

A Novel Framework for Monitoring the Remotely Located Patients using an IoT based Healthcare System

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Abstract—In India, providing the faster health care services for the elderly citizens and heart disease patients has become an immediate necessity. The implementation of health care system is a challenging task, as most of the people are located in the rural areas. There is a need for a novel framework in health care system to connect people and Technology. The idea of the work is to automate the process using an automated health care system based on IoT. The automated healthcare system will monitor the variations in the health conditions of an elderly person and alerts the doctors/caretakers during the critical condition. The history of the patients health condition is analyzed to provide the future medications. This novel information acquisition paradigm uses the Blynk server and allows the continuous patient medical information there by reducing the cost of medical personnel.

Index Terms— Internet of Things, Android App, sensors, Remote Patient Monitoring, Arduino uno, Blynk app.

I. INTRODUCTION

The Patient Health Monitoring system is a boon to the hospital management system and remotely located patients. The health condition of the remotely located elderly patients can be monitored with the connected devices like BP Monitoring Machine, ECG etc., The patient health care system has to monitor the status of the various parameters of the body condition and report to the care taker and to the medical personnel. The alarm notifications helps to take immediate action during the various health issues like heart attack, sudden fall and Alzheimer. There is a need for remote monitoring of the health condition of elderly people both in urban and rural places at low cost.

II. LITERATURE SURVEY

In India, there is a scarcity of physical health centers, medical personnel, medical kits etc. The remote health care system is trying to bridge the remotely located patients with the hospital networks so as to provide the emergency treatments.

In[1], Hai Tao, et al., have proposed a Health Care System called Secure Data which is a FPGA hardware based cipher algorithm. The patient data is more secured by secret cipher sharing techniques.

In[2], Parag Chatterjee et al., have designed and proposed an IoT based decision support systems specifically for the cardiovascular disease. The data is analyzed and improved for better visualization. The treatment is extended towards the remote and virtual paradigms.

In[3], S Lavanya et al., have proposed Raspberry pi based system that ensures the health of the patients by recoding. The collected data is analyzed and based on that the treatment is suggested. This saves both doctor's and patients time. The alert message would be sent to the concerned whenever there is a variation in the patient condition.

In[4], Dr. Malti Bansal et al., have discussed about both traditional healthcare systems and new IoT based Systems. The author has discussed the various development boards which are used for Health Care Systems. The use of IoT based concepts will provide services to the people with less cost and ease.

In[5], Abdulhamit Subasi et al., have proposed an m-healthcare system, which uses data mining techniques to recognize the human being. The different machine learning techniques are used for recognition of the human activity(HAR). The dataset related to body motion and vital sign are used for the recognition.

In[6], M.Ganesan et al., have proposed a clustering based healthcare system. The sensors are deployed outside the hospital collects the data and sends to the cloud platform for further processing. The available energy is a challenge to operate, there for the clustering technique is used to minimize the energy consumption.

In[7], Soumya Yattinahalli et al., have proposed a Health Care system to monitor the health of the patient. The system will notify about the nearby hospitals and physicians. The system also alerts the patient when he enters the location with worst condition.

In[8], Niharika Kumar, has done a extensive survey of recent advancement in the design and architecture of IoT based Healthcare systems. The healthcare systems like mHealth and 6LOWPAN are discussed. The author has proposed the design of a Intel Curie based healthcare system.

In[9], Haobijam Basanta, et.al, have developed an IoT-based system Help to You(H2U) connection to connect the patient and relatives. The system provides the real time service to the patients with the help of wearable devices.

In[10], Tamanna Shaown, et.al, have proposed an ECG monitoring system, to monitor the ECG from the patient body using the wearable sensors. The fetched data is stored in the database. The doctor is alerted with an email, about the variation of health condition of a patient.

In[11], Anurag et al., have implemented the remote health monitoring system based on Wi-Fi and ZigBee. The advantages and disadvantages of both the architectures are analyzed for its implementation in remote health monitoring. The system implemented with low power ZigBee consists of sensor nodes to collect, process and sends the data to server node. The system implemented with Wi-Fi system consists of sensors to access the bio-medical signals from patients and send it to a remote server.

In[12], Ravi Kishore Kodali et al., have proposed a novel information acquisition paradigm for continuous monitoring of patient health. The In-hospital health care system is implemented using ZigBee mesh protocol. The various parameters of the in-hospital patients are monitored continuously.

III. IMPLEMENTATION

The hardware module is used to sense the various parameters of patient body are DS18B20 body temperature sensor, the heart beat sensor, Global positioning system (GPS) module, fall detection sensor, Arduino UNO, ESP-8266 Wi-Fi Module and BLYNK app. The Blynk is a toolset for all makers, inventors, designers, teachers, nerds and geeks. The smart phones can be used to control Arduino, RaspberryPi, etc. Blynk will work with all popular boards and shields. The hardware module for patient health monitoring system is as shown in Figure 1.

Software Module

The Blynk app is used for remotely monitoring the patient health status. The input data is sensed from the sensors and given to the microcontroller. The captured data is sent to Blynk server using Wi-Fi module. The data is stored on the Blynk database.

