

A Study on Child Safety Wearable Devices

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Abstract: Child safety wearable comes from the increasing need for safety for children. The major advantage of this wearable over other wearables is that it can be used in any cell phone and doesn't necessarily require a savvy individual to operate. Most of the wearables available today are focused on providing the location [20], activity, etc. of the child to the parents providing via Wi-Fi and Bluetooth which seems to be an unreliable source of communication [18]. This device is to help parents locate their child with ease and also alerts the parent quickly when the child is in unfavorable conditions like fire, harmful gases. Therefore, this paper is to have an SMS text enabled communication medium between the child's wearable and the parent using GSM mobile communication. The parent can send a text with specific keywords such as "LOCATION" "TEMPERATURE" "UV" "SOS" "BUZZ", etc., the wearable device will reply back with a text containing the real time accurate location of the child which upon tapping will provide directions to the child's location on Google maps app and will also provide the surrounding temperature, UV radiation index so that the parents can keep track. It also alerts with SMS text to the parent when the child is in an environment where harmful gases like H₂, CH₄, CO, ALCOHOL, SMOKE. For the secondary safety measure the device alerts the people present in the surrounding of the child who could instantly react for the child's safety till the parents arrive or they could contact the parents and help locate them. In this 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.

I. INTRODUCTION

Child safety wearable comes from the increasing need for safety for children in current times as there could be scenarios of the child getting lost in the major crowded areas and child getting into harmful environment. This paper focuses 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 and Bluetooth [18] which seems to be an unreliable source of communication. 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. This project will be running on Arduino Uno microcontroller board based on the ATmega328P [19], 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. Also, additional modules employed which will provide the current location of the child to the parents via SMS and warns the parent through SMS if any fire accident occurs or any combustible gas is around the child. 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 [21]. 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.

II. LITERATURE ANALYSIS

From our literature survey we get know about the available safety wearable devices. Also By this, there is a possibility of increasing more applications than the existing devices at the moment. Child safety device must be able to keep the information about child's geographical location, the environment around the child, and should warn the parent if any undesirable event occurs near the child [1,2]. It should also alert people around the child about the need for assistance. Our analysis made clear that there is a scope of adding more applications to the existing safety device. All the modules can be integrated in a wristband [9,16,10,].

S.no	Author name & year	Title of the project	Methodology	Remarks

1.	Zhigang Gao (2017)	ChildGuard: A Child-Safety Monitoring System[3]	The guardian application (which appears on the guardian's mobile device), a child application (which appears on the child's mobile devices), and a web server.	The system collects a child's geographical coordinates in real time and sends them to a guardian application then displays the child's real time movements on a map.
2.	Akash moodibidri (2017)	Child safety wearable devices[4]	Alarm buzzer, SOS, GPS location sensor, UV sensor, Temperature sensor.	Easy Availability & Affordability Tracking Made Easy
3.	Haobijam Basanta (2017)	Health care system[5]	Trigger alert, Health care data base, Mobile.	.Acts as an interface between the doctor and patients
4.	T. Elakkiya (2017)	Wearable safety wristband device for elderly health monitoring with fall detect and heart attack alarm[6]	Wi-Fi , Bluetooth, Buzzer, NFC card, GPS ,LED,EEPROM, Audible beep signal.	This technique is about having multiple method in a single device to monitor location, heart rate or attack, alarm, device missing alert, take medicine at correct time with suitable tablets, traffic signal reading.
5.	FezzaHaider (2017)	Wearable-free Wireless Fall Detection System[7]	An accelerometer and/or gyroscope, wireless communication (e.g. cellular, Wi-Fi, Bluetooth, wall-mounted UWB RF radar.	Fall detection with the use of RF radars. Detects stationary objects, long with tracking motion, as well as successfully detects falls for a single person.
6.	Anand Jatti(2016)	Design and development of an IOT based wearable device for the child.[8]	Temperature sensor, Skin resistance sensor, Triple axis accelerometer, ESP 8266 wifi module.	The safety and protection of women and girls. The physiological signals that are analyzed are galvanic skin resistance and body temperature.
7.	Y. Chen (2013)	Wireless wrist-wearable wake/sleep identification device for closed-loop deep brain stimulation[9]	wake/sleep identification device, closed-loop DBS system	It provides great potential to apply the device to implement the closed-loop deep brain stimulator. Medical services, such as night care in sickrooms, and fall alarm for elderly people.
8.	Andrea Bondavilli(2012)	Real time wearable devices safety critical track warning system	Multi interface management, Communication interface.	Trackside workers can benefit of intelligent systems for automatic track warning

