



Smart Children Safety Using Wearable Device – A Review

P.Elamathi, Dr.R.Nagaraja

M. E, Dept. of Embedded System Technologies, Gnanamani College of Technology, Pachal, Namakkal, India

Professor, Dept. of EEE, Gnanamani College of Technology, Pachal, Namakkal, India

ABSTRACT: This project discusses the concept of a smart wearable device for little children. The major pros of this wearable over other wearable is that it can be used in any cellphone and doesn't necessarily require an expensive smartphone and not a very tech savvy individual to operate. The purpose of this device is to help the parents to locate their child with ease. At the moment there are many wearables in the market which help track the daily activity of children and also help find the child using Wi-Fi and Bluetooth services present on the device. But Wi-Fi(Wireless Fidelity) and Bluetooth appear to be an unreliable medium of communication between the parent and child. Therefore, the focus of this project is to have an SMS text enabled communication medium between the child's wearable and the parent as the environment for GSM mobile communication. In an interview with the child psychologist, concluded that parents need to monitor their children, because children nowadays are having many threats. In this project the heart sensor are used to measure the human beat of children. Then the vibration sensor is used to found out the accident occurrences. The children's location are monitored by using GPS. Here GSM is used to send message to the authorised users mobile number. The sensor values are monitored by using IOT.

I. INTRODUCTION

The Internet of Things System (IoT) [1] refers to the set of devices and systems that stay interconnected with real-world sensors and actuators to the Internet. IoT includes many different systems like smart cars, wearable devices [2] and even human implanted devices, home automation systems [3] and lighting controls; smartphones which are increasingly being used to measure the world around them. Similarly, wireless sensor networks [4] that measure weather, flood defenses, tides and more. There are two key aspects to the IoT: the devices themselves and the server-side architecture that supports them [5]. The motivation for this wearable comes from the increasing need for safety for little children in current times as there could be scenarios of the child getting lost in the major crowded areas. This paper focusses on the key aspect that lost child can be helped by the people around the child and can play a significant role in the child's safety until reunited with the parents. Most of the wearables available today are focused on providing the location, activity, etc. of the child to the parents via Wi-Fi [8] and Bluetooth [9]. But Wi-Fi and Bluetooth seem a very unreliable source to transfer information. Therefore it is intended to use SMS as the mode of communication between the parent and child's wearable device, as this has fewer chances of failing compared to Wi-Fi and Bluetooth. The platform on which this project will be running on is the Arduino [10] Uno microcontroller board based on the ATmega328P, and the functions of sending and receiving SMS, calls and connecting to the internet which is provided by the Arduino GSM shield using the GSM network [11]. Also, additional modules employed which will provide the current location of the child to the parents via SMS. The second measure added is SOS Light indicator that will be programmed with Arduino UNO board to display the SOS signal using Morse code. The different modules stay enclosed in a custom designed 3D printed case [12]. In the scenario, a lost child can be located by the parent could send an SMS to the wearable device which would activate the SOS light feature on the wearable. Therefore alerting the people around the child that the child is in some distress and needs assistance as the SOS signal is universally known as the signal for help needed. Additionally, the wearable comes equipped with a distress alarm buzzer which sets to active by sending the SMS keyword "BUZZ" to the wearable. Hence the buzzer is loud and can be heard by the parent from very considerable distance. Also the parents via SMS can receive accurate coordinates of the child, which can help them locate the child with pinpoint accuracy. Some of the existing work done on these similar lines are for example the