The Blynk server is used for checking the remote wellbeing checking. The sensors will sense the various parameters from the patient body such as body temperature, heartbeat, patient's fall detection and location Information. A website page is likewise produced for showing the sensor information and emergency notice.

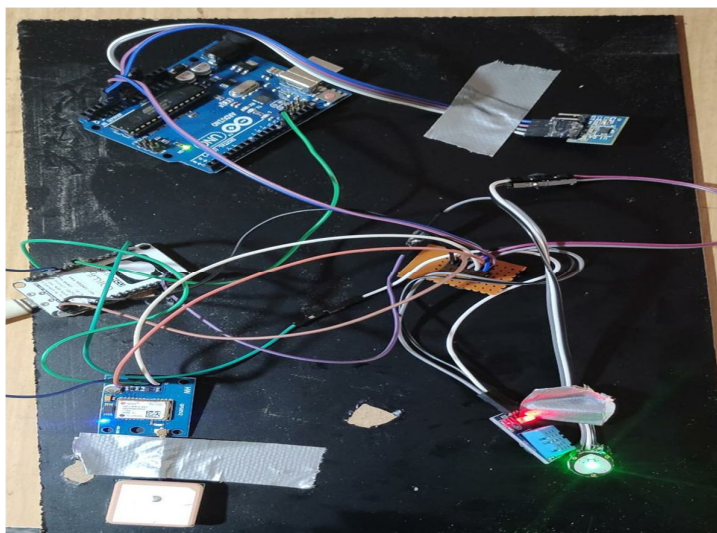


Fig.1. Hardware module for patient health monitoring system

The proposed framework includes sensors to get the natural parameters from the patient's body and transmit it remotely to the Blynk server. If there any unusual sensor esteems are recognized it will consequently show the alarm message.

Algorithm

Start

Step 1: The Patient Registration is done.

Step 2: Once the Patient Registration is done then the Blynk app should be logged in.

Step 3: The data is sensed from the patient body

Step 4: The Monitoring Application checks the status of the remote server.

Step 5: If the remote server connection is ON then Send the fetched data from the patient body to the Blynk server via Wi-Fi module else display the Error message.

Step 6: If the parameters received are within range then copy the values to Blynk Server, else the App should send a notification to the doctor and the care taker of the patient.

Step 7: Repeat the above steps of Monitoring and Reporting.

Stop

IV. RESULTS AND DISCUSSION

The proposed framework includes Temperature Sensor (LM37), GPS, Heartbeat Sensor and fall detection sensor. All these sensors are associated with arduino board. The parameters from the patient's body are sensed and transmitted to the blynk server . On the off chance that the patient condition is typical, the sensor esteems are refreshed on the blynk app. In the event that the patient is unusual, the sensor esteems are refreshed in the blynk app displays notification. The Fig.2 shows the Monitoring Reports and Fig.3 shows the generation of Alert Notification.

If there any unusual sensor esteems it will send the alert message to corresponding doctor and care taker. In that, a message we have given the patient present status. The histories of the patient are recorded.

V. CONCLUSION

The proposed Health Care System, monitors health condition of the remote elderly patient. The proposed system uses the Blynk app to monitor the patient health condition and Blynk server to store the data. The system will generate the alarm notification based on the parameters sensed from the body of the patient. During an emergency situation, the patient can be traced with GPS. The fall detection feature helps to find the current status of the patient. The system can be enhanced to detect the various complicated health issues with changing sensors requirements.

