Portable Device for Child Safety / Tracking Based on Internet of Things

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Abstract:

In a Modernized Technology, there is always an urgent need to enhance the safety of people especially little children. The prime inspiration of this paper talks about the idea of safety and tracking device for kids. Nowadays there are number of devices in the market which help to track the children with ease. Framework of existing system has an impact of Wi-Fi and Bluetooth module. Our aim of this work is to track and secure the child anywhere in the place, over a command through SMS to communicate between device and parent with the help of GSM module wired to Arduino Mega Board. This paper provides the comfort of taking care over the children remotely at an instance of time using our work.

Keywords: Internet of Things, Children, Arduino, Safety, Tracking, Portable.

Introduction:

The Internet of things is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. The Internet of Things[1] allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. IoT includes many different system like smart cars, portable devices and even human implanted devices, home automation systems and lighting control; smartphones which are increasingly being used to measure the world around them. The motivation for this portable 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 devices available today are focused on providing the location, activity, etc. of the child to the parents via Wi-Fi and Bluetooth. But Wi- Fi and Bluetooth seem a very unreliable source to transfer information.

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 Mega microcontroller board based on the ATmega2560, and the functions of sending and receiving SMS, calls and connecting to the internet which is provided by the GSM module. Therefore, the portable device proposed will be communicating with the parent via SMS which would ensure that there is a secure communication link.

Existing System:

Many researchers have discussed the importance of child safety system. Mobile wearable device communication creates a new challenges and also covers the short range. It gives peer to peer communication or client server fashion communication with smart phones tablets and gateway nodes [1]. Women safety device gives protection and women itself want to intimate her dangerous situation by pressing the buzzer in the device. Then only a person who having a particular application will receive current status of a women in a panic situation [2]. This system gives an alert message only for short range and it can be received only through mobile phones [3]. The existing system uses a Wi-Fi module to intimate to the parents about the condition of their child. Parent can get the Personal details of children by giving a keywords like Body temperature, Location to the

concern device. The main disadvantage of this system is it covers only a short range and cannot get the outdoor location of the child properly.

Proposed System

Based on the drawbacks identified from the existing system, we propose a child safety system using sensors and the electronic components to detect the child location. It also get the details about the body temperature, Surrounding temperature, heart beat rate, snapshot of the child's current situation and the intimations are get through by sending the keywords to the system. Buzzer is create a sound when the child is in dangerous situation.

The proposed system distinctly consist of four units

1) Arduino Unit
2) Sensor Unit
3) GSM and GPS Unit
4) Camera Module Unit

Design Components:

1) Arduino Mega:

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

The power pins are as follows:

- Vin - The input voltage to the board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V - This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3 - A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND - Ground pins.
- IOREF - This pin on the board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

Memory

The ATmega2560 has 256 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM library).

2) Temperature Sensor:

DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

Technical details:

- Low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy

3) Body Temperature Sensor:

Human body temperature is of vital importance to maintain the health and therefore it is necessary to monitor it requlary.We can measure the body temperature using various temperature sensors. For instance, LM35 series are precision integrated circuit sensors whose output voltage is linearly proportional to the Celsius temperature. It operates linearly +10.0mV/°C scale factor with 0.5°C accuracy. In emergency cases body temperature varies drastically which can trigger module for rescue.

4) GSM and GPS Module:

GSM is used to send data from control unit to base unit. We can use GSM800c which operates at frequency 900MHz.It has up link band of 890MHz to 915MHz and down link of 935MHz to 960MHz GSM takes

advantages of both FDMA & TDMA. In 25MHz BW, 124 carriers are generated with channel spacing of 200kHz (FDMA).Each carrier is split into 8 time slots (TDMA).At any given instance of time 992 speech channels are made available in GSM800c[2],[3].

Global positioning system (GPS) is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from various satellites to reach the receiver. In six different orbits approximately 12,500 miles above the earth, 24 MEO (Medium-Earth Orbit) Satellites revolve around the earth 24 hours and transmit location every second as well as present time from atomic clocks.

5) Buzzer:

Piezo electric buzzer is used to create sound to take care or track the child in crowded area. Piezoceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer.

When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal thereby producing sound.

Use the following code (BUZZER ON) to generate an alarm type of sound. **The tone is an Arduino Library to produce square-wave of the specified frequency (and 50% duty cycle) on any Arduino pin.**

6) Camera Module:

The OV7670 CAMERACHIPTM is a low voltage CMOS image sensor that provides the full functionality of a single-chip VGA camera and image processor in a small footprint package. The OV7670 provides full-frame, sub-sampled or windowed 8-bit images in a wide range of formats, controlled through the Serial Camera Control Bus (SCCB) interface. Camera module is powered from a single +3.3V power supply.

Omni Vision CAMERACHIPs use proprietary sensor technology to improve image quality by reducing or eliminating common lighting/electrical sources of image contamination, such as fixed pattern noise (FPN), smearing, blooming, etc., to produce a clean, fully stable color image.

Conclusion & Future Scope:

The proposed system design and the concept of a child safety device with location identification and monitor the child's current status is useful and effective method to the children when they are in outside of their home. The key features of our system are simple design, ease to use and maintain. This proposed system combines more technologies and sensors for easily monitor the child and get the information. The buzzer provides a sound when the child is in dangerous situation and the camera is used to track a child current status by sending a snapshot through a mobile device. For further development can improve a device by adding features like live streaming, cloud storage to the existing device for child safety.

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