

# Low Cost Intelligent Child Safety Wearable IoT Device for India



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**Abstract:** *in this present world, child security has become greater issue. Not only children even women has to be safeguard from threats. So, we are developing the smart wearable device for low cost which can be affordable for common people. To track the real-time location of the children, this project presents a mobile application where we have used Java, XML for code. This device is designed such that it monitors the child location and alerts the parents by sending SMS or voice message when the child moves out of the boundary. Even though using Wifi and Bluetooth, many systems are there for security purpose. This paper describes the system which comprises of an MPU 6050 gyroscope, Node MCU microcontroller and other sensors, GPS receiver for smart and safe usage. This includes some characteristics of high reliability, efficiency, short response time, high accuracy. The requirements enable to child's safety.*

**Keywords:** Child, IoT, Location, Sensors.

## I. INTRODUCTION

Nowadays the synopsis of the child getting lost in the major crowded areas are increasing, which was the main motivation that comes for safety of little children. This project focuses on the aspect of the lost children who can play a remarkable role in the child's safety until reconvene with the parents. Most of the wearable devices today are focused on the location, activity, temperature, pressure etc of the child and informs to the parents via GPS. Therefore it is intended to use voice call as the way of communication between the parent mobile and child's wearable device. The manifesto on which this project will be running on the microcontroller board and the functions of sending and receiving notification, calls, voice messages..

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Therefore, the wearable device proposed will communicate with the parent via voice call which ensures the security. Also, customization of the wearable device is possible by reprogramming the system as per our requirements. GPS module determines the location by analyzing the signals that are received from GPS satellites which are orbiting around Earth. These satellites send signals that takes long time to reach the GPS module. Calculation of the distance from several satellites can be done based on the amount of time taken by the signals to reach the receiver. After determining the distance from some satellites, using triangulation the GPS module calculates its own position. One of the most amazing found in technology is Geo Fencing technique that nowadays mostly used in security national defense. This is a feature in software developing program that uses the global positioning system (GPS) module to trace the location of the child. While the technology is growing rapidly, the technique also now used to locate a location of someone or vehicle that can be used for the public or for the private security. [1] Smart security solution for the safety of the child is based on GPS using IOT, the threats against children using smart device based on IOT. The system intends to a wireless technique in the form of embedded devices. This issue of child safety, they developed a prototype which is easy to use and well organized to provide help to that fatality. So when the victim press the button, collect user information to send notification to registered phone number with link of capture image. The system proposes a location tracking facilities and speed monitoring using GPS, GPRS, and GSM for child safety for low cost which can be affordable by the people. [2]. Design, development and implementation of child security monitoring system approach of security application of child. There is a severe rise in number of kidnapping and road accident circumstances. In existing system, there will be message based solution using GPS to aid parent to track their children's location in real time. The system acquires GPS and GSM based system are used to track the location of children health monitoring heartbeat, pressure etc.

## II. MATERIALS AND METHODS

### A. Materials

**GPRS MODULE:** General Packet Radio Service (GPRS) module is a packet oriented mobile data service for mobile communications (GSM). It is commonly used module for communication with the components. GPRS module is used to access the internet so that it can connect with the device and can guide both parents and the child.



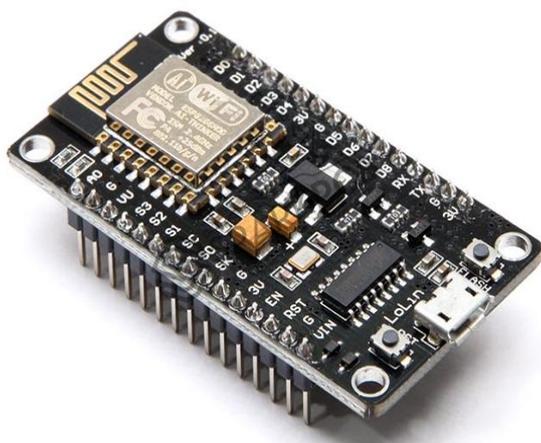
**Fig 1. GPRS Module**

**GPS MODULE:** The main purpose is to transfer information back to earth over radio frequency. With this statistics, the ground based module or GPS receiver can enumerate the position and time. It provides time legally traceable to UTC. It provides millisecond accuracy to some operating system applications like Windows and Linux. . GPS module coordinates along with to track the child’s current location.



