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Wearable Child Guarding Device

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Abstract – This project aims to develop a smart and wearable device for children that is compatible with any cell phone. It focuses on providing parents with an easy and reliable tool for locating their children. The device utilizes SMS text messaging as a communication channel, allowing parents to receive real-time location updates and directions through Google Maps. It also provides temperature information for monitoring environmental conditions. Recognizing the potential unreliability of technology, the project emphasizes the importance of a backup plan involving nearby individuals for assistance. The device is equipped with a bright SOS light and distress alarm buzzer, which can be activated via SMS to signal a distress situation. This visual and audible distress signal can be recognized by passersby, enabling them to offer help or notify parents. Overall, the goal is to create a user-friendly wearable device that enhances child safety and provides a sense of security for parents.

Index terms - Arduino UNO board, GPS module, GSM module, DTH11 sensor

1. INTRODUCTION

This project focuses on leveraging the Internet of Things (IoT) to enhance child safety. By utilizing interconnected devices and systems, such as wearables and smartphones, the project aims to address the risk of children getting lost in crowded areas. While existing wearables use Wi-Fi and Bluetooth for location tracking, their reliability can be limited. To overcome these limitations, the project proposes utilizing SMS communication between parent and child wearable devices. The Arduino Uno microcontroller board, along with the Arduino GSM shield, enables functionalities such as SMS sending and receiving, call management, and internet connectivity. Real-time SMS updates about the child's location are provided to parents, and an SOS Light Indicator using Morse code is implemented for additional safety. All components are housed in a 3D-printed case tailored to the project's requirements. By combining IoT, Arduino technology, and reliable communication channels, this project aims to provide parents with an effective tool for tracking their children and ensuring their well-being.

2. LITERATURE SURVEY

This project is to create a smart wearable device for children that uses advanced technology to ensure their safety. It employs cutting-edge technology to protect the youngster through the use of a GSM module, ensuring that the child does not feel abandoned while dealing with such social issues.
An over simplistic design of an instrument targeted for guarding title children against child theft and missing from crowded places like shopping malls or fairs or other potential crowded places and its ability to be controlled remotely by using a cell phone and global system for mobile communication (GSM) is presented.
As wearable technology is rapidly penetrating our daily life, mobile wearable communication is becoming a new communication paradigm. Mobile wearable device communications create new challenges compared to ordinary sensor networks and short-range communication.
The Internet of Things (IoT) has various fields of application including health care, resource management, asset tracking, etc. Depending on the use case, various technologies like RFID, Wireless Sensor Network (WSN) or Smart Objects can be used.
They present a low-cost light-weight wristband Vital as the basic element for emergency response network, which senses and reports hazardous surroundings for people who need immediate assistance such as children and seniors. Based on a multi-sensor Arduino microsystem and a low-power Bluetooth module.

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3.1 BLOCK DIAGRAM AND FLOWCHART

Fig 3.1.1 Block Diagram

3.2 HARDWARE AND SOFTWARE DESCRIPTION

3.2.1 Aurdino UNO Board:

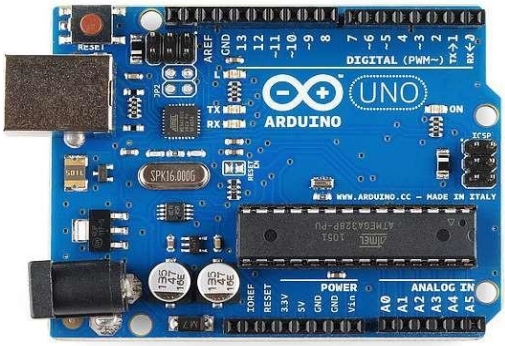

Fig 3.2.2: Arduino Mega board

The Arduino UNO is a microcontroller board built around the ATmega328P. It offers 14 digital input/output pins (6 of which can function as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. The board includes all the necessary components to support the microcontroller, allowing easy connection to a computer via a USB cable or power supply through an AC-to-DC adapter or battery. The UNO provides a user-friendly platform for experimentation and prototyping, as any mistakes made can be rectified by replacing the chip at an affordable cost. The name "Uno" derives from the Italian word for "one" and signifies the release of Arduino Software (IDE) 1.0. Initially, the Uno board and Arduino Software (IDE) version 1.0 served as the standard reference for the Arduino platform, which has since evolved with newer releases. The Uno board represents the first in a series of USB Arduino boards and remains a prominent model in the Arduino lineup, while the Arduino index of boards provides a comprehensive list of current, past, and outdated board variations

3.2.2 GPS Module:

Fig 3.2.2: GPS module

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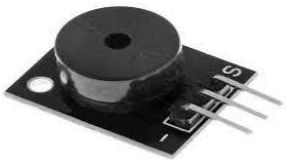
A GPS module integrates GPS technology into electronic systems. It receives signals from satellites to determine precise location coordinates, offering accurate latitude, longitude, and altitude information. GPS modules are commonly used in navigation systems, vehicle tracking devices, wearables, and IoT applications. They provide real-time positioning data for tracking assets, vehicles, or personal location. GPS modules come in different form factors, making them versatile for integration or standalone use. They are essential components in modern location-based technologies.

