International Journal of Research in Engineering, Science and Management
Volume-2, Issue-3, March-2019
www.ijresm.com | ISSN (Online): 2581-5792

Design of BLE based Child Tracking Device

V. Shireesha[1], K. Anjali Krishna[2], S. Aghileswari[3], V. Agilandeswari[4], K. Bhargavi[5]
[1]*Assistant Professor, Department of ECE, Anand Institute of Higher Technology, Chennai, India*
[2,3,4,5]*Student, Department of ECE, Anand Institute of Higher Technology, Chennai, India*

***Abstract*: Nowadays, parents are concerned about their child's whereabouts whether he/she has reached school on time or has arrived home back from school on time. This is a serious concern especially for working parents who don't have time to keep an eye on their children with their busy schedule. The increasing rates of kidnapping and crimes happening in the society also adds pressure and tension to the parent's mind. To overcome this problem and to keep parents and their children at ease, the child tracking bag is developed. Here, this bag is equipped with a tracking device which informs parents if their child has taken the wrong path that is lost or if the child has reached late to school or to home. This project aims at tracking the child who has left home from school. It uses BLE technology to detect whether the device on the child is within the vicinity of the school. If yes, then the parents are informed that their child has reached the school. While leaving the school the BLE detects the distance and from that activates path tracking. This is to find whether the child is taking the right path or not. If the child takes a wrong path, notifications are sent to the parents.**

***Keywords*: child tracking device**

1. Introduction

A sadly and deeply disturbing truth about India's missing children is that while on an average 174 children go missing every day, half of them remain untraced. According to the National Crime Records Bureau (NCRB) report which was cited by the Ministry of Home Affairs (MHA) in the Parliament, more than one lakh children (1,11,569 in actual numbers) were reported to have gone missing till 2016, and 55,625 of them remained untraced till the end of the year. Child Tracking system is used widely all over the world to assure parents that their wards are safe. There are many child tracking systems developed, but they all have a disadvantage in common, that is the high power consumption. All the child tracking systems have a GPS which is the main component required to find the location of the child. But always having the GPS on leads to waste of power, though the power use cannot be completely eliminated, they can be reduced thus leading to this proposed system. The proposed model is about tracking the child's movement from and to school. Here, the power consumption is reduced by the introduction of BLE (Bluetooth Low Energy). BLE is an improved, advanced and power friendly version of the Bluetooth. For a school going child , it is necessary for the tracking device to identify whether the device is in the vicinity of the school, which gives rise to detection of distance using BLE technology. Once the child leaves the school, the Bluetooth pairing is cut and triggers the GPS. This GPS keeps track of the path, the child takes and the notifications are sent to the parents accordingly The proposed model consists of two modes. The first mode, where as soon as the child leaves home to school, the GPS is turned on and the path tracking is initiated, and constant information about the location is sent to the cloud through the GPRS. When the child reaches the school, the device present with the child recognizes the Bluetooth device attached within in the school building. As soon as the Bluetooth device is detected, message is sent to the parents that their child has reached school and sets the GPS to the off mode. The second mode is when the child takes the wrong path. If the child goes off track the GPS present in the device recognizes it and sends an alert information to the parents that their child is in a different route rather than the path supposed to be taken. This way the power consumption can be reduced by turning off the GPS inside the school and also keeping parents assured about their child's safety.

2. Literature review

The proposed model has a part which uses BLE (Bluetooth Low Energy) whose main advantage over RFID tags [1] is that it uses low power consumption. Though the classic Bluetooth and BLE have almost the same features, the BLE has advanced feature of having a low power consumption compared to other wireless technologies such as the classic Bluetooth and Wi- Fi. The classic Bluetooth consumes 1W while BLE consumes power of about 0.1W-0.5W which is considerably the half. Here, the path taken by the child is tracked upon whether the child takes the right path to school and in case if they take any other path or goes off track, then the corresponding alert message is sent to their parents via the GSM/GPRS module [2]. We use tm4c123gh6pm belonging to the tiva c series family manufactured by the Texas instruments though there are many proposed systems which makes use of arduino and raspberry pi [3]. This is a device that is attached along with the accessory of the child such as the bag. The device includes GPS to detect if the child moves beyond the range mentioned by the parents which is set according to the corresponding latitudes and longitudes of the location and sends the corresponding information through the GSM/GPRS module [4]. Instead of the use of Wi-Fi [5], we use Bluetooth due to its low power consumption. The Bluetooth (BLE) attached around the school along the surface of the school buildings is recognized by the

