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IoT based Child Protection Using Android App

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Abstract--- *The sad and horrifying truth about today's society is that children are not safe in any part of the world. Studies show that about 5 to 6 million kids are subjected to maltreatment every year. The proposed system is basically to design a smart child safety wearable device that goes unnoticed by the public. An android application will track all the activities through the device and report to the parents. It includes sensors like temperature, pulse rate and heartbeat that will monitor the child 24/7. A gas sensor is added to detect the presence of alcohol or any sedatives present. It includes GPS location system and sound amplification technique that helps the child during emergency situations. Along with all these components, there is a camera module that shows what kind of danger is awaiting the child. All these information will be sent to the server and viewed via the app whenever the values of the sensors exceed the threshold along with snoozing of messages. In the absence of internet facilities, a GSM module is used to alert parents by SMS.*

Keywords--- *Child Security, Security System, SMS.*

I. INTRODUCTION

The problems faced by children, especially girls, have escalated to an extent that questions the value of humanity. These kids, irrespective of the gender, undergo abuse and harassment, that they are robbed of the chance to speak out to their families and friends. Times like these, it is necessary to take action and reduce these events using technology. There must be a way for children to intimate their parents of the abuse without actually speaking or explaining the problem. This device's main goal is to locate the child easily by the parents sitting in the place wherever they are in the world which leads to the concept of IoT. This device is used for monitoring the child's activities. It is especially helpful for all the working parents in the society to track their children at home or school from their office. The main point is the parent need not be always looking at the mobile to see if there is any problem. The device automatically gives notifications in case of any danger. Though the parent knows that there is a danger, it is also necessary to know what is that problem and that is why we use camera module to show the parent what is the danger.

II. EXISTING SYSTEMS

A. Smart Intelligent System for Women and Child Security

The system deals with the a portable device which will have a pressure switch. Instantly the pressure sensor senses the pressure put by the person and a conventional SMS, with the victim's location will be sent to their

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parents/guardians cell phone numbers stored in the device. It is followed by a call and if the call is unanswered for a prolonged time, the call will be redirected to the police and the same message will be sent. The device will also provide a message with the real time location to the parents/ guardian's phone through conventional SMS.

B. Real-Time Child Abuse and Reporting System

In this system the child stores its voice commads in a voice recognition module. When the child is in danger, he/she gives voice as input and that is compared with the stored commands, if matched, then the message as such is sent to the server using GPRS-GSM module and the location is sent using GPS module, server contacts parent/police accordingly.

C. An Integrated Child Safety Using Geo-fencing Information on Mobile Devices

This system deals with a mobile application which is used to monitor the child's location. The parents will first register the child to be protected, enter the fences which helps the parent know if their kid is within the safe area using geo-fencing technique. If there is any problem, the child can simply shake the phone and using motion sensor, a voice recorder will be activated to alert the parents.

D. Reach Out Smart Safety Device

In this system the wearable device includes a GPS module for fetching the location of the victim by taking the input from the distress button. It works with Raspberry Pi for running the GPS and updating the cloud database. The respective parents are notifed through the android application which will fetch the stored coordinates from the cloud.

III. PROPOSED SYSTEM

This paper discusses the concept of a smart wearable device for safety of little children. It includes various sensors like temperature and pulse rate of the child that will be monitored every second of every day. It also includes GPS location system and sound amplification technique that allows the child to get help as soon as possible. Along with all these components, the parent will also receive the snapshots by using a camera module. It works in such a way that the parents are notified every time the pulse rate increases or the temperature is found to be different from the child. Both the GPS location and the snapshots are recorded in the android app which helps the parents to get to know what is happening around the child. Our proposed system will be measuring the pulse rate of the child as well as respiration which helps to record and store the information about their child's activities so that the parent can view the progress of their child at anytime. A message alert will be sent only if the pulse rate or heart rate of the child reaches the abnormal level. Whenever the child faces any harassment or inconvenience, the screams can only be heard upto a certain extent. By using sound amplification mechanism the sound from the child can be amplified that is higher than the normal frequency which can allow more number of people to be aware of this situation and rescue the child immediately. Also, a camera module can be attached in order to provide screenshots of the child's surroundings, that will be sent to the parents as updates of the child's situation. The camera module also provides the live tracking of the kid and its surrounding whenever the parent demands. Gas Sensor is used in this system for detecting presence of alcohol in surroundings. GSM module is used to provide all the above services even when there are no Internet facilities via sending SMS. These above mentioned factors will occur only if the pulse rate and

