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Raspberry Pi Based Child Safety Wearable Device

G.Priyanka[1], Dr.Vandanakhare[2], K.Ravikiran[3]

[1]PG Student, Dept, of ECE, CMR College of Engineering & Technology, Hyderabad, India.

[2] Professor, Dept of ECE, CMR College of Engineering &Technology, Hyderabad, India.

[3] Assistant Professor, Dept. of ECE ,CMR College of Engineering & Technology, Hyderabad , India.

1. ABSTRACT

This paper discusses the concept of a smart wearable device for little children. The major advantage of this wearable over their wearable is that it can be used in any cell phone 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 parents locate their children with ease. At the moment there are many wearable's 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 and Bluetooth appear to be an unreliable medium of communication between the parent and child.

Therefore, the focus of this paper is to have an SMS text enabled communication medium between the child's wearable and the parents as the environment for GSM mobile communication is almost present everywhere. The parent can send a text with specific keywords such as "LOCATION" "TEMPERATURE" "UV" "SOS" "BUZZ", SNAPSHOT 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 if the temperature or UV radiation is not suitable for the child. The secondary measure implemented was using a bright SOS Light and distress alarm buzzer present on the wearable device which when activated by the parents via SMS text should display the SOS signal brightly and sound aft alarm which a bystander can easily spot as a sign of distress. Hence this paper aims at providing parents with a sense of security for their child in today's time.

KEYWORDS: TEMPERATURE, GSM, SOS, LOCATION

2. INTRODUCTION

With the rise of Internet of Things (IOT), standalone devices with web connectivity have become an important part of our lives. In internet of things objects are microcontroller/microprocessor and sensor devices and various software applications. They also have communication protocols which enable them to talk to other objects. Internet of things delivers on demand real-time services and helps in saving time, resources and even manpower. In present scenario there is a drastic increase in the number of child kidnapping cases. Since crime against the children in the age of 14 years to 17 years is more popular, so parents are always worried about their children's safety. This paper proposes a voice enabled alerting system to aid to track children location in real time. Also at the present scenario women are competing with men in every field of life. Crimes against child thefting are more common at present time. It is very important to ensure the safety of women. Hence our system provides a required safety to child

3. LITERATURE REVIEW

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; smart phones 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].The motivation for this wearable comes from the increasing need for safety for little children in current times as they are could be scenario of the child getting lost in the major crowded areas.

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 wearable's 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, almost 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 the similar lines are for example the low-cost, lightweight Wristband Vital [2] which senses and reports

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hazardous surroundings for people who need immediate assistance such as children and seniors. It is based on a multi-sensor Arduino mici Swing band having their several drawbacks.

Therefore, the wearable device proposed will be communicating with the parent via SMS which would ensure that there is a secure communication link. Also, customization of the wearable is possible as per our needs by reprogramming the Arduino system.

4. BLOCK DIAGRAM

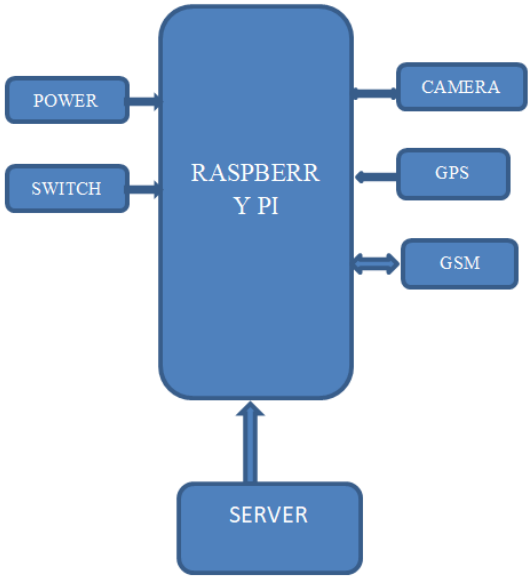

Fig 4 block diagram of child safety warble circuit

5. HARDWARE REQUIRMENTS

5.1 RASPBERRY PI 3 MODEL B

The Raspberry Pi is an index card sized single board computer developed in the UK by the Raspberry Pi foundation with the intention of promoting the teaching of basic computer science in schools.

