Chips: An Iot Based Child Protection System

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Abstract- *In today's world, security is the major issue for an individual especially for child and women. Many harassment on women, elders and children are increasing day by day. Child care and security is a critical issue in solving this epidemic. Various systems and methods have already been implemented in solving this crisis, but all that requires manual action like button pressing, shaking of mobile device or the device needs to be tapped to activate. In these systems, even an adult cannot act in an intelligent way because of the absence of mind at emergency situation. Obviously the kids also couldn't activate. So we required a new system or a method to overcome these drawbacks. Hence in this research, the GPS based child care and security system is proposed to solve this problem. The aim of this work is to develop a wearable device for the safety and protection of child and women, which needs to be attached with the dress.This system consists of two nodes; child node and parent node, each carried by the child and parent respectively. The parent node is a mobile device that has an internet connection. The GPS technology helps us to determine the exact position of the child.*

Keywords- Child, GPS, GSM, Harassment, Safety, Security,Wearable device, Women.

I. INTRODUCTION

India which seeks itself as a promising super power and an economic hub can achieve its goal if and only if large numbers of women get themselves involved and participate in the development process. In today's world, women 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 women is not decreasing but in fact increasing at a rate especially harassment, molestation, rape, kidnapping and domestic violence. Even Child's are also getting affected, now a day. Many preventive measures have been taken by the government so far to minimize the occurrences and have remained unaffected.

The misbehaviours against children and women are increasing day by day at an exponential rate. They are under the threat of easily being kidnapped. In today's date, women and a child face physical harassment in public places, schools and at workplaces or while traveling. Rape is the fourth most common crime against Women in India. According to latest National Crime Records Bureau (NCRB) 2017 annual report, 56,709 rape cases are reported across only India. The number of reported rape cases has been steadily increasing over the past decade. Most cases of physical harassment take place when women are alone or while traveling. Women feel insecure to step outside their house. There are many android applications for smartphones but for those who don't use smartphones or those who cannot keep their mobile handy at their workplace, hence many other systems are developed.

The Internet of Things extends internet connectivity beyond traditional devices like desktop and laptop computers, smart phonesand tablets to a diverse range of devices and everyday things that utilize embedded technology to communicate and interact with the external environment, all via the Internet. The IOT structure is shown in below fig 1.1.

Fig 1. IOT Structure

II. IDEATION OF THE STUDY

Initially we begin the security system by identifying the solution only to the women. After taking some surveys we come to know that not only the women affected by the daily scenario but also the child's. Hence, enhancing the system to be used by both women and a child. After that, in the overall

survey, we come to know that the existing system is only identifying the location and situation of the person who is in danger. It does not identify the details of the person who is attacking. In this system, we are overcoming the drawbacks of the existing system and we can identify the person details through the fingerprint sensor. By using this fingerprint, the details (aadhaar number) of the person who makes the bad touch will be notified by a message to the parent node.

III. SURVEY OF EXISTING SYSTEMS

PAPER NAME	CONTENT	DRAWBACKS
A NOVEL APPROACH TO PROVIDE PROTECTION FOR WOMEN BY USING SMART SECURITY DEVICE Authors: Kalpana seelam, K. Prasanti Year of Publication: 2018	• When the woman is in threat, the device senses the body parameters. • If the sensed value crosses the threshold limit, alert messages are sent out to the listed contacts, who receive your message along with your physical location.	• Can't identify the attacker, since no details about him will be found. • No call will be made to the registered contacts.
AN INTELLIGENT SAFETY SYSTEM FOR INDIVIDUAL'S SECURITY Authors: Prof. Kiran. Mensinkai, Chaitra B.V, Chinmayi V Pandith, Goutam P Nayak and Jyothsna. C. S Year of Publication: 2017	• Monitoring device gets activated when the device is tapped upon then a text message along with voice alert message is received by the respective emergency contacts. • Location can also be tracked	• Device need to be tapped. • Can't identify the attacker, since no details about him will be found.
SMART SECURITY SOLUTION FOR WOMEN BASED ON INTERNET OF THINGS (IOT) Authors: G C Harikiran, Karthik Menasinkai, Suhas Shirol Year of Publication: 2016	• The security device used in the form of armband. • Senses the body parameters. • If above the threshold value, sends a message and location.	• The initial action has to be triggered by the victim which often in situation like these doesn't happen. • Can't identify the attacker, since no details about him will be found. • The device has the chance of missing.
RESEARCH AND DEVELOPMENT OF A MOBILE-BASED WOMEN SAFETY APPLICATION WITH REAL-TIME DATABASE AND DATA-STREAM NETWORK Authors: Dantu Sai Prashanth, Gautam Patel, Dr. B.Bharathi Year of Publication: 2017	• Uses arm band as a security device. • Turned on by gestures of hand (Twisting of the wrist.) or by button pressing. • Sends location along with the SMS to the registered numbers. • Uses camera in Chain or Locket	• Requires manual action. • Probability of getting lost.
WOMEN'S SAFETY MEASURES THROUGH SENSOR DEVICE USING IOT	• Uses security device in the form of bracelet. • Here the embedded device can be activated by just merely pressing the	• The device is not automated. • Only message will be send and no call. • Can't identify the attacker,

