

Real World IoT Applications in Daily Domain

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Abstract: *In present-day world technology is growing at a significant rate and IOT plays a vital role in it. Important features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. The hardware utilized in IoT systems includes devices for a remote dashboard, devices for control, servers, a routing or bridge device, and sensors. These devices manage key tasks and functions such as system activation, action specifications, security, communication, and detection to support-specific goals and actions. In this project we developed a device which helps us in different scenarios; The first application of this is, (smart cap): When a person wearing a smart cap comes in a contact with an object which lies within the range of 1 meter of this device, it gives us a beep and the LED glows in these situations of COVID it is necessary for us to maintain social distancing. The second application of this is, (smart Blind stick): Technology can indeed neutralize human disability so we build this device for the visually impaired to guide the user to respective destination and avoiding colliding with the obstacles. When the stick comes in a contact with the obstacles it gives a beep to alert the person.*

Keywords: Raspberry pi, Ultra sonic Sensor

1.Introduction

IoT is progressively becoming an important aspect of our life that can be sensed everywhere around us. In whole, IoT is an innovation that puts together extensive variety of smart systems, frameworks and intelligent devices and sensors. A great transformation can be observed in our daily routine life along with the increasing involvement of IoT devices and technology.

Raspberry pi distance measurement project has the number of applications that require to measure distance between two moving or stationary objects, etc. Ultrasonic sensors like HC-SR04 are widely used to measure the distance without actual contact.

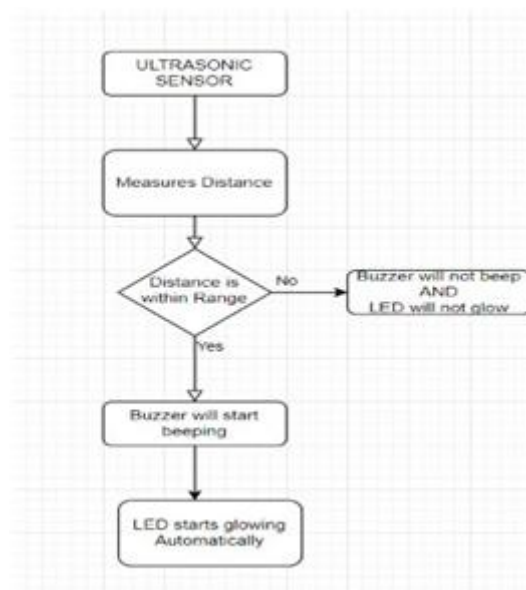
The module works on the natural phenomenon of ECHO of sound. A high pulse is sent to trigger the module. After which the module sends ultrasound signal through transmitter and checks its echo received at receiver. By using this process, the distance is calculated.

2.Methodology

SMART CAP:

The functioning of the smart cap comes into play when the person wearing it comes in contact within an object which lies in the range of 100 cm or less.

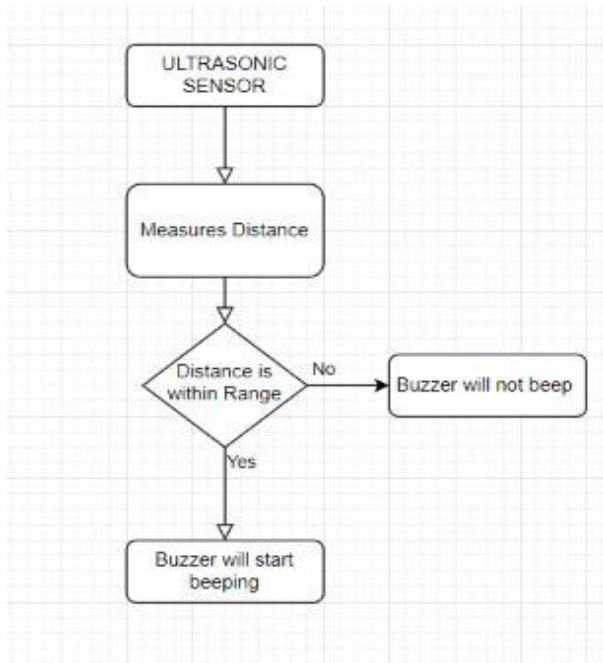
As the ultrasonic sensor measures and returns the value of the distance between the person and the object the buzzer will get activated if the distance is less than 1 metre and simultaneously the LED will glow or if the distance is more than 1 metre the LED and buzzer will not get activated.