- The Raspberry Pi 3 delivers 10 times the processing capacity of Raspberry Pi 1 model.
- This second generation Raspberry Pi as an upgraded Broadcom BCM2837 processor, which is powerful ARM cortex-A53 based 64 bit quad-core processor that runs at 1.2GHz.The board also features an increasing memory capacity to 1G byte.

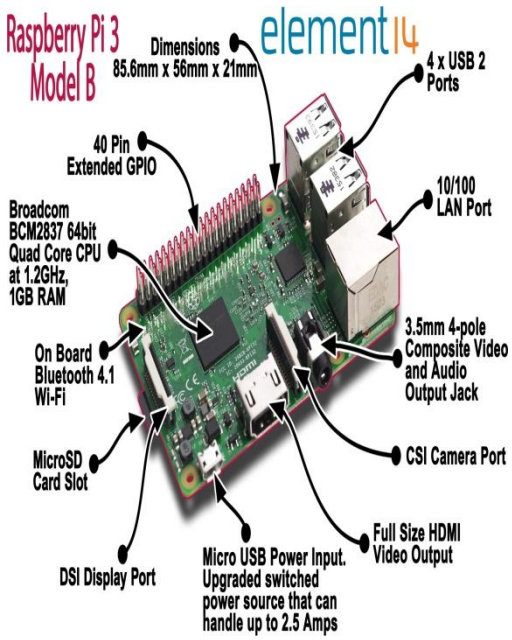

Fig 5.1 Raspberry pi board description

The Raspberry PI has a Broadcom BCM2836 system on a chip which includes an 900 MHz 32 bit quad-core ARM cortex – A7, video core IV GPU, and was originally shipped with 256 mega bytes of RAM, later upgraded {Model B & Model B+} to 512 MB .It doesn't include a built –in hard disk or solid-taste drive, but it uses an SD card for booting and persistent storage, with the model B+ using a micro SD as shown in figure 2.1.

The foundation provides Debi an and Arch Linux ARM Distributions for download. Tools are available for python as the main programming language, with support for BBC BASIC {via the RISE OS image or the brandy basic clone for Linux} , C, Java and Perl.

5.2 GSM (Global Systems For Mobile Communication)

The words, "Mobile Station" (MS) or "Mobile Equipment" (ME) are used for mobile terminals Supporting GSM services. A call from a GSM mobile station to the PSTN is called a "mobile originated call" (MOC) or "Outgoing call", and a call from a fixed network to a GSM mobile station is called a "mobile Terminated call" (MTC) or "incoming call".

What is GSM?

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

Fig 5.2 GSM module

What does GSM offer?

GSM supports voice calls and data transfer speeds of up to 9.6 Kbit/s, together with the transmission of SMS (Short Message Service).

GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries. By having harmonized spectrum across most of the globe, GSM's

international roaming capability allows users to access the same services when travelling abroad as at home. This gives consumers seamless and same number connectivity in more than 218 countries. Terrestrial GSM networks now cover more than 80% of the world's population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available

5.3 GPS (GLOBAL POSITIONING SYSTEM)

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

The GPS is made up of three parts:

1. Satellites orbiting the Earth
2. Control and monitoring stations on Earth
3. The GPS receivers owned by users.

GPS satellites broadcast signals from space that are picked up and identified by GPS receivers. Each GPS receiver then provides three-dimensional location (latitude, longitude, and altitude) plus the time.