Authors: T. Sathyapriya, R. Auxilia Anitha Mary Year of Publication: 2018	• emergency press button (SOS) once for the alert purpose. • Sends an SMS along with the location to the registered number and can be tracked.	since no details about him will be found.
SMART SHIELD FOR WOMEN SAFETY Authors: Rachana B. Pawar, Manali H. Kulabkar, Kirti S. Pawar, Akshata R. Tambe, Prof. Smita Khairnar Year of Publication: 2018	• Uses the security device in the form of Jacket. • The device can be activated by button pressing. • Message and Location will be send.	• The device requires button pressing. • No call, only the message will be send to the registered numbers.
SMART BEARS DON'T TALK TO STRANGERS: ANALYSING PRIVACY CONCERNS AND TECHNICAL SOLUTIONS IN SMART TOYS FOR CHILDREN Authors: Katerina Demetzou, Leon Böck, Obaida Hanteer Year of Publication: 2017	• This paper is about a "smart bear", a connected smart toy targeted towards children. • When it was hacked by someone, camera will be on. • The message and location of the child will automatically send to the registered number.	• Chance of missing. • No call is made, only the message will be send.
A SMART WATCH FOR WOMEN SECURITY BASED ON IOT CONCEPT 'WATCH ME' Authors: A. Helen, M. Fathima Fathila, R. Rijwana, Kalaiselvi. V. K. G Year of Publication: 2017	• When a person wearing this 'watch me' is exposed to sexual or vulnerable attack, the sensor present in it detects the heart beat rate. • Makes a call to registered numbers and create an alarm sound. • Can track location.	• Chance of missing the watch. • It will work only when the person is exposed to vulnerable attack. • Can't identify the attacker, since no details about him will be found.
ACTIVITY TRACKER WRIST BAND FOR CHILDREN MONITORING USING IOT Authors: T. Bhanupriya, Dr. T. VP. Sundarajan Year of Publication: 2017	• Uses the security device in the form of Wrist watch. • Reads the behaviour of the human reactions. • Sends an SMS to the smart phone and location can be tracked.	• Chance of missing the band. • No call. • Can't identify the attacker, since no details about him will be found.
IOT BASED UNIFIED APPROACH FOR WOMEN AND CHILDREN SECURITY USING WIRELESS AND GPS Authors: Ms. Deepali M. Bhavale, Ms. Priyanka S. Bhawale, Ms. Tejal Sasane, Mr. Atul S. Bhawale Year of Publication: 2016	• A wearable safety device is used. • During emergency the button can be pressed. • The image of the victim will be captured. • The location and the image link will be sending to the registered number.	• Need to press the button to activate the device. • No call.

IV. PROPOSED SYSTEM

The architecture of the proposed system as shown below in fig 2., consists of Arduino Nano as a main source and it receives input signal from various sensors, where thereby the sensor receives the input signals from a human who is in threat or in danger or in abnormal situations.
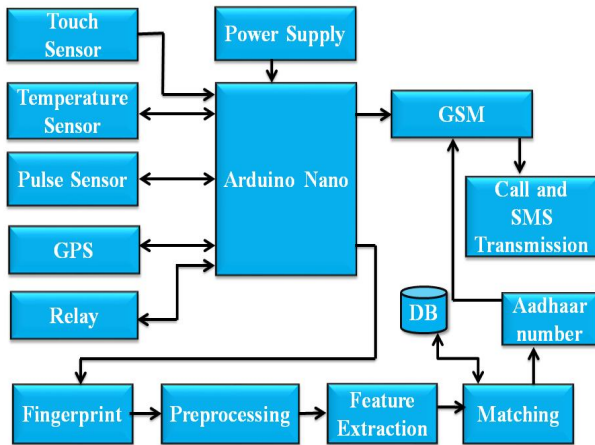

