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Real Time Pilgrim Health Monitoring and Tracking the Position using GPS and Biomedical Sensor

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Abstract: ***The main aim of this paper is to monitor the parameters like body temperature, heartbeat rate and track location of the pilgrim. The pilgrim body temperature, heartbeat rate are detected using a particular sensors. Every year number of pilgrims gathers for pilgrimage in blessed area. Finding the location and movement of such large number of pilgrims is important for the establishment who is managing the whole event and also pilgrim relatives. The organizing establishments face so many problems like crowd, security and detection of pilgrims. A number of technologies are used during Hajj in Saudi Arabia to reduce such problems. The goal of this paper, is to review the past work of pilgrim tracking and health monitoring systems, to classify various methodologies and identify new trends.***
Keywords: Node MCU, Pilgrim tracking, GPS, Heart beat sensor, temperature sensor.

I. INTRODUCTION

The large coverage of cellular and satellite network lead to various useful applications in our daily life. GPS (Global Positioning System) is used to track the pilgrims' location. Every year number of pilgrims are taking part in pilgrimage. Because of that every year pilgrims number is increasing, these pilgrims move simultaneously from one place to another. Relatives and establishment face many problems in finding a lost or dead pilgrim. For such situations there is a need of a system to track pilgrim. In the beginning tracking was carried out with the help of active and passive RFID systems. Further tracking was carried out with the help of image processing system. In this paper, the utilization of sensors and tracking device is effectively undertaken to observe and take corrective actions from both the sides of system.

1) The paper is organized as follows:
a) Section 2 elaborates about the past research work in the field of titled paper and the literature review of the same.
b) Section 3 describes the functioning of the systems along with its block diagram.
c) Section 4 states about the conclusion followed by the references.
2) The major findings of the proposed work focuses on:
a) The real time monitoring of the physical parameters of the pilgrim for health checking
b) The tracking of the pilgrim in crowdies area
c) Integration of microcontroller system to the Wi-Fi network for better monitoring

II. LITERATURE REVIEW

Traditional crowd management system implies lots of human efforts. It ultimately leads to the problem of managing resources which directly overhead on economic and ecological issues. Now days, there are many state of art technology which can help us to solve the crowd management issues without stress. Some of states of art technologies are LBS (Location Based Services), RFID (Radio Frequency Identification), Web Services, Cloud Services, Mobile Computing and much more. Previously some engineers have proposed solutions for problems faced by pilgrims and authorities during the holy events.

GPS is global navigation satellite system for getting details of the position of receivers using signals broadcasted by satellite. Global positioning system is used to point the people on the global map provided by OSM (Open Street Map) services. Using GPS people can easily obtain location of living and non living entities. GPS has become a useful application for human and other moving object navigation worldwide and useful tool for checking out commerce and scientific uses [1].

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Radio Frequency Identification (RFID) has been used in object tracking, supply-chain management and inventory management system on the large scale [2]. RFID system is capable of finding the particular tag from bunch of tags [3]. Since from 1950's or 1960's, radar and radio frequency signal are improved and leads scientists and researchers to find new technologies.

Mohamed Mohandas [4] has developed a mobile device that helps the authorities to identify pilgrim using RFID He has given a solution which is based on RFID technology. It helps the managing authority not only for identification of pilgrims but also for crowd control. Pilgrim wears the wristband RFID tag that stores pilgrim data. In such situations pilgrims may take help of guide books or follow other pilgrims. But all the time, experts may not be around to help.

So, Shahida Sulaimanand Hasimah [5] Mohamed have proposed knowledge based approach that can cover possible problems and solutions from experts and this system is called Hajj-QAES. This system helps the pilgrims in learning process and what to do next without asking to anyone.

Willy Wahyn Mulyana [6] proposed a simulation of crowd's behavior based on the development of intelligent agent. Intelligent agent is applied to each pilgrim to build the crowd behavior. The results showed that Hajj crowd simulation is able to demonstrate more realistic pilgrim's behavior. Such system can be used to train the pilgrim before they perform actual activities.

Balakrishnan K.et.al. [7] Developed the system that can be used to track specific pilgrims. In emergency any pilgrim can request for help using same system. Pilgrim who needs help will be identified on the map so that it becomes easy to reach at pilgrim in most efficient way. The developed system works in coordination with an RFID identification system that was proposed earlier. The developed system was tested successfully during the recent pilgrim season.