Fig 5.3 GPS module

6. SOFTWARE REQUIRMENTS

6.1 **Install Open CV 3.0 for both Python 2.7+ and Python 3+ on your Raspberry Pi 2**The Open CV 3.0 install process is divided into four sections:

- **Section 1: Configuring your Raspberry Pi by installing the required packages and libraries.** Regardless of whether you are using Python 2.7 or Python 3+, we need to take some steps in order to prepare our Raspberry Pi for Open CV 3.0 — these steps are mainly calls to apt-get, followed

by installing the required packages and libraries.

- **Section 2: Compiling Open CV 3.0 with Python 2.7+ support.** If you want to install Open CV 3.0 with Python 2.7+ bindings on your Raspberry Pi, then this is the section that you'll want to go to. After you complete this section, skip Section 3 and head right to Section 4.

- **Section 3: Compiling Open CV 3.0 with Python 3+ support.** Similarly, if you want to install Open CV 3.0 with Python 3+ bindings on your Pi 3, then complete Section 1 and skip right to Section 3.

- **Section 4: Verifying your Open CV 3.0 install.** After you have installed Open CV 3.0 with Python support on your Raspberry Pi 3, you'll want to confirm that is indeed installed correctly and working as expected. This section will show you how to verify your Open CV 3.0 install and ensure it's working correctly.

7. RESULT

After successful implementation of proposed system we can Sending the child's current location and image to the parents.

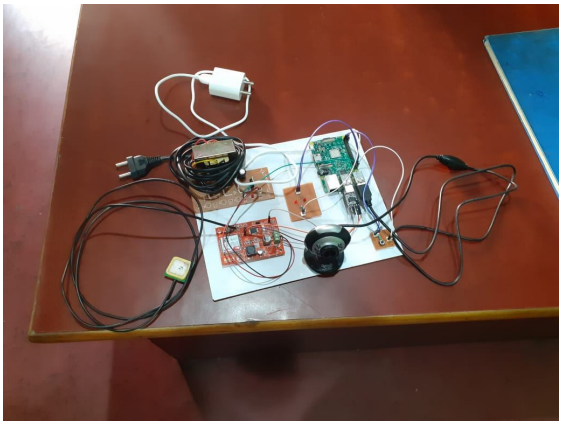

Fig 7.1 kit diagram

7.2 sending message &capturing image

8. CONCLUSION

The child safety wearable device is capable of acting as a smart IOT device. It provides parents with the real-time location, surrounding temperature, UV radiation index and 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 Lily Pad 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.

9. FUTURE SCOPE:

In future the idea behind the Android app has been derived from having an automated boot to respond to text message responses from the user. It will provide the user with predefined response option at just the click of a button. The user doesn't need to memorize the specific keywords to send. Also, the boot will be preprogrammed to present the user with a set of predefined keyword options such as "LOCATION," "SNAPSHOT," "SOS," etc. Whereas for the future aspect of this wearable device based on what type sensor is added to it, additional specific keywords could be added such as, "HUMIDITY,""ALTITUDE,"etc.

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AUTHOUR PROFILE 1:

Priyanka Gattikoppula received her B.Tech Degree in 2014 from TRR Engineering College for Women, TS, India. Currently working towards post Graduation degree in the department of Electronics & communication engineering at CMR College of Engineering & Technology, TS, and India. Her research interest is Embedded Systems.

AUTHOUR PROFILE 2:

Dr. VANDANA KHARE is presently working as a Professor at CMRCET, Hyderabad. She has received PhD (Wireless Communication) from JNTU Hyderabad. She has more than 20 years of experience in the field of teaching. Her contributions include around 45 research papers in journals & Conferences of national/international repute. Her areas of interest include Multimedia systems, Communications & Biomedical signal processing. She is a senior member of ISTE, IETE & IEEE technical societies.

AUTHOUR PROFILE 3:

Mr. K. RAVIKIRAN is presently working as Assistant professor in the Department of ECE in CMR College of Engineering and Technology. He did his B. Tech & M. Tech in Embedded Systems from JNTUH.