Fig 2. Architecture of the system

The relay is used to control and activate the temperature sensor and Pulse sensor. When the touch sensor is activated, the signal moves to Arduino circuit and it closes the relay. Then the temperature rate, pulse rate and respiration rate of the child is measured. When it crosses above the threshold value (all or at least one), using GSM and GPS technology, an alert message will be send to the parent number with latitude and longitude value and a call is made to the respective numbers. The parent can track the location of the child using this latitude and longitude value and their child can be saved. At the same time, by using the Finger Print Recognizer, we can easily identify the details of the offender.

V. HARDWARE DESCRIPTION

1. ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x).
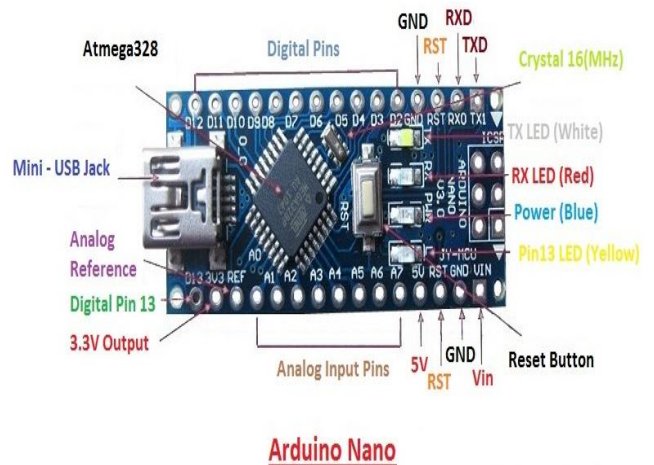

Fig 3 Arduino Nano description

It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech.

2. TOUCH SENSOR

The Touch Sensor is sensitive to touch, pressure as well as force. The Touch Sensor works similar to that of a simple switch. When there is contact or a touch on the surface of the Touch Sensor. It acts like a closed switch and allows the current to flow through it. When the contact is released it acts similar to the opened switch and hence there is no flow of current.

3. RELAY

A relay is an electrically operated switch of mains voltage. It means that it can be turned on or off, letting the current go through or not. Controlling a relay with the Arduino is as simple as controlling an output such as an LED. The relay module is the one in the figure below.

Fig 4. Relay

4 TEMPERATURE SENSOR

We can measure the body temperature using various temperature sensors. For instance, DS18B20 is 1-Wire digital temperature sensor from Maxim IC. Reports degrees in Celsius with 9 to 12-bit precision, from -55 to 125 (+/-0.5). Each sensor has a unique 64-Bit Serial number fetched into it. In emergency situation, body temperature varies drastically which can trigger module for rescue.Here we are using LM35 temperature sensor.

5 PULSE SENSOR

We are going to interface a Pulse Sensor with Arduino. It can be used by students, artists, makers, and developers who want live **heart-rate** data into their projects. The pulse sensor we are going to use is a plug and play heart rate sensor. This sensor is quite easy to use and operate. Placing the finger on top of the sensor and it will sense the heartbeat by measuring the change in light from the expansion of capillary blood vessels.

6 GPS

Global positioning system (GPS) is a navigation and precise positioning tool, which tracks the location in the form of longitude and latitude based on Earth by calculating the time difference for signals from various satellites to reach the receiver. In six different orbits approximately 12500miles above the earth, 24 MEO (Medium-Earth Orbit) satellites revolve around the earth 24 hours and transmit location every second. It receives the data of location and transmits it to the Arduino.

7 GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.Since many GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phones when they travel to other countries. SIM cards (Subscriber Identity Module) holding home network access configurations may be switched to those will metered local access, significantly reducing roaming costs while experiencing no reductions in service.

8 FINGER PRINT RECOGNIZER

Human fingerprints are detailed, nearly unique, difficult to alter, and durable over the life of an individual, making them suitable as long-term markers of human identity. They may be employed by police or other authorities to identify individuals who wish to conceal their identity, or to identify people who are incapacitated or deceased and thus unable to identify themselves, as in the aftermath of a natural disaster. Fingerprint analysis, in use since the early 20th century, has led to many crimes being solved.In our project we are using the R305 finger print Recognizer to identify the details of the offender by comparing the fingerprints with the Aadhaar database.

