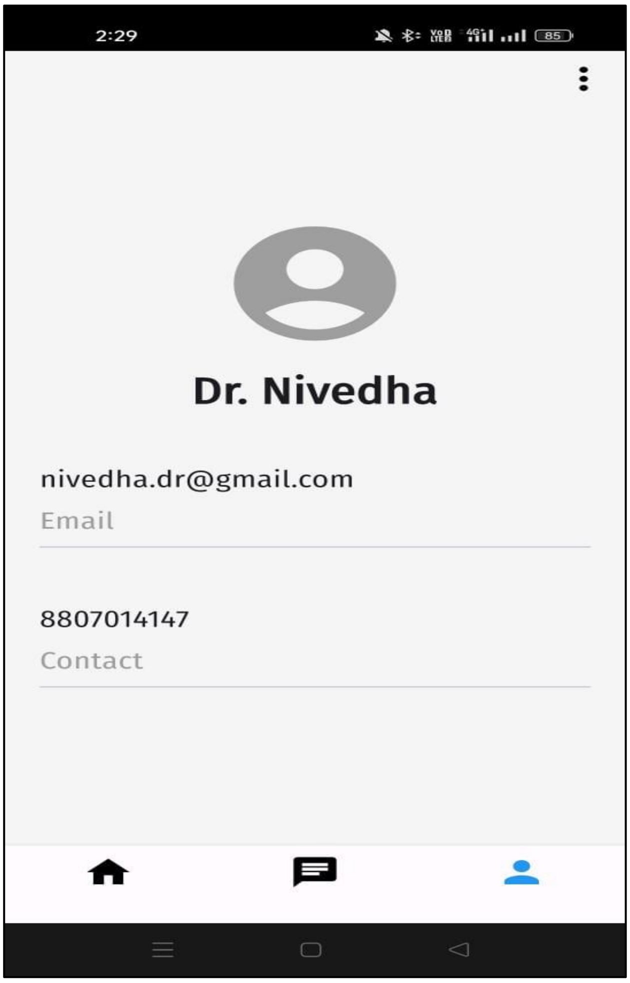

Fig 10: Doctor Details

G. Merits of Proposed Work

- Provision of real time health care monitoring.
- Monitoring vital health parameters includingstress levels and glucose levels of the patient is provided via specialized sensor.
- Real time health stats and reports are provided to both patients and doctors.
- Emergency alert notification support isprovided in case of fall detection.
- Video, audio and chat consultation with the doctor is provided
- Pharmacy support is provided for deliveryof medicines to the patient
- Specialized ML is used for facial stressanalysis using a dedicated camera.
- Water and sedentary remainder alerts are provided using a dedicated vibration motorsupport.

SUMMARY

Both the doctor and the patient will have access to Android applications. The patient cancombine the headband and glove with the program,examine their real-time health statistics, request doctor consultations, send their prescriptions to pharmacies for delivery of medications, and receive personalized alerts to drink water and stay active. All types of people may easily wear and use the hardware because of the way it is made. The necessary sensors are there in it to keep track of the patient's health. An emergency contact person can get alert notifications from a fall detection alertsystem in the event of a fall incidence. The doctor's application allows for viewing the patient's health statistics and reports for consultation and diagnosis.

IV. CONCLUSION

Both patients and healthcare practitionerscan gain a lot from an IoT-based health monitoringproject. This system makes use of networked sensors and equipment to enable real- time data collecting, remote patient monitoring, and enhanced patient-physician communication. While healthcare professionals can access a wealth of data to help guide diagnoses and treatment options,wearables and other connected devices can offer patients ongoing monitoring and updates on their health state. All things considered, this technology has the potential to significantly enhance healthcare for all parties concerned.

However, putting such a system into place necessitates carefully taking into account a number of aspects, such as data privacy and security, device compatibility, and regulatory compliance. Additionally, it is crucial to make sure that patientsand healthcare professionals receive the necessary instruction and assistance to use and comprehend the data produced by the system. Overall, a projectusing the Internet of Things to monitor patient health has the potential to revolutionize healthcare delivery, enhance patient outcomes, and lower medical expenses.

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