Priyanka Anant Khilare et.al. [8] proposed hybrid architecture .This architecture is based on sensor networks using BSN. Each pilgrim carries a small size mobile unit. The server can receive large volume of data via this high data rate network.

Aladdein Amro, Qasem Abdel-Muti Nijem [9] proposed a distributed communication and information system that assist the guide of pilgrims group in their duties. They added new capabilities and solutions for finding lost pilgrims, predict and avoid possible lost pilgrims. The location information of pilgrim is sent instantly to the web server via GSM.

The problems encounter during pilgrim tracking is out of range problem, heavy traffic density, network hanging and interference. To overcome this problem Karthikeyan Manikavasagam and Vinod Kumar Kochera [10] proposed system for tracking pilgrims using wireless sensor network also added some additional hardware for efficient tracking. To overcome Network hanging and interference usedGSM module (or) CDMA module.

Malak Osman,Adnan Shaout [11] proposed a fuzzy based solution for a personal location system. Fuzzy logic used to design an efficient personal location system. They proposed to divide the location area into small grids. Practically it is very difficult to know exact position of any pilgrim .The best way to locate a person is by using a tracking system. This project and its main ideas are taken from "Wireless Sensor Network for Pilgrim Tracking" by Mohamed Mohandas, Mohamed Haleem, and Mohamed Deriche [12]

III. METHODOLOGY

The block diagram of a system and the working of the system is as shown in fig 3.1

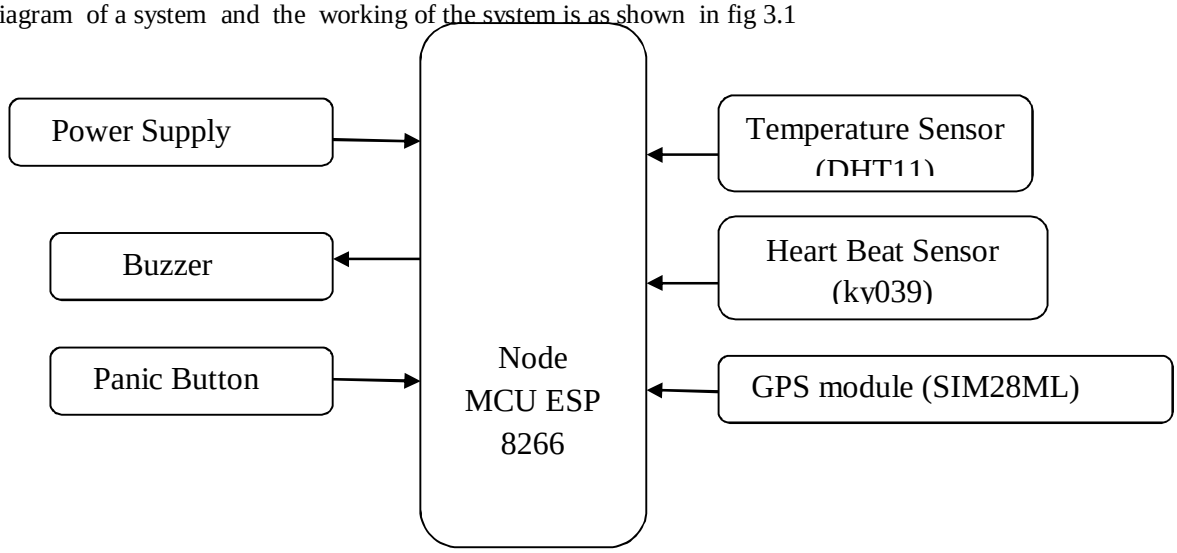


Fig.3.1 Block diagram of Real Time Pilgrim Health Monitoring

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A. Working

In this system, the Pilgrim Health is monitored by using the Node MCU ESP8266 controller. In the Node MCU, there is an inbuilt Wi-Fi. Because of that, real time pilgrim health monitoring is possible on a Smartphone using a Blynk android app. In this system, the DHT11 temperature sensor is used for obtaining a body temperature of a pilgrim, KY039 Heart beat sensor is used for obtaining the heart rate of a pilgrim and also SIM28ML GPS module is used for receiving the location details of a pilgrim. In this system, buzzer is used to alert the pilgrim in any problematic condition.

