Children Tracking and Monitoring System using IoT

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Abstract— Everything is digitalized in this present era. Nowadays, every person is connected with each other by many ways, where most popular communication is internet so it is internet which connects people. In the existing system, an android application was developed to aid parents to track their children in real time. To use that application, user need to send commitments to their contacts based on the privacy. The device can be used by parents to track their children in real time or for child safety. But the location settings in the mobile phone must be enabled to track the location of the user and the users must learn to use this application. The proposed solution takes the advantage of the location services provided by GSM. It allows the parents to get their child's location on real time by SMS. In this project we proposed a device which is integrated with multiple devices that are programmed with all the required data which includes the behaviour of the human reactions like anger, anxiety, nervousness and fear. When these situations are faced by the victim, the various sensors generate the emergency signals which are to be transmitted to the numbers which is fed into the GSM. The Dijstra algorithm is proposed in GPS which is one of the best algorithms to find the shortest path. The proposed system effectively monitors the children presence within the expected zone. When the person crosses the monitoring zone through the IOT Monitoring system, GSM sends alert message to the numbers which are fed into the GSM. As a result, this device tracks and monitors the child in smarter way.

Key words: GPS, GSM, Safety, Temperature Sensor, Pulse Sensor, Cloud

I. INTRODUCTION

The Internet of Things (IoT) is that the network of physical devices, vehicles, and alternative things embedded with natural philosophy, electronics, software, sensors, actuators, and network property that modify these objects to gather and exchange the information. Everything is unambiguously diagnosable by its embedded system however is ready to interoperate with the present web infrastructure (Figure 1). Consultant's estimate that the IoT can carries with it regarding 30 billion objects by 2020. As of 2016, the vision of the IoT is related with our research. We have made use of this new technology in our research in such a way that it helps the children while they are in trouble. It deals with hardware as well as the software. The prototype is a combination of both which makes it special.

In India, which seeks itself as a promising super power and an economic hub can achieve its goal if and only if large numbers of children get themselves involved and participate in the development process. In today's world, child safety has become a major issue as they can't step out of their house at any given time due to physical or sexual abuse and a fear of violence and the rates of crimes against child is not decreasing but in fact increasing at a rate especially harassment, molestation, rape, kidnapping and domestic violence.

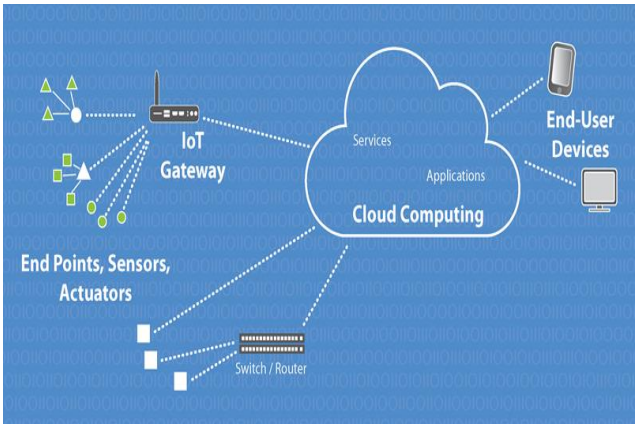

Fig. 1: Embedded system with cloud.

Many preventive measures have been taken by the government so far to minimize these occurrences and have remained unaffected. Generally, "embedded system" isn't a strictly definable term, since many systems possess some component of extensibility or programmability. The hardware of the project is selected to make the devices starting as low as possible. In current scenario security for child is a major concern. There is no one without a smart phone and this can help the victim to be in to stay in contact with their friends, relatives, and family members at anywhere and in any time. Thus, the aim of this project is to develop a wearable device for the safety and protection of children especially for girls. It is a simple gadget designed solely to serve the purpose of providing security to children mainly against sexual assault.

A Real-time GPS tracking is used by which the user can be constantly tracked by the user's emergency contacts. It allows the parents to get their child's location on real time by SMS or by retrieving it from cloud. Additionally the temperature sensor to sense the temperature and pulse sensor to count the victim's pulse rate is used. The system sends an automatic SMS to user if it crosses the threshold value. The temperature sensor senses the body temperature while we place our finger in the pulse sensor. If the signal is not available then we can retrieve the data from the cloud.