Fig 5. R305 Fingerprint Recognizer

VI. SOFTWARE DESCRIPTION

1. ARDUINO IDE

Various kinds of Arduino boards are available depending on different microcontrollers used. However, all Arduino boards have one thing in common: they are programed through the Arduino IDE. The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons we can use on a single board), speed, operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which we would need to buy separately. Some can run directly from a 3.7V battery, others need at least 5V.

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are,

- ➢ Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- ➢ We can control the board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- ➢ Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. We can simply use a USB cable.
- ➢ Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- ➢ Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

VII. SYSTEM IMPLEMENTATION

MODULES

1. Indication of bad touch
2. Measuring Vital signs
3. Location Tracking
4. Call and SMS Transmission
5. Fingerprint Recognition

MODULE DESCRIPTION

a. INDICATION OF BAD TOUCH

A touch sensor is placed on the bad touching places of a girl child. If any touches on that places are detected, the device gets automatic activation. A touch sensor performs the function of the switch. We need Switch to control electronics or electrical appliances or something. Sometime electrical switches will give a shock when we use electrical switches with wet hand and then touch to control electrical or electronic load is much interactive than ordinary switches, may be some projects needs touch switch. Here the Digital Capacitive touch sensor Arduino interface is made as an experiment. It acts as a transmitter.

b. MEASURING VITAL SIGNS

When the touch sensor activates the device, the relay moves from open state to the close state and the sensors like temperature sensor and Pulse sensor starts measuring the vital signs of the child.

BODY TEMPERATURE DETECTION OF VICTIM

The Temperature sensor starts measuring the body temperature of the child. The normal body temperature of a person varies depending on gender, recent activity, food and fluid consumption, time of day, and, in women, the stage of the menstrual cycle. Normal body temperature can range from **97.8 degrees F (36.5 degrees C)** to **99 degrees F (37.2 degrees C).** When the measured temperature value crosses above the threshold value, a call and an alert SMS will be send to the parent mobile.

PULSE RATE DETECTION OF VICTIM

The Pulse sensor starts measuring the pulse rate of the child. The pulse rate is a measurement of the heart rate or the number of times the heart beats per minute. Taking a pulse not only measures the heart rate, but also can indicate the following:

- Heart rhythm
- Strength of the pulse

The normal pulse rate can range from **60** to **100 beats per minute**.

When the measured pulse rate crosses above the threshold value, a call and an alert SMS will be send to the parent mobile.

c. LOCATION TRACKING

GPS stands for Global Positioning System and used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). GPS module is used to track the location of accident in our project. This device receives the coordinates from the satellite for each and every second, with time and date. We have previously extracted $GPGGA string in Tracking System to find the Latitude and Longitude Coordinates and this values are send along with the SMS to the parent mobile. The $GPGGA is a basic GPS NMEA message. NMEA 0183 is a combined electrical and data specification for communication between marine electronics such as echo sounder, sonars, anemometer, gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the National Marine Electronics Association.

d. CALL AND SMS TRANSMISSION

Once the measured vital signs value (any one or all the three) crosses above the threshold, GSM Module with a SIM card fixed with it is used to send a call and an alert SMS to their parent's mobile number. It consists of an antenna to

receive the transmitted signal from the Arduino Controller. We can use GSM 800A which operates at frequency 900MHz. It has up link band of 890MHz to 915MHz and down link Band of 935MHz to 960 MHz GSM takes advantages of both FDMA & TDMA. In 25MHz BW, 124 carriers are generated with channel spacing of 200 KHz (FDMA). Each carrier is split into 8 time slots (TDMA). At any given instance of time 992 speech channels are made available in GSM 800L.

f.FINGERPRINT RECOGNITION

When the measured vital signs value crosses above the threshold value (if any one or all the three), it will automatically send a message and make a call to their parent's mobile number in order to indicate the dangerous situation of the child. At the same time the fingerprint Recognizer will automatically be on. The Finger Print Recognizer is designed as a band and wears it on hand. When the person hand touches the fingerprint band, the system starts recognize the fingerprint and check with database. If the fingerprint was match with their own person it will send "safe" message or else, it will send the aadhaar card number of the touched person to the registered number.