1) *Node MCU ESP8266:* Node MCU is an advanced version of an arduino. In the Node MCU, there is an inbuilt Wi-Fi network offering as a bridge between the controller and Wi-Fi and it is also capable to run its self-contained applications. There are 17 GPIO pins for the Node MCU which are used for assigning the various functions by programming the appropriate registers. GPIO pins of Node MCU can be configured with the internal pull-up or pull-down. If they are configured as an input, then the data will be stored in the software registers. Node MCU consists of the analog and digital pins on its board. It supports for a serial communication protocols like I2C, UART, SPI etc. With the help of these protocols, the serial devices like GPS modules, SD cards can be connected with it.

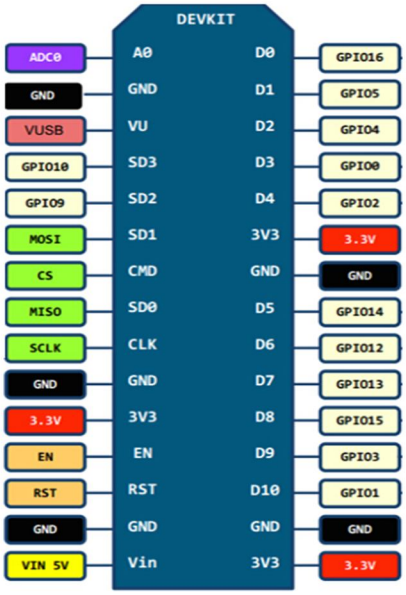


Fig.3.2 Pinout Diagram Of Node MCU

2) *SIM28ML (GPS Module):* Mainly Global Positioning System (GPS) receivers are used in a Smart phones, fleet management system, military etc. for getting or finding the location details.GPS receiver system is a satellite-based system. For computing or detecting the location, GPS uses satellites and ground stations.GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. For receiving the data, GPS needs at-least 4 satellites for accuracy purpose. GPS receiver only receives the data from a satellite. It does not transmit the data to the satellite. In this system, GPS receiver receives NMEA strings continuously and sends them to the micro controller. The micro controller extracts the longitude and latitude from the string and sends them to blynk app.

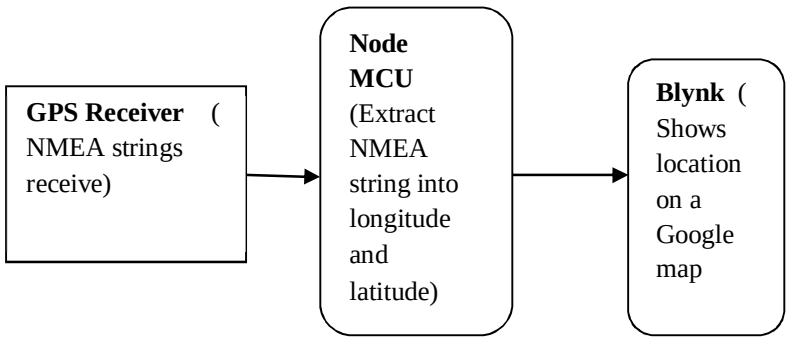


Fig.3.3 block diagram of receiving a location on a blynk app

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3) *DHT 11:* In this system, DHT11 sensor is used which is a combination of digital temperature and humidity sensor. For getting the pilgrim's body temperature, this sensor is used. This sensor gives the calibrated digital signal output of the temperature and humidity collectively at its data pin. It is a simple to use. DHT11 sensor is a single wire digital humidity and temperature sensor. It requires one-wire protocol for providing the humidity and temperature values. DHT11 provides values of humidity in a percentage and temperature in a degree Celsius. DHT11 has total 4 pins i.e. GND, NC, DATA and VCC. Fig 3.4 shows the photograph of DHT11

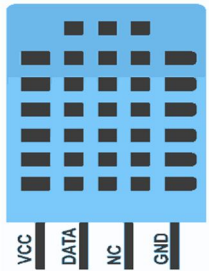


Fig.3.4 Pin Diagram Of DHT11

4) *Heart Beat Sensor (ky039):* Heart Beat Sensor is used to measure the pulse rate of the heart. It is a digital sensor. The heart beat sensor works on the principle of Photoplethysmograph. According to that principle, the changes in the intensity of the light passing through organ will measure the changes in volume of blood in the organ. IR LED is the light source of heart beat sensor and the detector would be any type of Photo Detector. By using this light source and a detector, two types sensor i.e. transmissive sensor and reflective sensor can be build.