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heart rate of the child reaches the abnormal level. These measures, if implemented and converted to a working prototype, can help to provide safety to a lot of children. The parent monitors all these and receives notification through an Android App. Also, a server page is available that stores all the entries so that in case of any malfunction in app it acts as a backup.

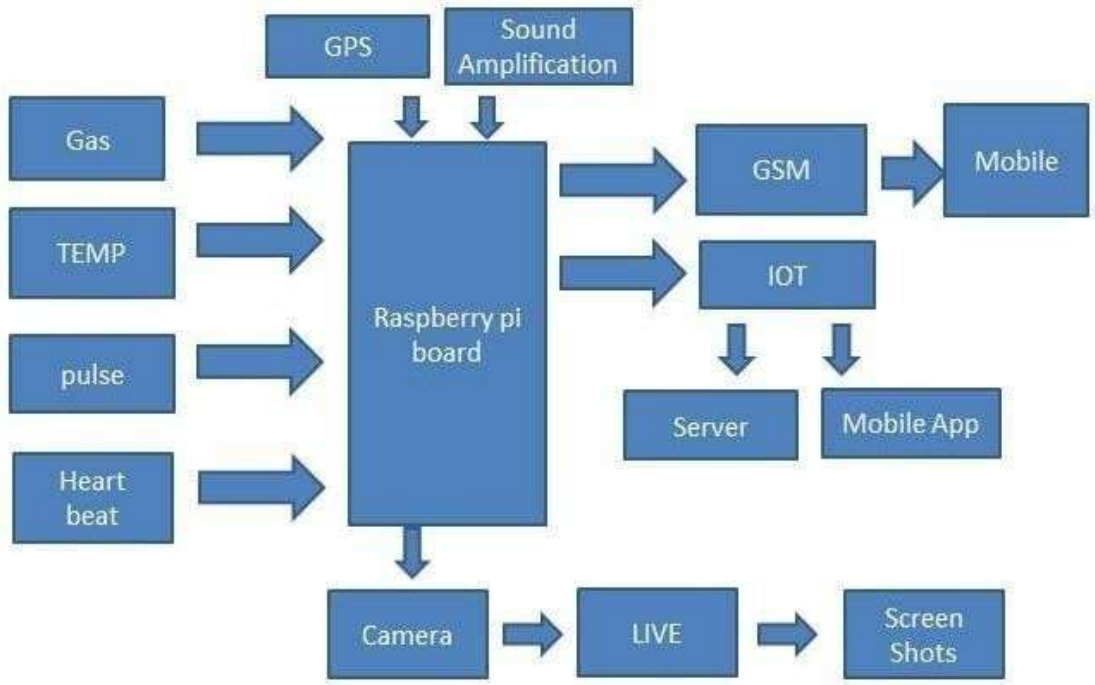

Fig. 1: Child Protection System Block Diagram

A. Heart beat Sensor

Heart beat sensor is designed to give digital output of the heart beat when the finger is placed on it. It works on the basic principle of optoelectronics. It measures the heart rate with a pair of LED and LDR connected to the microcontroller where the LED emits the infrared radiation. The reflected light from the surface is made incident on the IR sensor and produces the reverse leakage current which is passed through resistor to get proportional voltage.