**Fig 2. GPS Module**

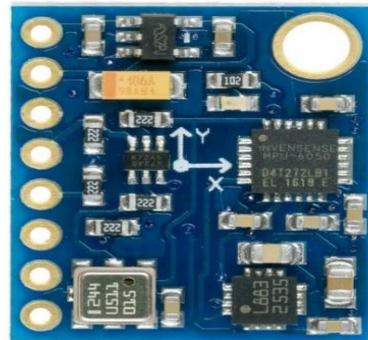
**NODE MCU:** Node MCU is an open source IoT manifesto. It includes firmware which runs from Espressif Systems, and hardware that is based on the ESP-12 module. Node MCU microcontroller is used to process the data given by these sensors.



**Fig 3. Node MCU**

**MPU 6050-GYROSCOPE:** A gyroscope is a gadget that is used to help determine orientation. The design of this device consists of a rotating disk called a rotor, ascend onto a spinning axis in the center of a larger and more firm wheel.

This device can measure and maintain the intention and angular velocity of an object. These are more advanced than accelerometers. These can measure the tilt and lateral orientation of the object whereas accelerometer can only measure the linear motion.



**Fig 4. MPU 6050 gyroscope**

**ALARM BUZZER:** It is an audio signaling instrument that is either electromechanical or piezoelectric. When a child move out of zone or moves away from the parents then the parents can detect their child by the sounding loud alarm. This indicates that the child is in some threat and alert the parents.



**Fig 5. Pieze buzzer**

## B. Methods

We have implemented the devices that are helpful for child safety wearable devices. A child wearable devices has the magnetic sensor inside. For the work analysis of the child position, we are using four types of zones. If the child moves out of these zones or to another location or unknown location then automatically it sends an alarm or SMS or voice notification on the parent mobile. The daily activity of the child at particular location will be recorded as a regular work of the child. We have written a program for this to find out unknown location of child. Fig.6 represents the architecture of this safety wearable device. This device is helps for the school student or child. Sensors are useful for tracing the actual location of the child and also dispense the details where the child is currently located away from their parents and also informs the parents the condition and situation of their child. SMS or voice notification services are used to receive the information. When smart mobiles not hold up internet connectivity, in that case child can send a message or can share the correct location to the parents. This system also helps the parent to track the location of their children without knowing by them because their movements are displayed on the parent mobile.

The application was implemented in mobile device which supports the Sensor. The application programmed for particular zones, and if the child go to unknown location it sends SMS or alarm to the parent mobile along with the display of current location. This application used to four zones in a single parent application. Parents will be receiving the information of their child's movement from their devices for each five seconds, by this they can monitor their child's movement because each five second. It will automatically update the location on the parent mobile, so easy to analysis the current location of the child.

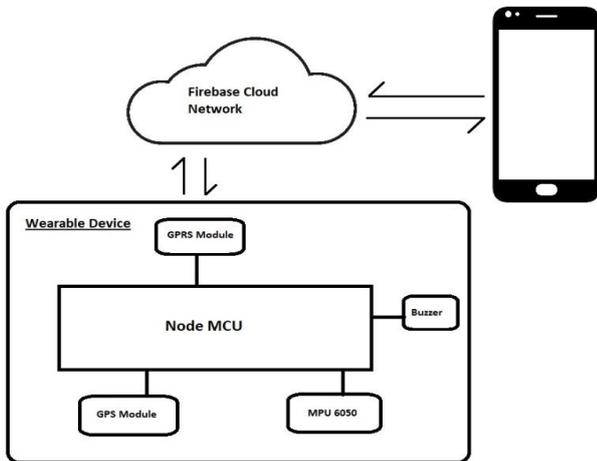


Fig 6. Architecture diagram of the device

Using MPU 6050 gyroscope and accelerometer, the present location of the children will be tracked and the voice notifications or SMS will be sent on the parent's smartphone where the application will be installed. GPS module coordinates along with to track the child's current location. The daily activity of the child at particular location will be recorded as a regular work of the child in the wearable device. When the child moves out of the regular recorded zones, parents will be receiving the notifications from sensors in the device. Node MCU microcontroller is used to process the data given by these sensors. The collect data will be stored in the firebase cloud network. GPRS module is used to access the internet so that it can connect with the device and can guide both parents and the child.