II. RELATED WORKS

Alex Kayal1, M. Birna van Riemsdijk, Mark .A. Neerincx and Willem-Paul [1] in their proposed system, an android application was developed to share child's location. A user (creditor) could create a commitment with another user (debtor) to share and receive check-in from one or a number of users, with condition that their time and geographical location are active. This system uses Social Commitment (SC) models for governing the sharing and receiving of the data. But the location settings in the mobile phone must be

enabled to track the location of the user and the users must learn to use this application.

D. G. Monisha , M. Monisha , G. Pavithra and R. Subhashini [2] in their proposed system, a device named "FEMME" was developed. Radio frequency signal detector is used to detect the hidden cameras. When some attack occurs or hidden camera is detected an alert message is send to the contacts in the users contact list by an android application. The device and the application are synchronized by Bluetooth and tracking of the location is done lively. As Bluetooth has small coverage this device cannot enforced with success.

Cassandra Dsouza, DhanashreeRane, Anjanette Raj , Supriya Murkar and Namita Agarwal [3] in their proposed system ,a system is developed with 8051 microcontroller, GPS, GSM and a panic button along with an RFID tag and reader. An RFID reader along with 8051 microcontroller and GSM is placed in the school/bus. An android application will be developed for the parents to enable them to monitor their child's location using GPS along with geo-fencing. If signal is lost, the application fails to work.

Predeba. B Gowri, N Shyamala, Tamil selvi, E Ramalakshmi, S Selsi, C Aulvina [4] in their proposed system ,a kit is designed with GPS ,GSM and a push button. When the emergency push button is pressed, the GPS will track the latitude and longitude co-ordinates and sends an alert message through GSM to the pre-defined numbers. Incase the user is not able to press that button, the system can fail.

Gopinadh Jonnadula , Bhanu Prasad Davu , Hari Kishore Kandula , Vinod Donepudi , Sivaiah Etukuri [5] in their proposed system ,a device with GPS, GSM, SOS, arduino, alarm and temperature sensor is designed. A message "LOCATION" is send to track the location of the user by GPS and GSM. A message "TEMPERATURE" will activate the temperature sensor and sends the temperature to the sender. If a message "BUZZ" is given, the alarm will be activated and the kidnapper will be alerted.

III. PROPOSED SYSTEM

In our proposed system a solution is given to aid the parents to track their child's location in real time. It allows the parents to get their child's location on real time by SMS or by retrieving it from cloud. Additionally the temperature sensor to sense the temperature and pulse sensor to count the victim's pulse rate is used. The system sends an automatic SMS to user if it crosses the threshold value. The temperature sensor senses the body temperature while we place our finger in the pulse sensor. If the signal is not available then we can retrieve the data from the cloud. The hardware requirements are:

1) Arduino,
2) GSM,
3) GPS,
4) Temperature sensor,
5) Pulse sensor,
6) Humidity sensor.
7) Wi-Fi serial IoT

And the software required is Arduino IDE (Embedded C).