B. Pulse Sensor

Pulse oximeter sensor is used to measure the patient's blood oxygen saturation level and pulse rate. The device is placed on a thin part of the patient's body usually a finger tip or earlobe. They are the non-invasive devices that measures the changing absorbance that allows to determine the absorbance's due to the pulsing arterial blood.

C. Temperature Sensor

The LM35 Series of temperature sensor is a precision integrated circuit temperature devices with an output voltage linearly proportional to the centigrade of temperature. With LM35 the temperature can be measured accurately than with a thermistor. The device is used with a single power supplies or with plus and minus supplies. This device is rated to operate over a -55°C to 150°C temperature range.

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D. Gas Sensor

Gas sensors are designed to react to the gas present spontaneously, thus keeping the system updated about any alterations that occur in the concentration of molecules at gaseous state. The gas sensor module is designed with sensitive material of snO2 which with lower conductivity in clean air. Signal conditioning circuit is used to convert the change of conductivity to correspond the output signal with the input gas concentration. The MQ-9 gas module is mounted on a ocb board that has an operating voltage of 5VDC.

E. IOT Board

IOT is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to- human or human to computer interaction. IOT Board featured with SLM900 GPRS modem to activate internet connection and the data may be updated to a specific site through which user can able to access data.

F. Raspberry Pi

It is a credit card sized computer which can be plugged into a computer monitor on TV consisting of standard keyboard and a mouse. Raspberry Pi is capable of learning how to program from scratch as well as python. Raspbian is the official OS used by raspberry pi. It is of low cost and is capable of working just like a normal PC.

G. Android App

Android Studio is the Integrated development Environment(IDE) which is used for Android development, which is used as Google's main Android operating system. Android studio is preferable than Eclipse since it has better features like rich layout editor, refactoring fixes and gradle-based build support. Android app automatically saves all the code and links all the code to show the data to the parent via application. The parent regsiters in the app and will be able to view the health parameters and track the child's location when needed.

H. GPS

The term GPS stands for global system positioning. GPS tracking unit is a navigation device normally carried by a moving object or person that uses the GPS to track the device's movements and determine it's location. GPS systems are extremely versatile and it does not require the user to transmit any data and it operates independently of any telephonic or internet reception. If the child goes beyond the certain range, then a message will be sent to the parents either through the app or SMS.

I. GSM Module

GSM stands for Global System for Mobile communication. GSM MODEM is a class of wireless MODEM devices that can accept SIM card of any GSM network operator and act just like a mobile phone. That mobile is having unique phone number. It uses General Packet Radio Service (GPRS) for data transmissions like browsing the web. These networks operate in a number of different carrier frequency ranges and is intended to be a secure wireless system.

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J. Sound Amplification

Sound Amplification needs not only to make sounds louder but more intelligent. A loud overhead sound system has no no value since no one can understand. The effect of quality sound amplification for presentations and trainings is significant. Studies have shown that sound amplification in small to medium size rooms *can* increase people's retention by as much as 30% so it helps the situation greatly.

K. Camera Module

For the surveillance of the child's surroundings and to get a clearer picture of the location, this wearable contains a camera module Incorporated in it. Raspberry Pi camera module is capable of capturing full 1080p photos and videos and can be controlled programmatically. Screenshots of the surroundings will be sent to the parent via SMS or app of the child violates a certain range of area since pictures or live footage always helps the situation.

IV. METHODOLOGY

Step1: The device is used for monitoring a child 24/7 and is activated when the sensor values crosses the threshold value. These sensors are temperature, heart beat, pulse rate and finally uses gas sensor to check traces of alcohol.

Step2: The device records location using GPS module and uses the geo-fencing by specifying the coordinates of the location where it checks if the child remains within the stipulated area. If the child crosses the geo- fencing, the device passes all these information to server and also provides it to the GSM module.

Step3: Now it sends notification to the app and sends SMS to the phone numbers of the parents stored in the SIM with location incase internet is not available

Step4: If the notification is not seen by the parents, alert messages will be sent to the mail as reminder continuously.