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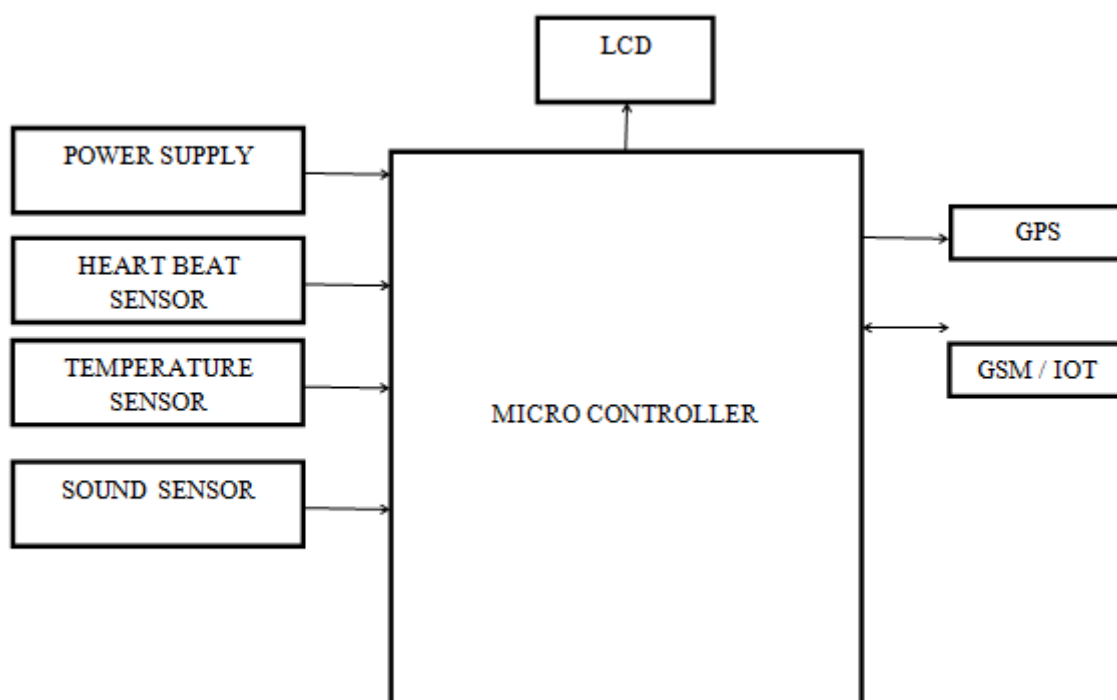
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low-cost, lightweight Wristband Vital [2] which senses and reports hazardous surroundings for people who need immediate assistance such as children and seniors.

It is based on a multi-sensor Arduino micro-system and a lowpower Bluetooth 4.1 module. The Vital band samples data from multiple sensors and reports to a base station, such as the guardian's phone or the emergency services. It has an estimated battery life of 100 hours. The major drawback for the Vital band is that it uses Bluetooth as the mode of communication between child and the parent. Since the distance between the two in some cases could be substantial and the Bluetooth just won't be able to establish a close link between the two.

The motivation for this wearable comes from the increasing need for safety for children in present times as there can be scenarios of the child getting lost in the major crowded areas. This paper focusses on the key aspect that lost children can be helped by the people around the child and can play a significant role in the child's safety until reunited with the parents. Therefore it is intended to use the SMS as the communication type between the parent and child's wearable device, as this has fewer chances of failing when compared to Wi-Fi and Bluetooth. The platform on which this project will be running on is the Arduino Uno microcontroller board based on the ATmega328P, and the functions of sending and receiving SMS, which is provided by the Arduino GSM Module using the GSM network. Also, additional modules employed which will provide the current location of the child to the parents via SMS. The second measure added is SOS Light indicator that will be programmed with Arduino UNO board to display the SOS signal whenever the parent want. In the scenario, a lost child can be located by the parent could send a predefined keyword as an SMS to the wearable device which would reply back by sending location to the parent mobile. Additionally, the wearable equipped with a distress alarm buzzer which sets to active by sending an SMS keyword "BUZZ" to the wearable. Hence the buzzer is louder and can be heard by the parent from very considerable distance. Also the parents via SMS can receive coordinates of the child, which can help them locate the child with maximum accuracy. Some of the existing work done on these similar lines are for example the low-cost, lightweight Wristband Vital which senses and reports hazardous surroundings for people who need immediate assistance such as children and seniors. It is based on a multi-sensor Arduino micro-system and a low power Bluetooth 4.1 module. The major drawback for the Vital band is that it uses Bluetooth as the mode of communication between child and the parent. Therefore, the wearable device proposed will be communicating with the parent via SMS through GSM which would ensure that there is a secure communication link. Also, customization of the wearable can be possible as per our needs by reprogramming the Arduino system

II. BLOCK DIAGRAM





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II. LITERATURE SURVEY

A NOVEL APPROACH TO PROVIDE PROTECTION FOR WOMEN BY USING SMART SECURITY DEVICE Seelam and Prasanti(2018)[1] says that in today's world women are less secure and have many issues regarding their security purpose. This paper describes about safe and secured electronic system for women which comprises of an Arduino controller and sensors such as temperature LM35, flex sensor, MEMS accelerometer, pulse rate sensor, sound sensor. A buzzer, LCD, GSM and GPS are used in this project. When the woman is in threat, the device senses the body parameters like heartbeat rate, change in temperature, the movement of victim by flex sensor, MEMS accelerometer and the voice of the victim is sensed by sound sensor. When the sensor crosses the threshold limit the device gets activated and traces the location of the victim using the GPS module. By using the GSM module, the victim's location is sent to the registered contact number.