3.2.3 DHT11 Sensor module:

Fig 3.2.3: DHT11 Sensor module

The DHT11 sensor module is a cost-effective and widely used sensor for measuring temperature and humidity levels. It features a simple digital interface and provides accurate readings within specific ranges. The module's built-in LED indicator offers visual feedback, allowing for easy status indication or threshold-based notifications. With its affordability and reliable performance, the DHT11 module is commonly utilized in weather monitoring, indoor climate control, and home automation projects

3.2.4 Buzzer Module:



3.2.4 Buzzer Module

As a type of electronic buzzer with integrated structure, buzzers, which are supplied by DC power, are widely used in computers, printers, photocopiers, alarms, electronic toys, automotive electronic devices, telephones, timers and other electronic products for voice devices. Buzzers can be categorized as active and passive ones (see the following picture). Turn the pins of two buzzers face up, and the one with a green circuit board is a passive buzzer, while the other enclosed with a black tape is an active one.

3.2.5 GSM module:

Fig 3.2.5: GSM module

The GSM module SIM800A is a widely used cellular communication module that enables devices to connect to the GSM network. It supports quad-band GSM/GPRS frequencies, making it compatible with various cellular networks worldwide. The SIM800A module provides functionalities such as voice calls, SMS messaging, and GPRS data transmission. It can be easily integrated into microcontroller-based systems or embedded projects using a UART interface. With its compact size and efficient power consumption, the SIM800A module is a popular choice for applications such as IoT devices, remote monitoring systems, and GSM-based communication solutions

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3.2.6 Power Regulator:

Figure 3.2.6: Power Regulator

A power regulator is an electronic device that adjusts the input voltage to provide stable output voltages. In this case, the regulator has an input of 12V and offers three outputs: 12V, 5V, and 3V. The 12V output powers devices requiring a 12V supply, while the 5V output is compatible with microcontrollers and sensors. The 3V output suits low-power components. The regulator ensures proper voltage levels, preventing damage and maintaining system stability.

3.2.7 SOS Light:

Fig 3.2.7: SOS LED

An SOS LED is a specialized light indicator that emits an SOS signal in Morse code. It is commonly used as a distress signal in emergency situations. The SOS LED is designed with high visibility and can be easily recognized by others from a distance. Its purpose is to attract attention and signal for help, ensuring that individuals in distress can quickly communicate their need for assistance

3.2.8 Arduino IDE:

Fig 3.2.8: Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) -contains a text editorfor writing code, a message area, a text console, a toolbar with buttons for common functions and a seriesof menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. The Arduino Integrated Development Environment is a cross-platform application that is writtenin functions from C and C++. It is used to write and upload programs to Arduino compatible boards. Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written inthe text editor and are saved with the file extension.ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including

complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

3.2.9 SMS INTERFACE

Fig 3.2.9: SMS app interface

The wearable child guarding device employs General Packet Radio Service (GPRS) for data transmission, with speeds ranging from 56 to 114 Kbit/sec. The Arduino GSM Shield facilitates this communication, allowing data to be sent to the user via SMS. Arduino provides libraries for various shields, including Ethernet and Wi-Fi, as well as dedicated GSM libraries for the GSM Shield. These libraries enable the GSM Shield to perform functions such as making and receiving calls, sending and receiving SMS messages, and operating as a client and server. This Integration of GPRS and the Arduino GSM Shield ensures effective communication and data transfer in the wearable child guarding device