Step 5: Camera module is used so that live streaming is done continuously and the parent using app can view the live video whenever they feel like or during any emergency.

Step 6: In case of emergency, screenshots are taken for particular time slots and sent via email to intimate the parents about the type of impending danger approaching the child.

Step 7: When the child is being harassed or harmed in any way the child tends to shout. Since the child's voice is feeble it cannot be heard even to the surroundings. Hence the sound uses a mike and speaker to amplify the child’s sound to some extent so that the neighbours can extend their help.

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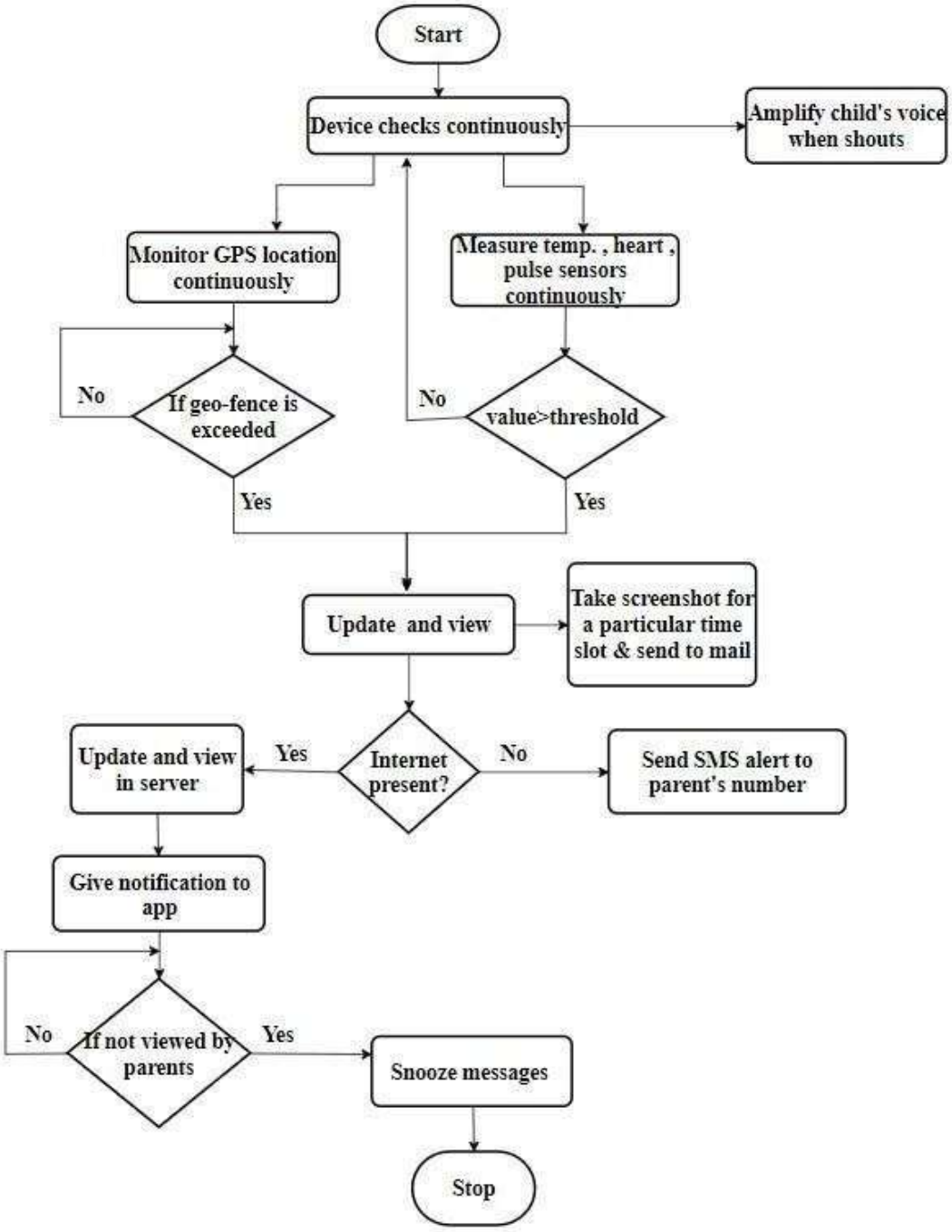

Fig. 2: Child Protection System Flowchart

V. ADVANTAGES

- Reduce victims related to sexual harassment problems.
- Automization and 24/7 monitoring system.
- Reduces the chances of abducting children.
- Backup details can be provided as a proof to the police.