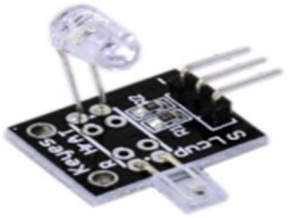


Fig.3.5. Heart beat sensor (ky039)

5) *Buzzer:* Buzzer is a beeper like device which consist of an audio signaling. There are three types of buzzer i.e. mechanical, electromechanical and piezoelectric. Usually buzzers are used in an alarm like devices i.e. In this system, buzzer is used to alert the pilgrim. Fig 3.4 shows the photograph of the piezoelectric buzzer.



Fig.3.6. Piezoelectric Buzzer

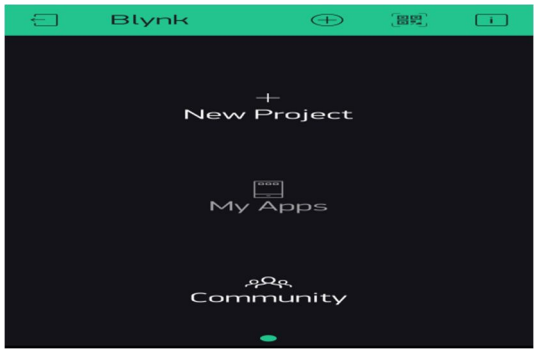
6) *Panic Button :*In this system, the panic button is used for getting the acknowlegment from pilgrim upon the buzzer alert which was send by the relative or the concerned establishment. The tac switch is used as a pannic button.
7) *Power supply :* The complete hardware system including microcontroller, GPS module, DHT11. Heart beat sensor and panic button requires 5V DC supply for its working. Therefore, a separate power supply module is used herein.

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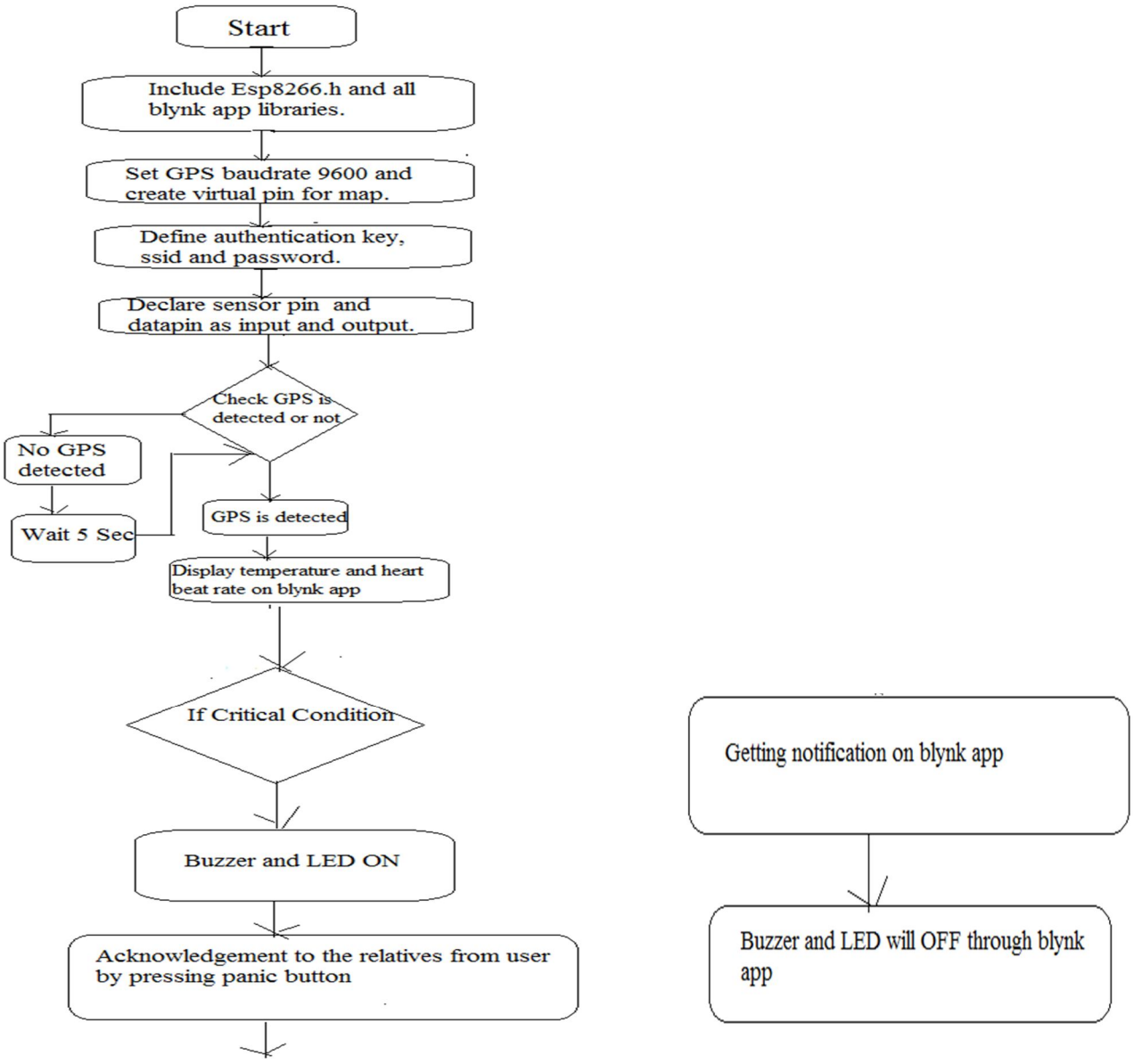
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IV. BLYNK APP