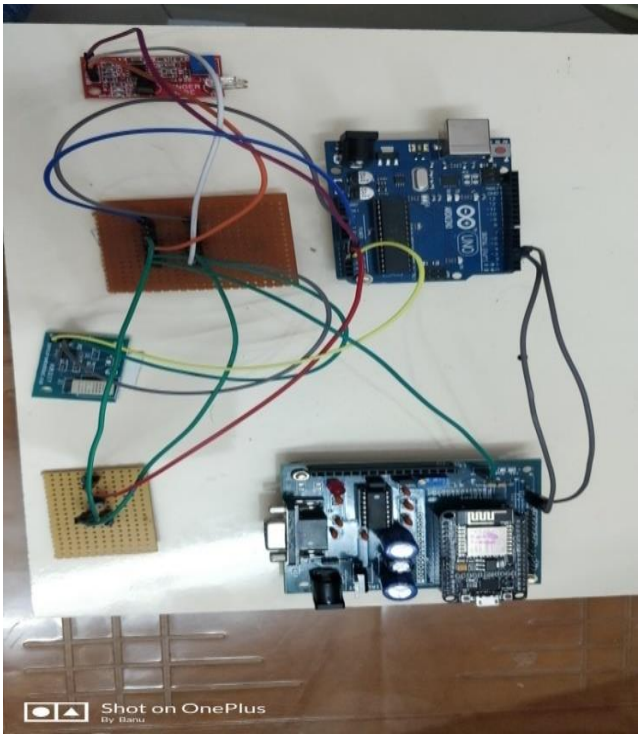

Fig. 2: Proposed System.

Arduino (Figure 3) is an open-source electronics platform supported on easy-to-use hardware devices and software packages. It have 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a button. It contains everything require to support the microcontroller through a USB cable. There are many versions of Arduino boards introduced in the market like Arduino Uno, Arduino Due, Arduino Leonardo and Arduino Mega. Some of the most commonly used versions are Arduino Uno and Arduino Mega.

Heart beat sensor (Figure 4) senses the heart beat rate as heart beats per minute (BPM). Heart Beat can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heart beat changes. The heartbeat sensor is based on the principle of photo phlethysmography. It measures the modifications in volume of the blood through any organ of the body that causes any changes in the light intensity through which organ (a vascular region). The flow of blood volume is determined through the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

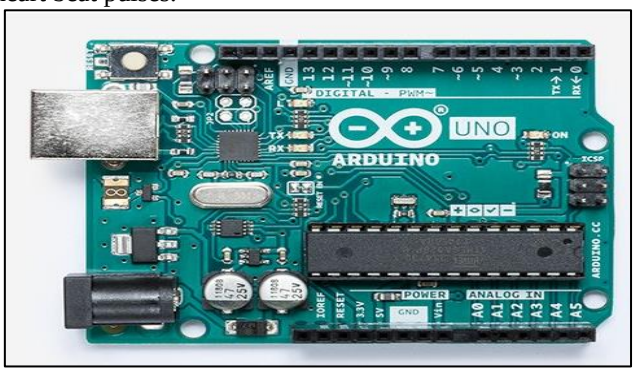

Fig. 3: Arduino

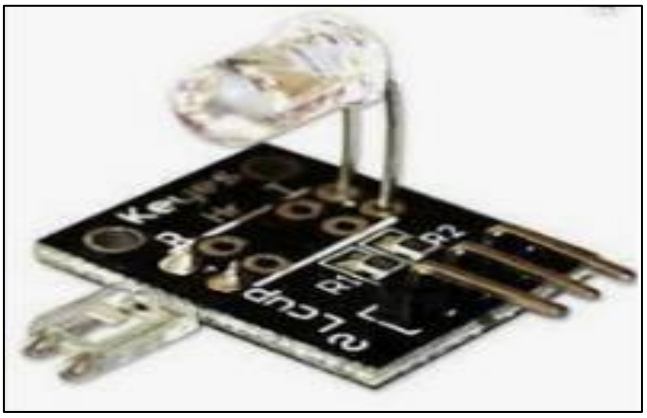

Fig. 4: Heartbeat sensor

Temperature sensor (Figure 5) senses the temperature of both the room and body. Here we use LM35 temperature sensor. The LM35 series are exactitude integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius temperature. The LM35 is operates at -55˚ to +120˚C. If the air temperature is much high or low when compared to the surface temperature, then the actual temperature of the LM35 would be at an intermediate between the surface and the air temperature.