VIII. EXPERIMENTAL RESULTS

RESULTS AND EVALUATION

The prototype of the child security system is shown in below fig 6. The signals from touch sensor and temperature sensor are detected successfully and send to Arduino. When the touch sensor is activated, temperature sensor and Pulse sensor starts measuring the vital signs of the child.
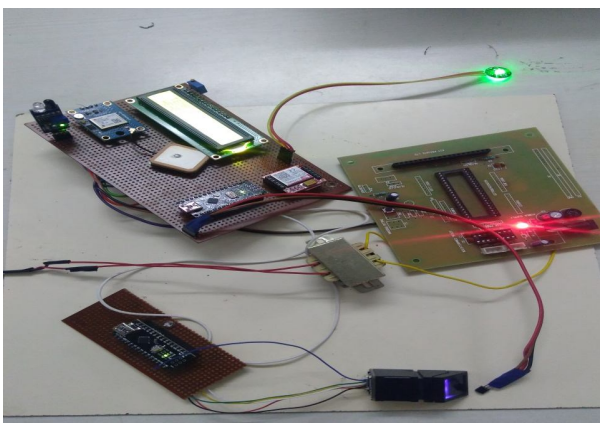

Fig 6.Prototype of security system

The measured value is displayed on the LED display as shown in fig 7.

Fig 7. Measured Vital signs of the victim

When the measured value crosses above the threshold limit, it turns on GPS and traces the location of the child. With the help of GSM, the Arduino send a message "HELP" to the parent mobile number along with the latitudinal and longitudinal values of child location as shown in below fig 8.
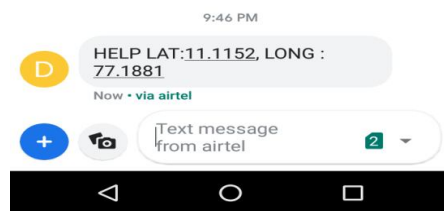

Fig 8. Alert message to parent

At the same time the fingerprint Recognizer will automatically be on. When the person hand touches the fingerprint band, the system starts recognize the fingerprint and check with database. If the fingerprint was match with their own person it will send "safe" message as shown in below fig 9. or else, it will send the aadhaar card number of the touched person to the registered number, as shown in fig 10.
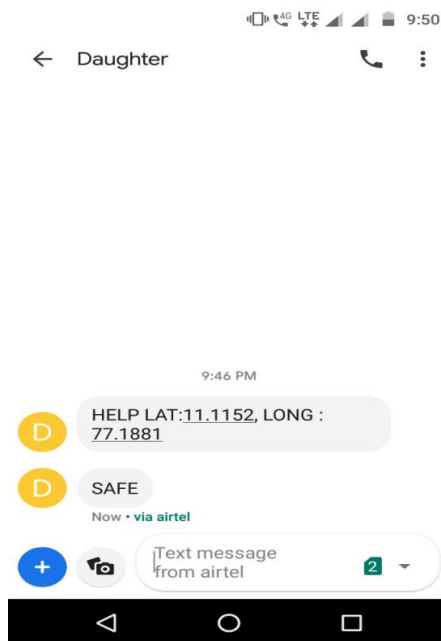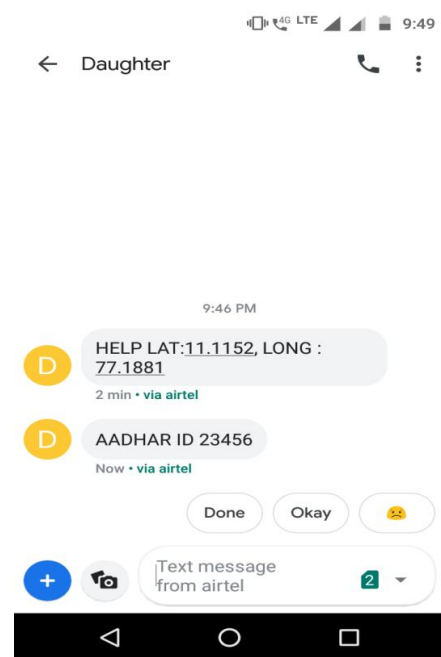
Fig 9. Sending safe message to parent

Fig 10. Sending Aadhar card number of the offender to parent

IX. CONCLUSION

This project is all about the existing applications for child and women security and comes out with an innovative idea for security and protection for child and women and more research is possible with introducing smart technology where people and objects form a network. This will help to solve them technologically with compact equipment and ideas. Alerting the emergency contacts like parents by sending the messages with the location is helpful for child and women's security. We can also be able to easily identify the offender by using Finger Print Recognizer and Aadhaar database. This system can overcome the fear that scares every child in the country about her safety and security.

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