4. METHODOLOGY

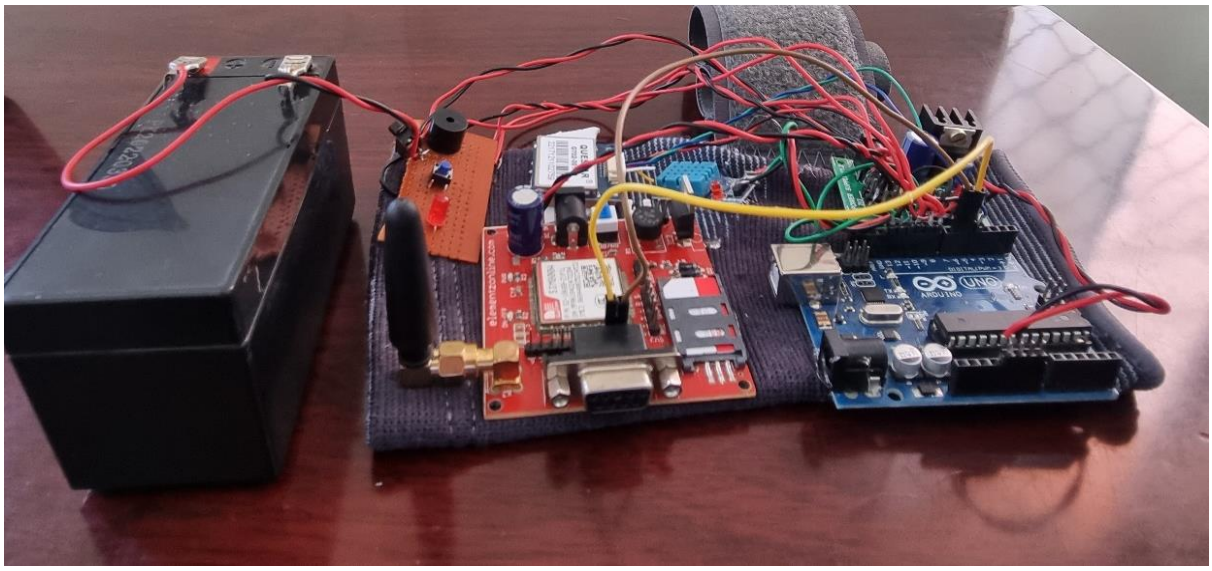

Figure 4.: hardware connection

The wearable child safety device utilizes an Arduino Uno boot loader as the controller and connects to various Arduino pins via a 5-pin header. It collects data from modules like GPS and communicates with a smartphone using the Arduino GSM shield over SMS or MMS. The device is designed with larger components to transition to a system-on-a-chip (SoC) model in the future. It uses an Arduino Uno microcontroller to gather and process data, which is then accessible through user interfaces on mobile devices. The physical design resembles a wristwatch and prioritizes functionality over compactness. Powered by a 12V battery, the device conserves power by providing GPS and image data only upon request via SMS. The system architecture aims to enhance child safety and enable convenient data access for users.

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5. RESULTS

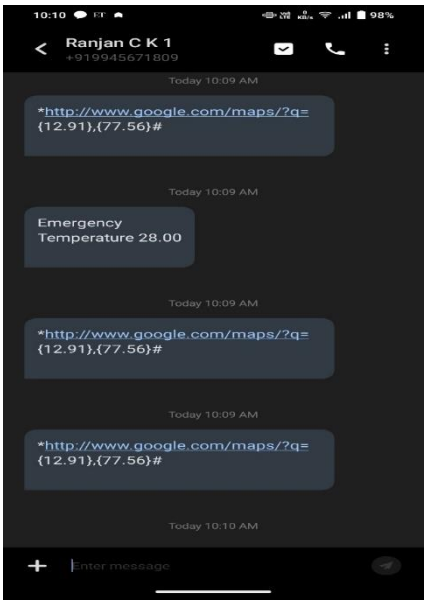

Figure 5.1. SMS data of location and temperature

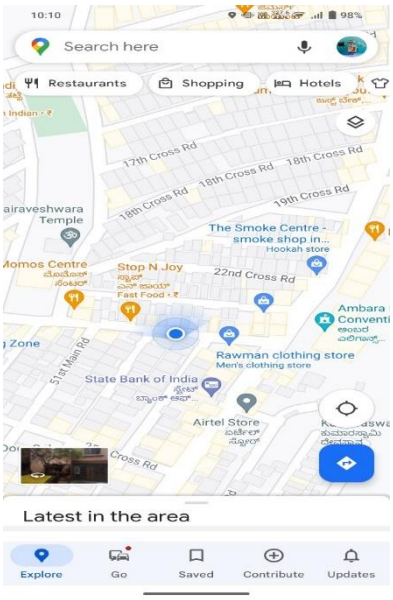

Figure 5.2. Location in google maps

Figure 5.3: Panic Button, Buzzer, and SOS light.

6. CONCLUSIONS

Child guarding devices, such as wearable smart IoT gadgets, provide real-time information about a child's location, temperature, and safety features like SOS lights and distress alarms. Future advancements may include smaller Arduino modules and improved energy efficiency. These devices offer benefits like location tracking, accident prevention, and communication between parents and children. They help prevent getting lost or abducted, notify parents of potential dangers, and foster a sense of security. Additionally, they facilitate communication and provide reassurance in emergency situations. Child guarding devices are essential tools for promoting child safety and peace of mind for parents and caregivers.

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