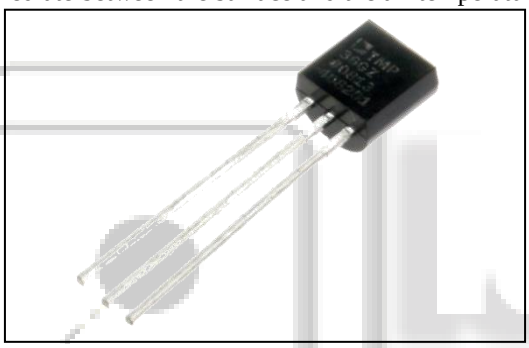

Fig. 5: Temperature sensor

Humidity sensor (Figure 6) sense humidity which is essential in such fields as environmental control, process monitoring and biomedical analysis. A micro fabricated humidity sensor is developed that uses a nitride/silicon microstructure which is suspended at a less distance above the surface of a glass. The suspended part is coated with polyimide. Moisture-dependent bending of the micro-cantilever is caused by the some variation in humidity. Some change is occurred between the micro suspending structure and the substrate while measuring the capacitance.

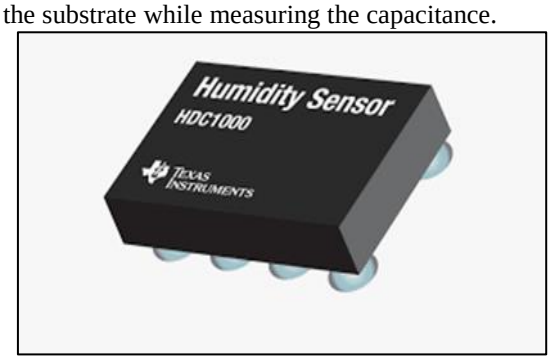

Fig. 6: Humidity sensor.

GSM (Global System for Mobile communications) (Figure 7) is employed to explain the protocols for second-generation (2G) digital cellular networks utilized by mobile devices and is a standard developed by the European Telecommunications Standards Institute (ETSI). GSM is a cellular network, which suggests that mobile phones connected with it by checking out cells. GSM was developed as a digital system using time division multiple access (TDMA) method for communicating purpose. A GSM digitizes and minimizes the data, then sends it down through a channel with two completely different streams of consumer's data, each in its own specific time slot. The digital system has a capacity to hold 64 kbps to 120 Mbps of information rates.

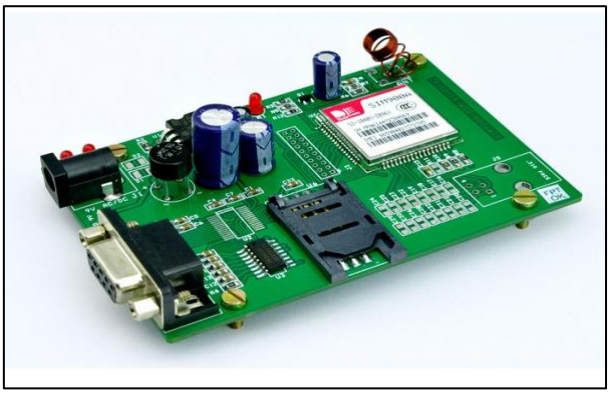

Fig. 7: GSM

GPS (Global Positioning System) (Figure 8) could be satellite navigation system used to determine the ground position of an object. Every of these GPS satellites send information about its position and the current time to the GPS receiver at fixed regular instants of time. This information is transmitted to the receiver in the form of signal which is then intercepted by the receiver devices. These signals are radio signals that travel with the speed of light.

Fig. 8: GPS.

The ESP8266 Wi-Fi Module (Figure 9) is a self-contained SOC which is integrated with TCP/IP protocol stack that can provide any microcontroller access to your Wi-Fi network. The ESP8266 has ability to either host an application or offload all Wi-Fi networking functions from other application processors. Each ESP8266 module is available as a pre-programmed module with an AT command set firmware, that is you can simply hook this to your Arduino and get Wi-Fi-ability. It acts as an interface to connect the arduino with cloud.

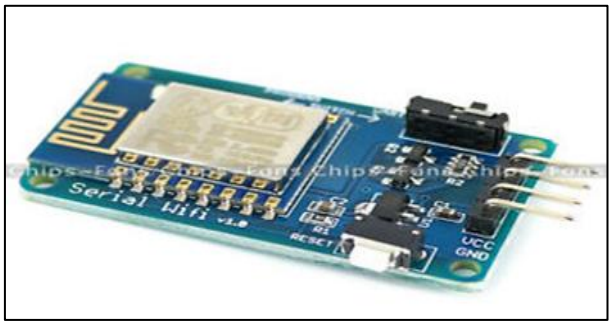

Fig. 9: Wi-Fi serial module

Arduino IDE (Figure 10) is an open-source platform which is used to build and program hardware projects. Arduino has a programmable physical circuit board (microcontroller) and a software framework, or an IDE (Integrated Development Environment) that executes on the computer, which is used to write and upload computer code to the physical board. Embedded C is used as programming language here.