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VI. RESULT

When the device keeps monitoring the child, it is necessary for the sensor values recorded, to be within the threshold limit. If the limit is exceeded, then an alert message will be sent. The data is updated in the server which is then viewed through the app by sending a notification, where all the sensor values will be shown along with the location of the child at present. Live Camera can be switched on during emergencies and when in need. Screenshots will be recorded at particular time slots. These will also be sent to the registered mail ids. In the absence of a stable internet connection, an alert message will be displayed via SMS. Also, the child's feeble voice can be heard during dire need using sound amplification.

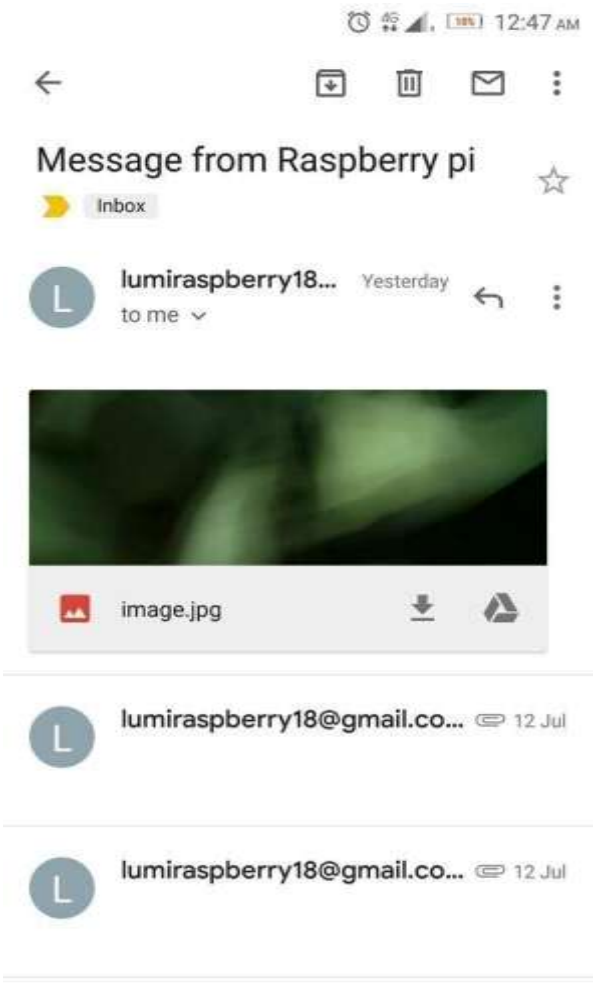

Fig. 3: Snapshots Sent to Parents Via Mail

VII. CONCLUSION AND FUTURE SCOPE

Thus our intention is to develop a system that measures and detect child's heartbeat and body temperature, sends the data to the parent based on the emergency faced by the child by using microcontroller with reasonable cost and great effect. The effect would be that the child need not verbally announce anything. Based on all the threshold values, the messages will be updated automatically to the parents or the police and required action will be taken.

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Our Future Scope includes the Real-time heath monitoring system using ARDUINO, can be integrated or implemented in hardware using various types of sensors to detect the human-health conditions of the child in critical sites. Continuous observing of health can be made and the data will be stored in database. In order to bring a solution to this problem, this device can be developed in the form of a stud or an earring in the future, that can go unnoticeable by public. SD card can be used for memory storage which can be used as a means of providing proof, if ever needed.

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