AN INTELLIGENT SAFETY SYSTEM FOR INDIVIDUAL'S SECURITY Prof. Kiran et al(2017)[2] says that, in today's world, security is the major issue for an individual. In this project the system consists of a monitoring device, which gets activated when the device is tapped upon then a text message along with voice alert message is received by the respective emergency contacts. Further the person who receives the notifications can find and track the location without the interaction of the victim's application at each and every function.

SMART SECURITY SOLUTION FOR WOMEN BASED ON INTERNET OF THINGS (IOT) Harikiran et al(2016)[3] says that, today in the current global scenario, the prime question in every girl's mind, considering the ever rising increase of issues on women harassment in recent past is mostly about her safety and security. In this paper they propose to have a device which is the integration of multiple devices, hardware comprises of a wearable "Smart band" which continuously communicates with Smart phone that has access to the internet. The application is programmed and loaded with all the required data which includes Human behaviour and reactions to different situations like anger, fear and anxiety. This generates a signal which is transmitted to the smart phone. The software or application has access to GPS and Messaging services which is pre-programmed in such a way that whenever it receives emergency signal, it can send help request along with the location coordinates to the nearest Police station, relatives and the people in the near radius who have application. This action enables help instantaneously from the Police as well as Public in the near radius who can reach the victim with great accuracy.

RESEARCH AND DEVELOPMENT OF A MOBILE-BASED WOMEN SAFETY APPLICATION WITH REAL-TIME DATABASE AND DATA-STREAM NETWORK Sai Prashanth et al (2017)[4] developed an application that incorporates all the unique features such as real-time location tracking and integrate all the features offered by the existing system such as GPS tracking, SOS. The application requires an initial registration along with emergency contacts and the user is asked to update the emergency contacts from time to time. When the user is travelling from one place to another, the dynamic GPS tracking offered by PubNub's channel is turned on to view the user's location on a map. Users with the same app can monitor other users with this app through the dynamic GPS Tracking system through the PubNub channel. When the SOS button is pressed then an alert message which contains the name of the user, GPS Location and a help message is sent via SMS. The user has access to first-aid information and toll free helpline phone numbers. All the information and data is integrated with Firebase.

WOMEN'S SAFETY MEASURES THROUGH SENSOR DEVICE USING IOT Sathyapriya and Mary(2018)[5] describes safety electronic device for women, a wearable smart bracelet, that sends alerts to friends, family, as well as the police when they fell they are in problem. The smart device based on IOT uses a low-energy Bluetooth connection to synchronize to an application on the wearer's Smartphone. The application lets the wearer inform her situation in case of a critical situation - to her friends, family members, the police, or a group. The software or application has access to GPS/GSM and Messaging services, which is pre-programmed in such a way that whenever it receives emergency signal, it can send help request along with the location coordinates to the nearest Police station, relatives using emergency keys (SOS). This action enables help instantaneously from the Police who is in the near geographical location, who can reach the victim with great accuracy. The app also uses the Smartphone's record the incident and subsequently transmits the wearer's location along with the audio recording to the police.



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SMART SHIELD FOR WOMEN SAFETY Pawar et al(2018)[6] made an attempt to solve the problems of women safety. The scope of their system is to develop a smart device which can help women in some emergency situations. The system is a smart wearable device which resembles a jacket. The device contains different modules such as GPS (Global Positioning System), GSM (Global System for Mobile communication), Camera, Buzzer, Shock Mechanism Circuit. The main objective of the system is to provide a reliable security system for a woman when they are alone or feel unsafe.