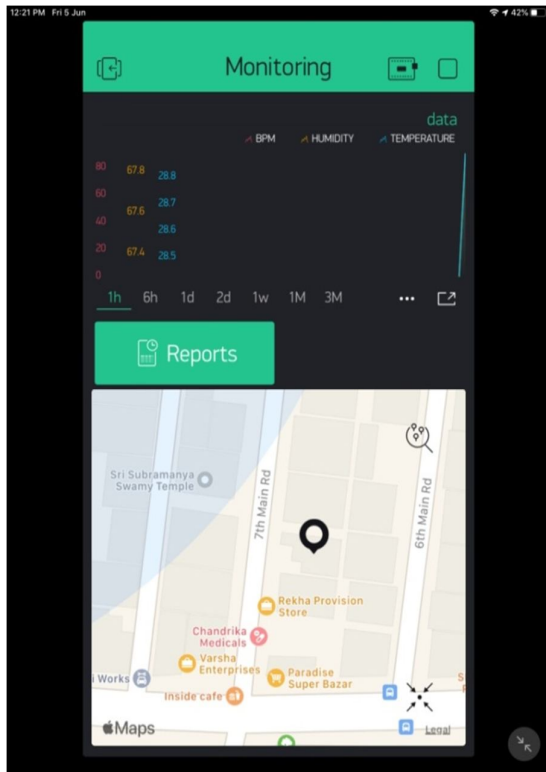


Fig 2. Monitoring Report

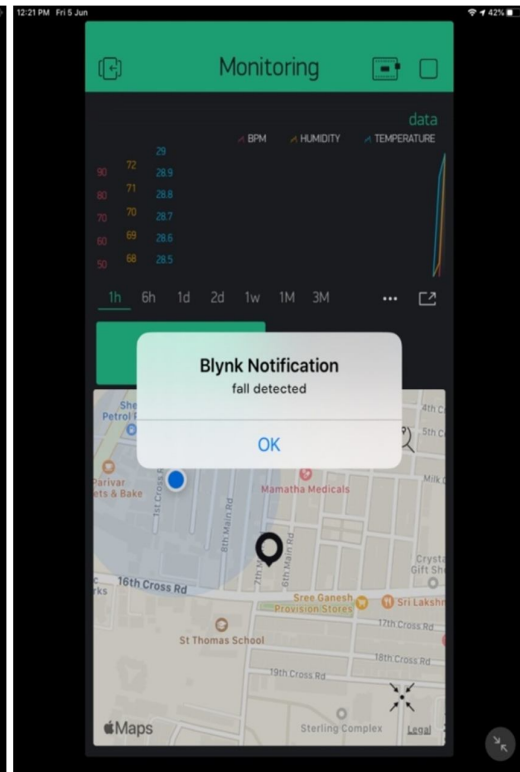


Fig 3. Generation of Alert Notification

REFERENCES

- [1] Hai Tao, Md Zakirul Alam Bhuiyan, Senior Member, IEEE, Ahmed N. Abdalla, Mohammad Mehedi Hassan, Jasni Mohamad Zain, and Thaier Hayajneh, Member, IEEE, "Secured Data Collection with Hardware-based Ciphers for IoT-based Healthcare", IEEE INTERNET OF THINGS, VOL. XX, NO. X, MONTH 2018
- [2] Parag Chatterje, Leandro J. Cymberknop, Ricardo L. Armentano, "IoT-based Decision Support System for Intelligent Healthcare – Applied to Cardiovascular Diseases", 7th International Conference on Communication Systems and Network Technologies Argentina 2017, 978-1-5386-1860-8/17 ©2017 IEEE, 2017.
- [3] S.Lavanya , G.Lavanya, J.Divyabharathi, "REMOTE PRESCRIPTION AND I-HOME HEALTHCARE BASED ON IoT", IEEE International Conference on Innovations in Green Energy and Healthcare Technologies(ICIGEHT' 17), 978-1-5090-5778-8/17/\$31.00©2017 IEEE
- [4] Dr. Malti Bansal, Bani Gandhi, "IoT Based Development Boards for Smart Healthcare Applications", 4th International Conference on Computing Communication and Automation (ICCCA), 2018.
- [5] Abdulhamit Subasi, Mariam Radhwan, Rabea Kurdi, Kholoud Khateeb, "IoT based Mobile Healthcare System for Human Activity Recognition", IEEE, 978-1-5386-4817-9/18/\$31.00@ 2018, IEEE.
- [6] M.Ganesan, Dr.N.Sivakumar, "An energy efficient IoT based Healthcare System based on clustering technique" , Proceedings of the Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019] IEEE Conference Record # 45616; IEEE Xplore ISBN: 978-1-7281-0167-5.
- [7] Soumya Yattinahalli, R M Savithramma, "A Personal Healthcare IoT System model using Raspberry Pi 3", Proceedings of the 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT 2018) IEEE Xplore Compliant - Part Number: CFP18BAC-ART; ISBN:978-1-5386-1974-2.
- [8] Niharika Kumar, "IoT Architecture and System Design for Healthcare Systems", 2017 International Conference on Smart Technology for Smart Nation, 978-1-5386-0569-1/\$31.00 c 2017 IEEE.
- [9] Haobjam Basanta, Yo-Ping Huang, "Intuitive IoT-based H2U Healthcare System for Elderly People", Proceedings of 2016 IEEE 13th International Conference on Networking, Sensing, and Control Mexico City, Mexico, April 28-30, 2016.
- [10] Tamanna Shaown , Imam Hasan, Atish Dipankar, Md.Muradur Rahman Mim, Dr. Md. Shohrab Hossain, "IoT-based Portable ECG Monitoring System for Smart Healthcare", 1st International Conference on Advances in Science, Engineering and Robotics Technology 2019 (ICASERT 2019).

- [11] Anurag , Sanaz Rahimi Moosavi , Amir-Mohammad Rahmani , Tomi Westerlund , Geng Yang, Pasi Liljeberg and Hannu Tenhunen, "Pervasive Health Monitoring Based on Internet of Things: Two Case Studies", International Conference on Wireless Mobile Communication and Healthcare - "Transforming healthcare through innovations in mobile and wireless technologies Finland", 978-1-63190-014-3 © 2014 ICST, DOI 10.4108 /icst.mobihealth.2014.257395.
- [12] Ravi Kishore Kodali, Govinda Swamy and Boppana Lakshmi , "An Implementation of IoT for Healthcare", 2015 IEEE Recent Advances in Intelligent Computational Systems (RAICS) ,10-12 December 2015 Trivandrum.