Bluetooth attached or included with the child's device present with the child's accessory as such as the bag, and on scanning and recognition turns off the GPS unit while sending the message to the parent that their child has reached school, thus saving power [6].

3. System methodologies

A. TM4c123GH6PM

The tm4c123gh6pm is a microcontroller belonging to the tiva c series family manufactured by the Texas instruments. The applications include network appliances and switches, factory automation, motion control, transportation and security, it has a 32-bit ARM cortex-M4, 80MHZ processor core with system timer. They are inexpensive, self-contained single board microcontroller, they can be easily configured as digital inputs or outputs with wide variety of applications.

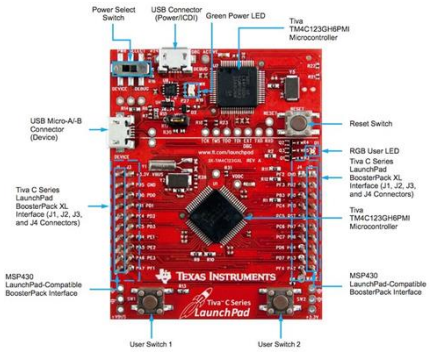

Fig. 1. Tiva c series-TM4C123GH6PM

B. Location tracking

- Interfacing GPS
- Interfacing GSM/GPRS
- Interfacing GPS

GPS - Global positioning system works by sending an Information which contains time from Different satellites orbiting the earth. There are around 6 orbits and each orbit contain 4 satellites. The Satellites send information to the GPS receiver in the earth in the form of NMEA (National Marine Electronics Association) protocol format. The GPS receiver has to decode the NMEA to get the required information such as latitude and longitude. While seeing the NMEA protocol various NMEA sentences are received starting with $. In that $GPGGA - Global positioning system fix Data, contains basic information which would be optimum for Decoding. For example. GGA - essential fix data which provide 3D location and accuracy data.

$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4, M,46.9,M,*47

Where: GGA Global Positioning System Fix Data 123519 Fix taken at 12:35:19 UTC

4807.038,N Latitude 48 deg 07.038' N

01131.000,E Longitude 11 deg 31.000' E 2 = DGPS fix

08 Number of satellites being tracked

0.9 Horizontal dilution of position

545.4,M Altitude, Meters, above mean sea level

46.9,M Height of geoid (mean sea level) above WGS84 Ellipsoid

(empty field) time in seconds since last DGPS update

(empty field) DGPS station ID number

*47 the checksum data, always begins with *

For each NMEA sentence There is check sum. We should assure that the received checksum is equal to calculated checksum. Normally the checksum is in Hexadecimal (*79). To calculate the checksum, we should EXOR all the data between '$' and '*'in Hexadecimal.