Fig. 10: Arduino IDE.

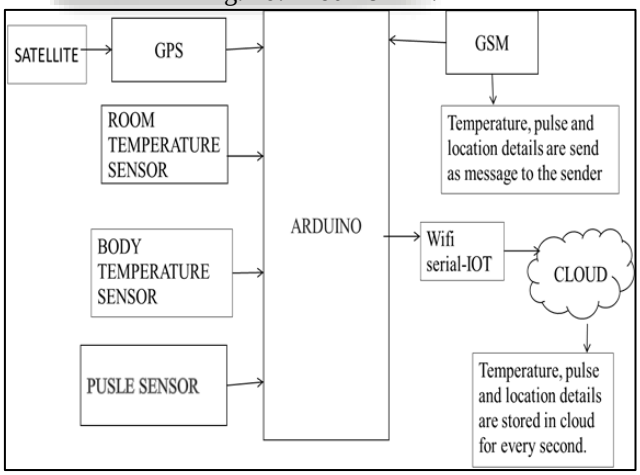

Fig. 11: Block diagram of the proposed system.

The arduino (Figure 11) is connected to the temperature sensor, GPS, GSM, pulse sensor and the Wi-Fi serial IOT. If signal is available then the request will be processed and the details will be sending through GSM. Otherwise the details will be stored in the cloud for every second and through Wi-Fi serial IOT, we can retrieve the data from the cloud.

A. Working

– If the device receives a message "LOCATION" from the pre-defined number in the GSM, the GPS immediately tracks the current location (co-ordinates) of the victim (Figure 12).

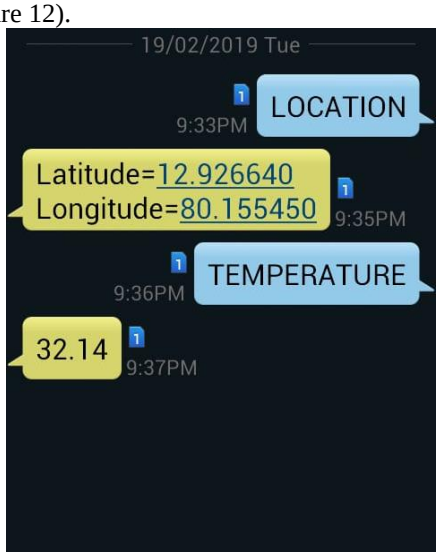

Fig. 12: Location and temperature as message.

– Then the tracked co-ordinates is messaged to the sender through GSM.
– A link (Figure 13) is provided as a message to the user to view the victim's location in the Google maps.

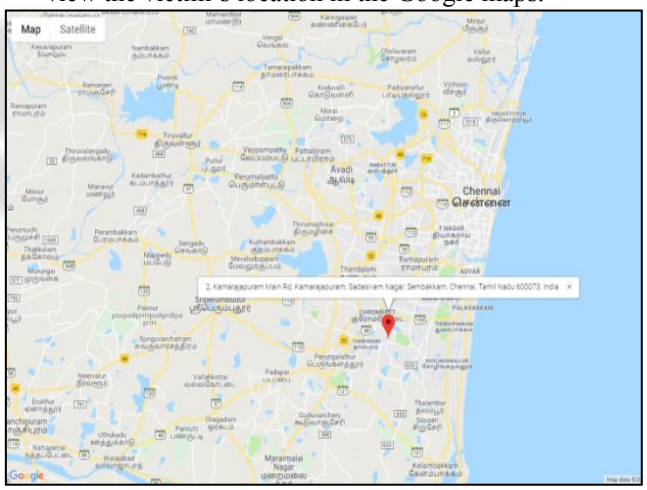

Fig. 13: Location in Google map.

