

IoT based Tracking System

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Abstract—This paper proposes the development of an IoT based system that monitors the health condition of a child and when it goes to an abnormal value, an alert will be sent to the parent's mobile phone which includes the child's location. The system includes an android application that monitors the physical condition of the kid by analyzing his pulse rate. The system comprises of an Arduino UNO, Heart rate sensor, GPS and GPRS modules, which will be embedded in to a wearable band. Such a system would be useful for parents to keep track of their wards in case of emergency situations.

Index Terms— Arduino UNO, IoT, Tracking System, GPS.

I. INTRODUCTION

In present day scenario with all types of incidents' happening around, especially in case girl child, like abduction, harassment etc. it becomes necessary for parents to keep track of the state and location of their ward. Not only girls, but any person can become prey to such incidents and in case of persons with disabilities like ASD etc this becomes a matter of more concern. It is not easy for a parent / caretaker to be with them all the time. Hence development of smart device like tracking software with embedded wearable devices would be very useful.

The aim of this work is to provide a wireless heart rate monitoring system which can send SOS message or call to a pre-defined mobile number depending on how bad the current status of the person is. The proposed system consists of an Arduino UNO, pulse sensor, Neo 6m GPS module and SIM800L GSM module. The proposed system includes a child module and receiver module for getting the information about the missed child on periodical basis using parents mobile.

II. RELATED WORKS

A brief review on the works related to the development IoT based tracking systems is presented in this section. Mohammad Zulhafiz et.al.[1] in their work have developed a children security and tracking system using Bluetooth and GPS technology which can help parents to track the location of their missing children. A similar work has been reported by Dsouza et.al., [2] in which the system was developed using 8051 microcontrollers, GPS and GSM modules and a panic button along with an RFID tag and reader.

In recent times a lot of research has been reported on the use of Arduino for development of tracking devices. Mukherjee [3] in their work proposed an Arduino Based Wireless Heart Rate Monitoring System. The system will include Design and implementation of a Wireless Heart rate monitor system using Arduino Lily pad which

is enabled with the feature of sending SOS messages or calls through GSM module. Agrawal [4] et.al. developed a system for tracking path with Arduino UNO R3 Microcontroller by using GPS and GPRS. Nowadays, a lot of experiments are going on tracking systems based on GPS/GPRS. Uddin [5] et.al. proposed a work for location tracking system with an android device. Bilgic and Alkar[6] developed a tracking system with GPS enabled devices which incorporates AES security during the transmission of GPS data. Hasan [7] et.al. proposed an object tracking system based on GPS/GPRS which make use of Free Google map and HTTP protocol to send the data which reduces the effective cost. Wu [8] et.al. done a simulation which works on signal acquisition and tracking system based on software GPS receivers. Sonowal [9] et.al proposes a fast system for tracking of GPS signals on a real time environment. A summary of the survey is given in table I.