### III. RESULT AND DISCUSSION

#### A. Experimental Setup

The usage of device find the corresponding location on missing child. If there is any danger to send the text message or alarm on parent mobile. The hardware and software requirement are

- GPRS MODULE
- GPS MODULE
- NODE MCU
- MPU 6050 GYROSCOPE
- ALARM BUZZER

Arduino is the software used for mobile devices that includes an Operating system, middleware, firmware and key application. We use a firebase Database along with JAVA, XML. The solution for tracing the missing or kidnapped child is done with the help of sensor. Normally the selected operating system is Arduino to overlook all the attributes and features. SMS and voice notifications are used for connecting

the child and the parent. The application evolved is to make as user- friendly approach on both sides. In the parent side, we have used SMS and Sensor server for communication with child's vigour and updates the child location on the parent mobile automatically. All the measures of the child's location is showed on the parent's mobile. The messages can be used by the child shortly to send current location and update to his/her parents. The application stores the last update location in firebase cloud server. The child will be able to send location by using sensor updates to the server and the updates are saved in the database on the server. A NodeMCU micro-controller controls the designed system architecture of the wearable device with an Arduino boot-loader. The system architecture of the wearable device is based and controlled by a NodeMCU micro-controller with an Arduino boot-loader. GPRS or GSM Module searches the corresponding location on the travel the child. The proposed system intends to wireless device technique in the form of embedded device for children that will serve the purpose of alerts and way of communication and it update the current location through IOT. Many safety wearable devices which help to track the daily routine of children and helps to detect the child using Wi-Fi and Bluetooth services are present nowadays. But these devices only send the SMS that may or may not be seen by the parents on time. So we have included some option of receiving voice message along with the SMS notification when their child move out of the zone. By this parents can view the movements of their children.

#### B. Experimental Results

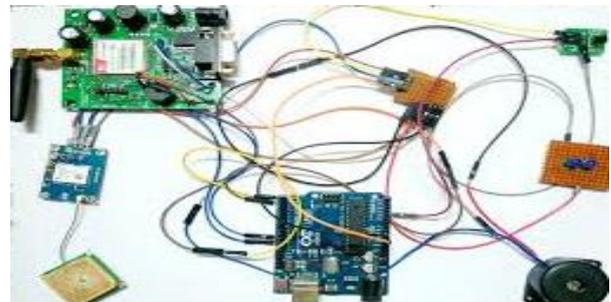
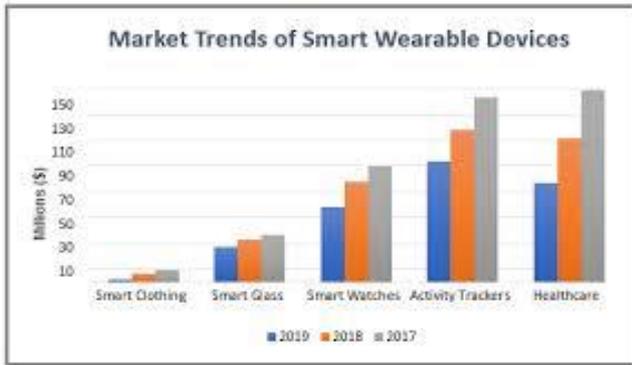


Fig 7. Hardware Connectivity of components

In Fig7, the hardware components mentioned in the experimental setup are connected to trace the location of the child. The sensors, modules, buzzer are connected and programmed to observe the child's movements and also to follow the child's location. The result represents the advantages of the smartphones which are playing an important role in this world nowadays. Smart application is to be installed in the smartphones which will receive the tracked data or message. This helps the parents to safeguard their children.

#### C. Graphical Notation

In this world, there are many trending industries which produce these wearable devices that work using WiFi and Bluetooth. On some census basis, the below graph is represented where day by day the production of these wearable devices are increasing along with some new trending options.



**Fig 8. Graphical representation of the usage of smart wearable devices**

In Fig8, the market that trends towards the smart wearable devices are represented using the graphical notation. This shows that many industries are eager to produce the trending products to the society and that too about the safety devices. So by this, our project is also eagerly done with the best output to provide the smart wearable device with the low cost for the safety of the child.

#### IV. CONCLUSION

The missing and kidnapping the children cases in the crowded areas are increased day by day. To prevent this, we have developed the smart wearable device where missing child can be traced through this application. The results presented in the paper takes the lead of smart mobiles which offer smart qualities like Sensors, IOT, message and Voice call etc. Also a more power structured model will be created which can be capable of handling the battery for a longer time.

#### V. FUTURE SCOPE

In future, it can be developed the security devices using GPRS module. GPS checks the location on each and every movement. It focuses on children's safety, tracking the real-time location with the help of longitude and altitude, positioning of GPS and sending information through SMS and Voice messages.

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