III. PROPOSED METHODOLOGY

This section discusses the architecture and proposed design methodologies chosen for the development of the Child Safety wearable device. The Fig illustrates the architecture of the child safety wearable device, which depicts the various technologies and

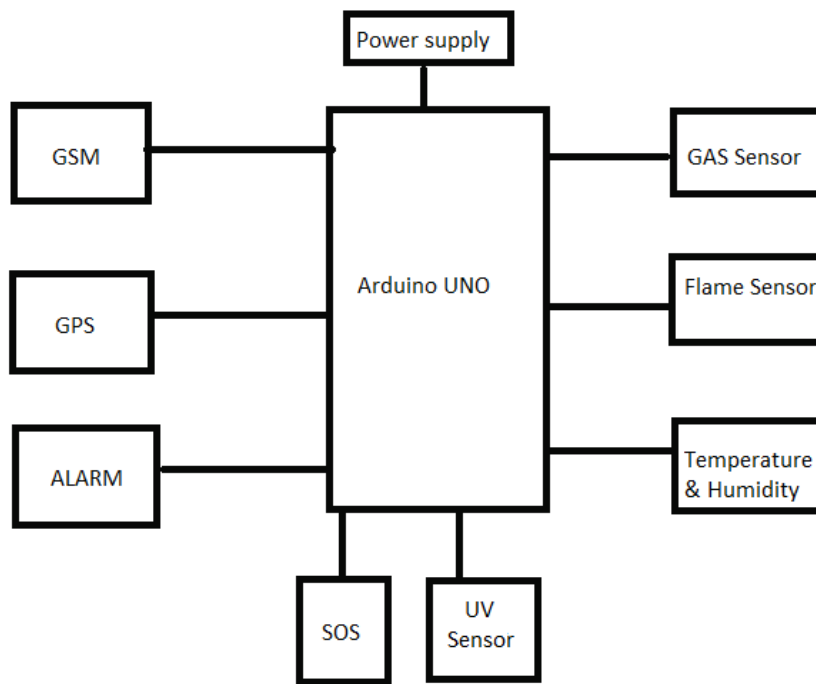


Figure 1: Block diagram of Proposed Methodology

technological standards used. The system architecture of the wearable is based and controlled by an AT - mega328p microcontroller with an Arduino Uno boot loader. The GSM shield is used as an interface to send the data received by the Arduino Uno via SMS or MMS to a Smartphone over GSM/GPRS [10-13]. The GSM shield functions as a trigger for the Arduino Uno to request data from its various modules. If an SMS text with distinct characters is sent to request the current location or GPS[10] coordinates is sent to the Arduino GSM shield via the user's Smartphone, then the GSM shield triggers the Arduino Uno to request the current GPS coordinates. Once the Arduino Uno has received at the coordinate information, it will process this information and transfer it over to the GSM shield, which then via SMS sends the coordinates to the user's Smartphone[14,15]. The user can just tap on the coordinates which will open up the default GPS application installed on the phone and will show the user the distance between the child and the user. The GPS module receives location information from the various satellites present in the GPS system. Similarly different sensors are used to measure temperature, flame, UV radiation, combustible gases like H₂, CH₄, CO, ALCOHOL, SMOKE or propane. The proposed architecture depicts the possibilities of increasing applications.

IV. CONCLUSION

. The child safety wearable device is capable of acting as a smart device. It provides parents with the real-time location, surrounding temperature and humidity, UV radiation index, harmful gas detection, flame detection and SOS light along with buzzer for their children surroundings and ability to locate their child or alert by standers in acting to comfort the child. Also a more power efficient model should be done. then we can hold battery for a long time..

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