TABLE 1: SUMMARY OF THE LITERATURE SURVEY

Sl.NO	AUTHOR	TITLE	CONCEPT	YEAR	MERIT
1	Mohammad Zulhafiz Md Isa, Muhammad Mahadi Abdul Jamil, Tengku Nadzlin Tengku Ibrahim, Muhammad Shukri Ahmad, Nur Adilah Abd Rahman, and Mohamad Nazib Adon	Children security and Tracking system using Bluetooth and GPS technology.	When people visit a new place they forget the path through which they have travelled and faces problem in returning. The situation can create the security issues especially with the small children.	2019	To implement a cost effective device with latest technologies
2	Cassandra Dsouza, Dhanashree Rane, Anjanette Raj, Supriya Murkar and Namita Agarwal	Arduino Based Wireless Heart Rate Monitoring system with Automatic SOS Message and/or Call facility using SIM900A GSM Module	The intensity of the blood is decrease and increase is respect to the heart rate the easily found the heart is normal or abnormal.	2019	Also the monitoring of the patient is available in everywhere it is more helpful in rural area user.
3	Saikat Mukherjee	Arduino based Wireless Heart-rate Monitoring system with Automatic SOS Message and/or Call facility using SIM900A GSM Module	The intensity of the blood is decrease and increase is respect to the heart rate the easily found the heart is normal or abnormal.	2019	Also the monitoring of the patient is available in everywhere it is more helpful in rural area user
4	Tarun Agrawal, Mohamaad Abdul Qadeer	Tracing Path With Arduino uno Using GPS & GPRS.	main objective of this paper is to design and develop a real time path tracing system using Arduino R3 microcontroller, GPS and GSM Module. in order to trace the path, we require a good quality and low price real time system. The purpose of this paper is to trace the path in real time using Google Map on mobile phone.	2019	It can be used for trucks for carrying valuable goods, to keep track of the status of delivery and location of the truck all times
5	Md. Palash Uddin, Md.Zahidul Islam, Md.Nadim, Masud Ibn Afjal	GPS Based location Tracking System Via Android device	Whole system is divided into two parts the user and the admin section. Location is tracked using android mobile phone and send to the web server upon the availability of internet connection.	2013	Used android mobile phone as GPS device
6	Hasan Tahsin Bilgic, Ali Ziya Alkar	A Secure tracking System For GPS Enabled Mobile Phones.	Intended using AES security during the transmission of GPS data. AES is implemented in hardware & software through the world to encrypt the sensitive data, Also key is a function of IMEI is a 15-17 digit code for every mobile phones, finding the lost thing without using GPS, internet access surely trace by using IMEI number. Geo fencing is also used in software program uses the GPS & RFID to define the geographical boundaries.	2009	AES algorithm is still widely used for security purpose it provided security for communication. Geo fencing allow user to track the border violation via emails.

7	Khondker Shajadul Hasan, Mashiur Rahman, Abdul L. Haque ,M Abdhul Rahman, Tanzil Rahman and Mahbudur Rasheed,	Cost effective GPS-GPRS based object tracking system	System reads the current position of the object using GPS, the data is sent via GPRS service from the GSM network towards a web server. Existing tracking system are available to use SMS for communication to device). Free Google map and the use of HTTP protocol as data sending method reduces the monthly bundle cost for the individual user. GPRS is communication to server which turned out to be expensive (SMS are used for cheaper than SMS by a factor of 20 to 100 (SMS costs about 0.5-1.0 SMS whereas GPRS costs about 0.02).	2009	The cost is much lower compared to SMS based tracking systems. Expected that the full implementation ultimately replace the traditional and costly SMS based tracking systems.
8	Lingjuan Wu, Yingying Cui, Dunshan Yu	Signal acquisition and tracking for software receiver.	The GPS receiver performs reliable acquisition and tracking	2009	Compared to conventional hardware GPS receivers, software GPS receivers provide flexibility and low cost for algorithms redesign.
9	Nomi Sonowal, Rajeev Yadav, S. Kannan	Real Time GPS Software Receiver with New Fast Signal Tracking Method	Implementing software based GPS receiver acquisition and tracking for L1 C/A signal on ADSP SHARC. This paper bring out fast GPS signal tracking method using which more number of channels(satellites) can be tracked on a fixed and limited resources DSP platform.	2008	Fast signal tracking and can apply in static scenario.

III. MATERIALS AND METHODS

The overall working of the system is depicted in figure 1. A prototype that is a smart device in the wearable form and that is travel friendly has been proposed in this work. Such a system when developed would be useful for people with disabilities who may be prone to lose or forget their way and in any emergency situations. The system mainly consists of an Arduino Uno, GPS / GPRS unit and Heat/pulse rate sensor which are interconnected for continuous monitoring the person health status and send a message to the caretaker accordingly.