– If the device receives a message "TEMPERATURE" from the pre-defined number in the GSM, the temperature sensor immediately senses the temperature of the victim's surroundings (Figure 13).
– If the victim placed their finger on the pulse sensor and a message "TEMPERATURE" is received from the pre-defined number in the GSM, then the temperature of the victim is sent to the sender.
– If the victim is in danger, their pulse increases and if they place their finger in the pulse sensor, an automatic alert message is sent to the pre-defined numbers in GSM (Figure 14).

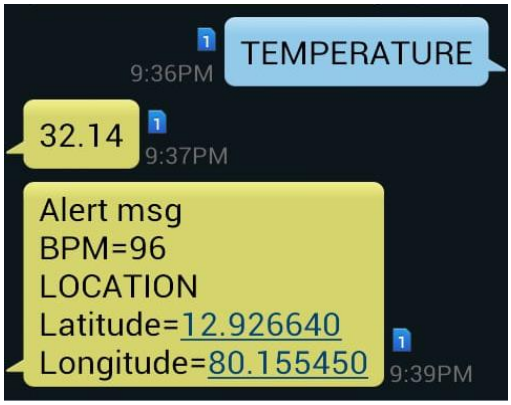

Fig. 14: Alert message when BPM increases.

- If the temperature of the victim or victim's surroundings increases, an automatic alert message is sent to the pre-defined numbers in GSM.
- If signal is lost, we can retrieve the data from the cloud storage (Figure 15).

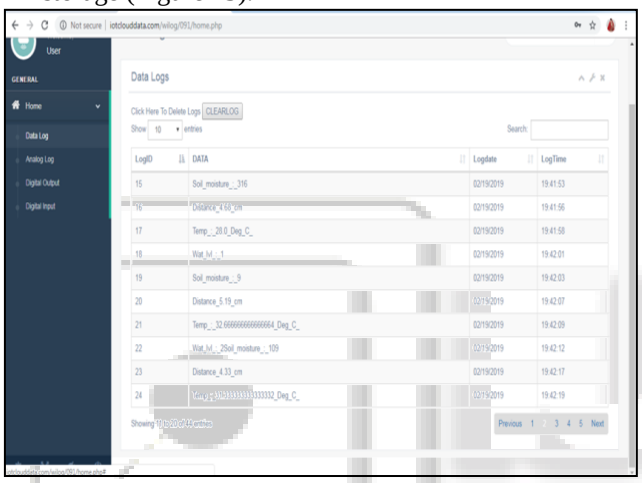

Fig. 15: Cloud storage.

B. Advantages

- No manual operation is needed.
- Other person can reach us immediately.
- Police can find the location easily.
- Increased safety.
- Even though the signal is lost, the information about the child's location can be retrieved from the cloud.
- The parents can know the current location of their child and also if required, they can check with the history of locations where their child has travelled.

IV. CONCLUSION

The proposed mechanism provides viewing the location of the victim or user in terms of latitude and longitude co-ordinates through GPS which can additionally be followed by utilizing the Google maps. Then the tracked data are stored in cloud and are retrieved when a message relevant message comes from the pre-defined numbers through GSM. Even though signal is lost, we can view the last location of the user from the cloud. Additionally temperature sensor and pulse sensor are added to the device. If the value of the temperature or pulse crosses the threshold value and automatic message is send to the pre-defined numbers by GSM. This system helps to diminish the crime rate against women and children being safer and securer in this world. Our effort behind this paper is to design and fabricate a gadget which is so compact so that it provides an advantage of personal security system. This design will deal with most of the critical issues faced by women and children and will help them to be secure.

V. FUTURE ENHANCEMENT

In future the size of the device can be still reduced. A camera can also be fixed with the device so that when the device receives the message "photo", an image of the surroundings of the user is clicked and is send to the user. Also when the BPM of the user increases, the camera gets on automatically and clicks an image of that surrounding and sends that photo along with the alert message to the pre-defined numbers in the GSM.

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