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, and it can store data, visualize it and do many other cool things.



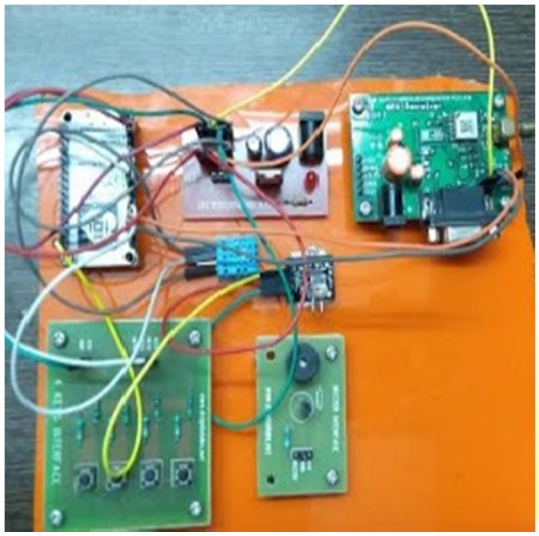
V. FLOWCHART



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A. Result

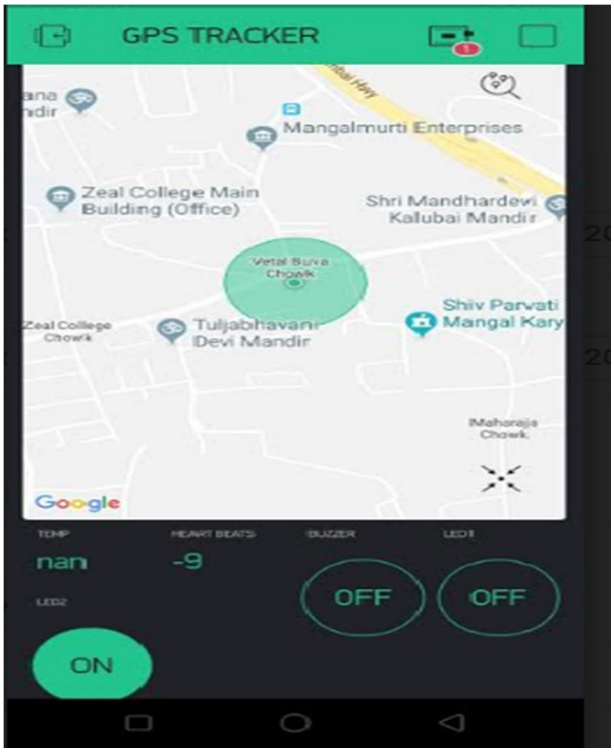
Demo PCB



Finalizes PCB



GPS Location



VI. CONCLUSION

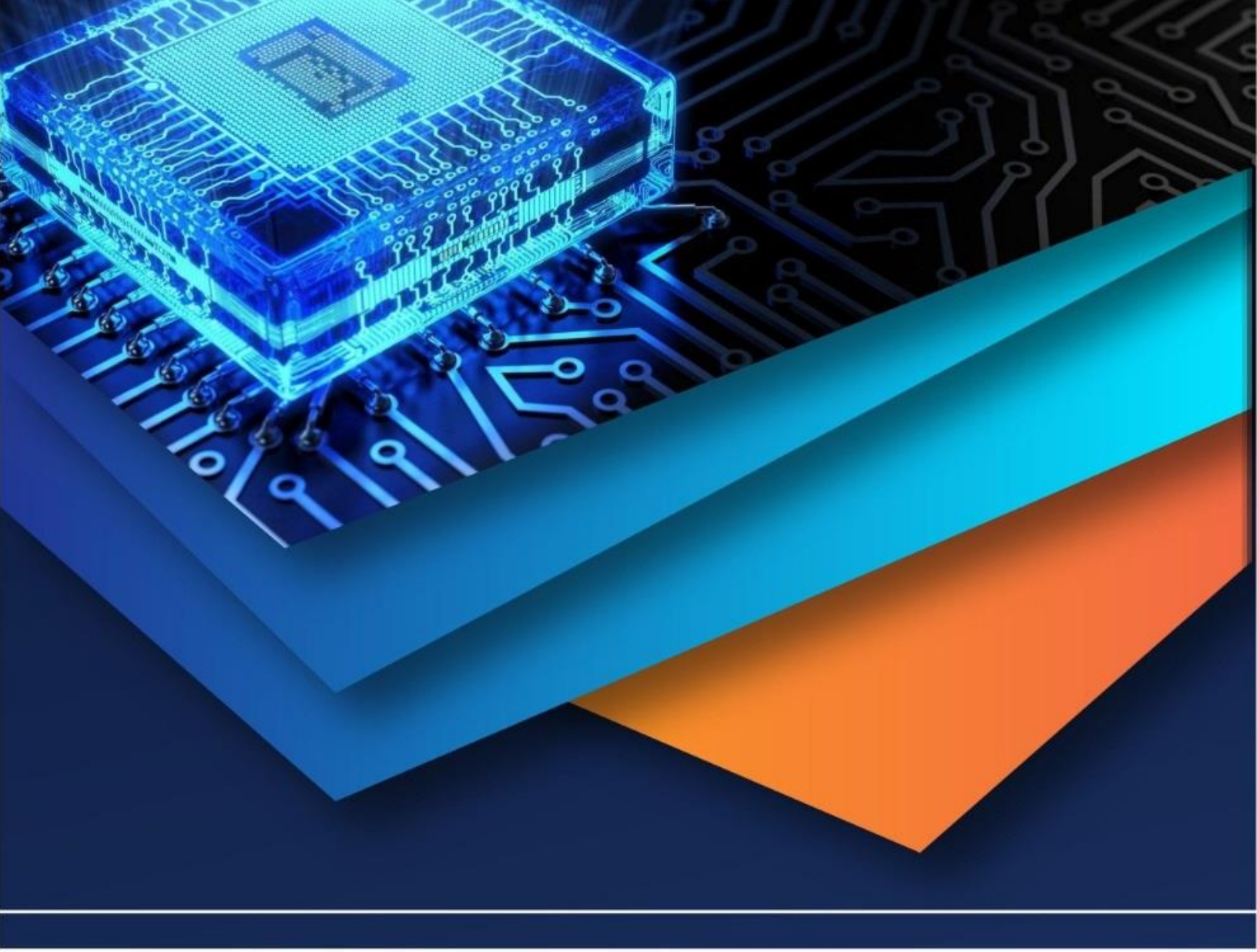
This paper gives the solution on the problem of tracking and monitoring the pilgrim. The real time health monitoring is possible using the said system. The tracking of the pilgrim is quick and accuarte due to the use of GPS module and Wi-Fi system. The monitoring authority can alert the pilgrim in critical conditions like pilgrim's health issue and stampade occurance.The pilgrim can acknowledge to the monitoring authority by using a panic button present on his side.Also, the pilgrim can give the indication on the Blynkapp by the same panic button. The system is realiable, compact, less power consuming, fast, interactive and cheap. The system can be upgraded if more sensors like gas sensor, blood pressure sensor and Electrocardiogram sensor.

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