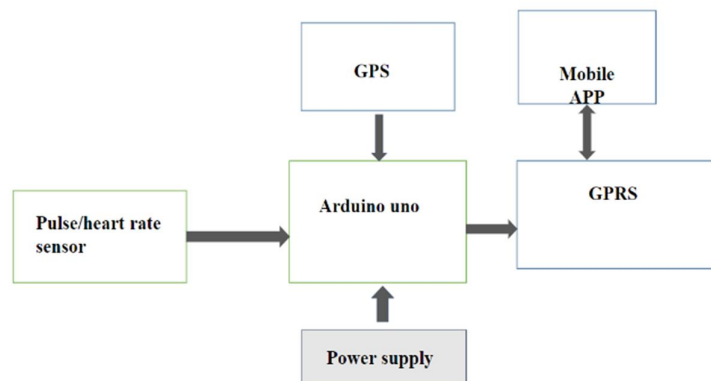


Fig 1. System architecture

The circuit diagram showing the various interconnections is shown in figure 2. The circuit consists of a NEO 6m used for GPS, SIM800L used as GPRS module and MAX30102 for Heart rate sensor. The heart beat sensor is placed on the finger for capturing the pulse rate and the data is transmitted to the Arduino. GPRS unit using the location tracked by the GPS helps to send an alert message to the android app installed on the caretakers mobile.

If the heartrate is low or high message is sent to the caretaker. Depending upon the range of heart rate, which is an indicator of the stress level or situation of a person their current location is send to the android app through GPRS. The device is programmed according to the age of the user as per the details given in table 2.

IV. RESULT & DISCUSSIONS

The circuitry of the complete system implemented for IOT Based Tracking is shown in figure 3. The sensed details as shown in figure 4 are sent to the mobile of the caretaker. The information sent includes the heart rate, Latitude and longitude of the person in distress.

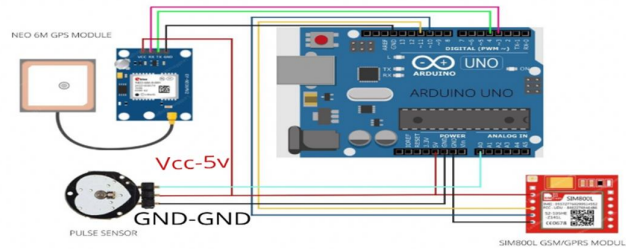


Fig 2. Circuit diagram

TABLE II. AGE SPAN- HEARTRATE PULSE RATE TABLE [10]

Sl. No.	Age Span	Heart Beat Pulse Rate (BPM)
1	Less than 1 month	120-160
2	1-12 months	80-140
3	12 months to 2 years	80-130
4	2-6 years	75-120
5	6-12 years	75-110
6	More than 12 years	60-100

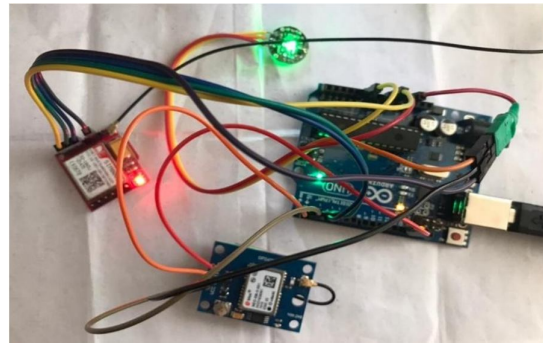


Fig 3. Connection Diagram

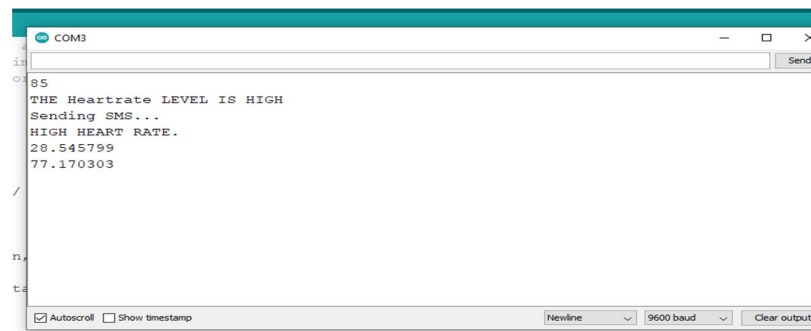


Fig 4. Details sent to the Mobile

V. CONCLUSION

In this work an IoT based system for tracking the location and state of children in general has been developed. The model uses an Arduino, GPRS unit and heart rate sensor for monitoring. The system is more useful in case of missing persons and when someone is in distress and needs help. The parents can track their child location using the Android Application that monitors the physical condition of kid by analysing the pulse rate.

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