Smart Blind Stick:

The functioning of the smart blind stick comes into play when the person holding it comes in contact within an object which lies in the range of 120 cm or less.

As the ultrasonic sensor measures and returns the value of the distance between the person holding the stick and the object the buzzer will get activated and alerts the person who is holding the stick when the distance is less than 120 cm. and if the distance is more than 120cm the buzzer will not get activated.



Hardware Design

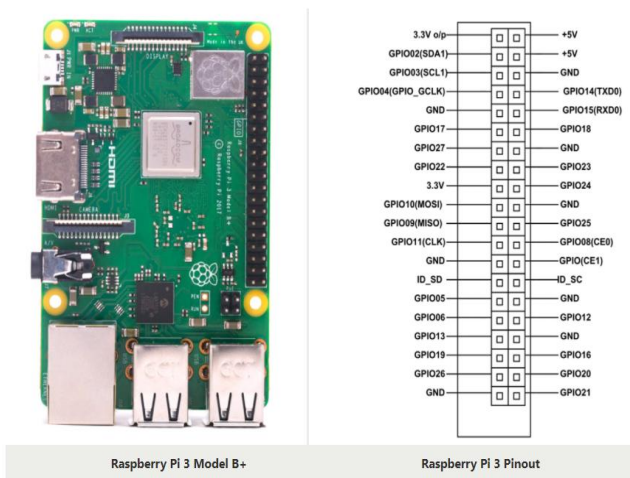


Figure 1: Raspberry pi 3B+ design

It is a development board in PI series. It can be considered as a single board computer that works on LINUX operating system. The board not only has tons of features it also has terrific processing speed making it suitable for advanced applications.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD.

The full specs for the Raspberry Pi 3 include:

- CPU: Quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz
- GPU: 400MHz Video Core IV multimedia

- Memory: 1GB LPDDR2-900 SDRAM (i.e., 900MHz)
- USB ports: 4
- Video outputs: HDMI, composite video (PAL and NTSC) via 3.5 mm jack
- Network: 10/100Mbps Ethernet and 802.11n Wireless LAN
- Peripherals: 17 GPIO plus specific functions, and HAT ID bus
- Bluetooth: 4.1
- Power source: 5 V via MicroUSB or GPIO header
- Size: 85.60mm × 56.5mm
- Weight: 45g (1.6 oz)

Ultrasonic Sensor



Figure 2: Ultrasonic Sensor

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received.

The HC-SR04 Ultrasonic Range Sensor Features:

- Input Voltage: 5V
- Current Draw: 20mA (Max)
- Digital Output: 5V
- Digital Output: 0V (Low)
- Working Temperature:-15°C to 70°C
- Sensing Angle: 30° Cone
- Angle of Effect: 15° Cone
- Ultrasonic Frequency: 40kHz
- Range: 2cm-400cm

Breadboard

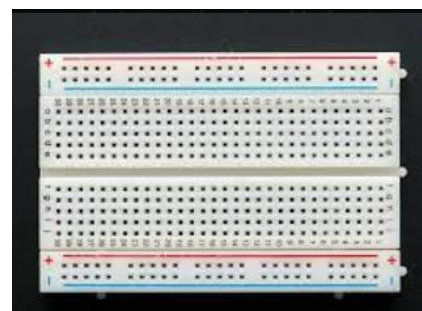


Figure 3: Breadboard

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode).