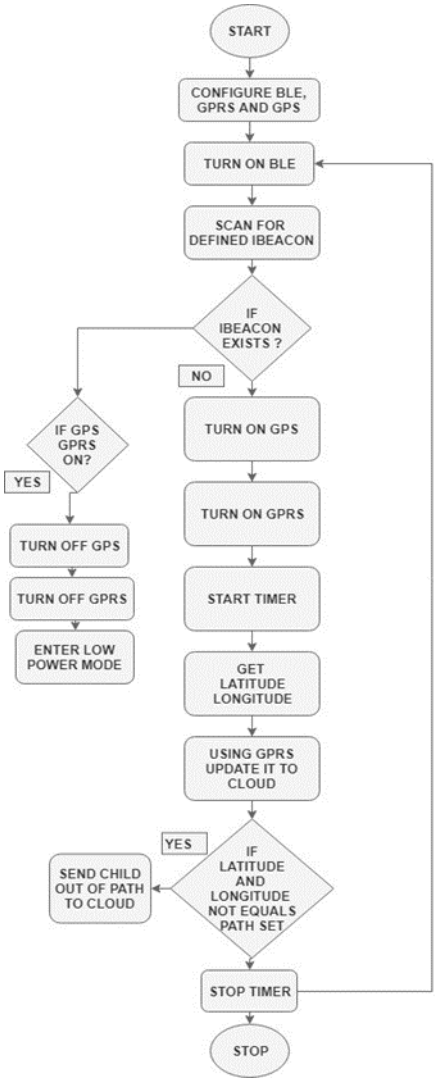

Fig. 3. Model flowchart

Interfacing GSM/GPRS: Both the GSM and GPRS can be controlled via AT commands. There are several AT commands. There are GSM and GPRS module which are standalone and Some GSM modules have built in GPS. To interface these modules, we can use Serial terminals like Putty for manual command interface. To use them with Arduino, Arduino should have been programmed with preloaded sketch. An example of

GSM AND GPRS module: The SIM 808 module has both built in GSM and GPS, it also has features like Bluetooth, PWM etc.

Fig. 2. SIM808 module

C. BLE (Bluetooth low energy)

Bluetooth Low Energy is a wireless personal area network which is basically a small device powered by a battery or USB. This emits a BLE signal. Here hm10 module is used. It transmits fewer data over shorter distances with very less power than Bluetooth. The main difference between classic Bluetooth and BLE is that though they both work in 2.4 GHZ frequency, BLE remains in sleep mode constantly except for when a connection is initiated which is not possible in a classic Bluetooth.

4. Conclusion

Developed the prototype of child tracking device which uses GPS for location tracking. Even if another route is taken by the child from the usual one, then parents are informed about the same. The message is sent to the mail set by the parents and the usual route latitude and longitude is set. The BLE technology used within the school premises pairs it to the device of the child and GPS is deactivated and message is sent to the parents that their child has reached school.

References

[1] Mayur Bhor, Nikhil Kadam, Dinesh Shinde, Pranoti Mane, “Children Safety and School Bus Tracking So- lution”, International Journal of Electrical, Electronics and Computer Systems (IJEECS), Volume 5, Issue 1, 2017.

[2] Zhigang Gao, Hongyi Guo, Yunfeng Xie, and Yanjun Luo,” ChildGuard:A Child-Safety Monitoring System”, IEEE, 2017.

[3] Asmita Pawar, Pratiksha Sagare,Tejal Sasane and Kiran Shinde,” Smart security solution for women and children safety based on GPS using IOT”, International Journal of Recent Innovation in Engineering and Research, Volume 2 Issue 3 March 2017.

[4] Archana. R, Priyadharshini. A, Satish kumar. R, Subhashini. R, “Design and implementation of child safety monitoring system”, International Journal of Intellectual Advancements and Research in Engineering Computations, Volume 6, Issue 1, 2018.

[5] Mahejabeen Budebhai, “IoT Based Child and Woman Safety”, International Journal of Computer Science and Mobile Computing, Vol. 7, Issue 8, August 2018,

[6] Benfano Soewito Agses Yohannes Haposan Ritonga Fergyanto E. Gunawan, “Increasing Accuracy of Bluetooth Low Energy for Distance Measurement Applications”, International Conference on Knowledge, Information and Creativity Support Systems (KICSS), 2016.

[7] Dhiraj Sunehra,Laxmi Priya, Ayesha Bano,” Children Location Monitoring on Google Maps using GPS and GSM Technologies”, IEEE 6th International Conference on Advanced Computing, 2016.

[8] Leonardo D’Errico, Fabio Franchi, Fabio Graziosi, Claudia Rinaldi, Francesco Tarquini,” Design and implementation of children safety system based on IoT technologies”, IEEE, 2017.

[9] R. Velayutham, M. Sabari and M. Sorna Rajeswari, “An Innovative approach for women and children’s security based location tracking system”, IEEE, August 2016.