SMART BEARS DON'T TALK TO STRANGERS: ANALYSING PRIVACY CONCERNS AND TECHNICAL SOLUTIONS IN SMART TOYS FOR CHILDREN Katerina Demetzou et al(2017)[7] designed a “Smart Bear” which is a hypothetical connected-smart toy for children. While the functionalities it presents are appealing to both children and their parents, the privacy concerns that are raised should be taken into serious consideration. A big amount of personal data of the child (and probably of other uninformed minors and adults in physical vicinity) are processed and analysed, an accurate profile of the child is created and direct marketing practices would most probably take place. The toy could suddenly turn into a surveillance device, while malicious third parties might hack the device and proceed to activities that would even threaten the child’s physical and/or mental health. Data minimisation and privacy enhancing technologies are suggested, that would, if not completely alleviate, at least diminish the risks presented. Cybersecurity measures constitute a necessary condition for the alleviation of privacy concerns. This paper concludes that while a zero privacy risk “Smart Bear” is currently not possible, a privacy considerate “Smart Bear” is not that hard to achieve.

A SMART WATCH FOR WOMEN SECURITY BASED ON IOT CONCEPT ‘WATCH ME’ Helen et al(2017)[8], designed a wearable smart watch. When a women or child wearing this ‘watch me’ is exposed to sexual or vulnerable attack, the sensor present in it detects the heart beat rate of a person which will be high at the moment by the secretion of epinephrine hormone from hpa axis and gets activated, this will not only provide alarm sound to the attention of nearby people, it will automatically make a call to our registered contact and also through GPS/GSM it will detect the nearby police station and make a ring there so it will be helpful for police to arrive soon at the spot by tracking the GPS, such a system will lead to safer and better environment.

ACTIVITY TRACKER WRIST BAND FOR CHILDREN MONITORING USING IOT Bhanupriya and Sundarajan(2017)[9] proposed a device which is integrated with multiple devices, comprising of wearable “Activity Tracker Wrist Band” which is 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 smart phone. The system effectively monitors the children presence within the expected zone. When the person crosses the monitoring zone, then based on IOT Monitoring system, GSM sends help request by sending messages to the nearest police station, parents and the people in the near radius.

IOT BASED UNIFIED APPROACH FOR WOMEN AND CHILDREN SECURITY USING WIRELESS AND GPS Bhavale et al(2016)[10] proposing a system that works on the controversy of children and women security using IOT. The proposed system intends to a device wireless technique in the form of embedded device namely Arduino for women that will serve the purpose of alerts and way of communicating with secure channels and it captures the image using electronic camera. There are many android applications for women safety but they are not as efficient. So to solve this issue of women safety they develop a wireless sensor kit which is easy to use and which is efficient to provide help to that victim. so when the victim press kits button, our application will capture the photo, collect user’s information to send notification to registered phone numbers with link of captured image. This saves the time and that victim get help without loss of time. Also in the case of Children security the system proposes a speed monitoring and location tracking facilities using GPS, GPRS, GSM. The system consists of bus unit. The bus unit which is used to detect the path of Bus by using GPS. Whether the bus is travelling on its day to day route and also it monitors the over speeding of bus. For the mechanism of vehicle tracking Haversine and Trilateration algorithm are used. According to that by using GSM, alert messages will be send to their parents and vehicle owner. The system has been developed on web based data driven application that provides the useful information.



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DESIGN AND DEVELOPMENT OF AN IOT BASED WEARABLE DEVICE FOR THE SAFETY AND SECURITY OF WOMEN AND GIRL CHILDREN Anand Jatti et al (2016)[12] presents a work. The aim of this work is to develop a wearable device for the safety and protection of women and girls. This objective is achieved by the analysis of physiological signals in conjunction with body position. The physiological signals that are analysed are galvanic skin resistance and body temperature. Body position is determined by acquiring raw accelerometer data from a triple axis accelerometer. Acquisition of raw data is then followed by activity recognition which is a process of employing a specialized machine learning algorithm. Real-time monitoring of data is achieved by wirelessly sending sensor data to an open source Cloud Platform. Analysis of the data is done on MATLAB simultaneously. This device is programmed to continuously monitor the subject's parameters and take action when any dangerous situation presents itself. It does so by detecting the change in the monitored signals, following which appropriate action is taken by means of sending notifications/alerts to designated individuals. A prototype of the model is shown below.

III. CONCLUSIONS

The child safety wearable device is capable of acting as a smart device. It provides parents with the real-time location, surrounding temperature, SOS light along with Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child. The smart child safety wearable can be enhanced much more in the future by using highly compact Arduino modules such as the LilyPad Arduino which can be sewed into fabrics. Also a more power efficient model will have to be created which will be capable of holding the battery for a longer time.

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