Buzzer

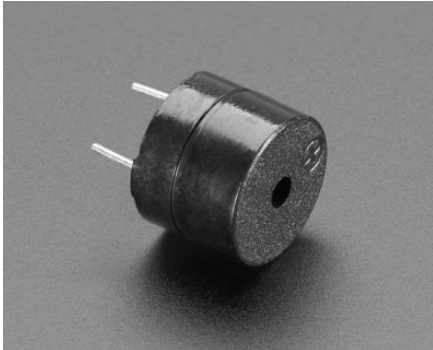


Figure 4: Buzzer

This buzzer is an active buzzer, which basically means that it will buzz at a predefined frequency (2300 ±300 Hz) on its own even when you just apply steady DC power. If you are looking for a buzzer can produce varied tones from an oscillating input signal, then take a look at our passive buzzer.

- Rated Voltage 5 V
- Max Rated Current ≤32 mA Min.
- Sound Output at 10cm 85 dB
- Operating Temperature-20°C to 45°C

Resistor

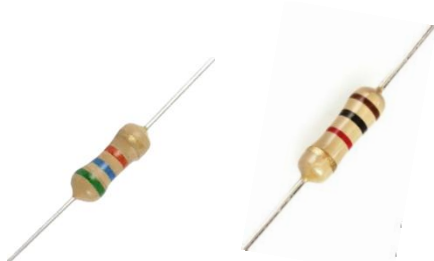


Figure 5: Resistors

The above resistors are of values 1.5k & 1k ohm.

Resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines.

LED



Figure 6: LED

(LED) is a semiconductor device that emits light when an electric current is passed through it.

The MCL053MD is a 5mm HE red round LED Lamp with red diffused lens, through hole mounting, round-shaped lens, 15mcd luminous intensity, 625nm peak wavelength, 45° viewing angle. This LED lamp is made with GaAsP on Gap.

Software Design

1) SMART CAP:

Circuit

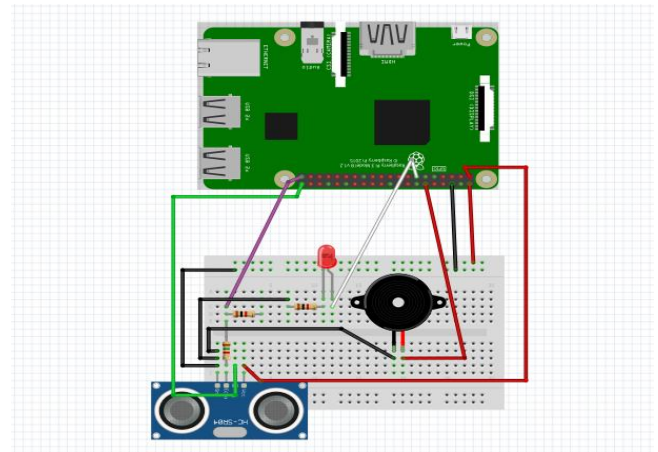


Figure7: Circuit Diagram

Working:

During this pandemic it is mandatory that no two persons come closer to each other to avoid this situation we came up with this device called smart cap. The functioning of this smart cap explains as follows: Whenever a person comes in contact with another person within a specified range of 50-60cm the smart cap will eventually alert a person by giving a beep sound and also by glowing the led so that the person can maintain a particular distance from another person to avoid contact and to be obedient towards COVID protocols.

Applications:

The use of this smart cap can be implemented at several places like:

- Shopping malls
- Restaurants
- Educational Institutes
- Railway Stations
- Airports
- Bus Stops
- Theatres etc.

Real Time Images of Smart CAP



Figure 8: Top View

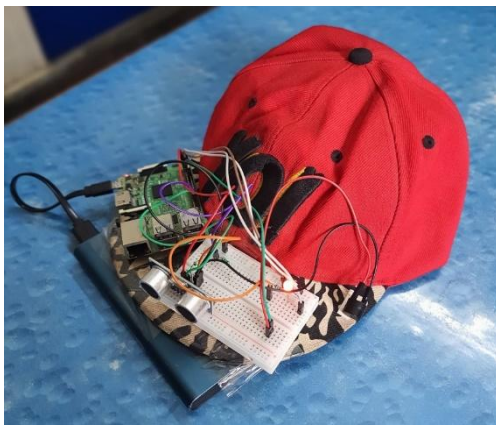


Figure 9: Front View

There's a red LED in the onboard FLASH memory.

2) Smart Blind Stick:

Circuit:

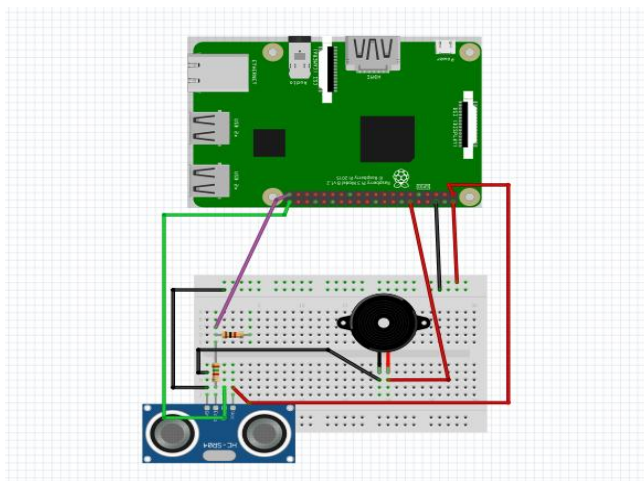


Figure 10: Circuit Diagram

Working: We build this device for the visually impaired to guide the user to respective destination and avoiding to collide with the obstacles. The functioning of this smart stick explained as follows: Whenever a person comes in contact with any obstacles within a specified range of 80cm the smart stick will give an alert to the person by giving a beep sound so that the person can beware of the

coming obstacle and can safe guard himself from the obstacle this way the smart blind stick will help the blind people to secure themselves without depending on others.

Real-Time Image of Smart Blind Stick:

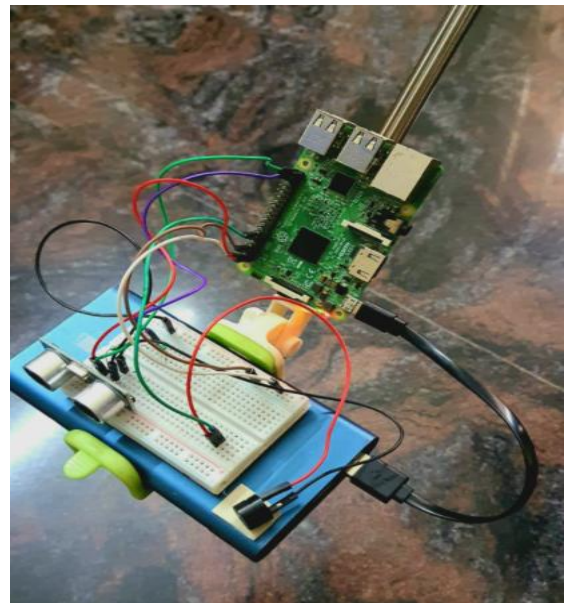


Figure 11: Blind stick

Applications:

The use of this smart Blind stick can be implemented at several places like:

- Shopping malls
- Restaurants
- Educational Institutes
- Railway Stations
- Airports
- Bus Stops
- Theatres etc.

Stimulation of Smart Cap:

When a person comes closer to another person wearing a smart cap, the ultra-sonic sensor will detect the distance and if the distance is in identified range (under 50cm) it will automatically alerts the buzzer and it beeps per second, as the person progresses further towards (i. e. below 15cm) the buzzer starts beeping continuously and the led glows simultaneously which indicates that the person is very near to us.



References

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Stimulation of Smart Blind Stick:

When a person comes closer to an obstacle carrying a smart blind stick, the ultra-sonic sensor will detect the distance and if the distance is in identified range (under 80cm) it will automatically alerts the buzzer starts beeping continuously which indicates that the person is very near to the obstacle so that he can safeguard himself from the obstacle.



3. Conclusions

Internet of Things is a significant technology which facilitates the several advantages in day-to-day life. So, by using the terminology of this we developed two projects which are cost efficient as well as user friendly. By using raspberry pi and ultrasonic sensor as major components of our project we developed these models which interacts with our daily life activities such example is like maintaining person to person distance in this pandemic and also by supporting the blind people to use their blind stick as a smart device which detects the obstacles in their way and alerts them by giving a beep.