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Sensors for Availability using Virtual Interface

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Abstract - As all of us observed at the doors of a Company Manager, a doctor or a head of the organization, we find a sign board displaying whether the person is IN or OUT. This sign board is used to mention the availability of the person sitting on his chair in his covered room. These boards are operated manually. These boards have various designs as per the interest of the person or manufacturer like sliding, hanging, rotating and etc. This mini project brings different approach on the same information. This concept replaces manual operating system by automatic sensor based system. Sensors are smart enough to sense the availability of the person sitting on his chair in his covered room.

Key Words: Arduino Microcontroller, Sensor Monitoring, Indication ,Sign Board, Signage, LED, Arduino IDE.

1.INTRODUCTION

Professional sliding message boards for conference room availability signs, in-session door signs, board room name plates, in use doctor's office signs, medical door signs & sliding in/out employee signs - for government, hospitals and military. See Fig 1

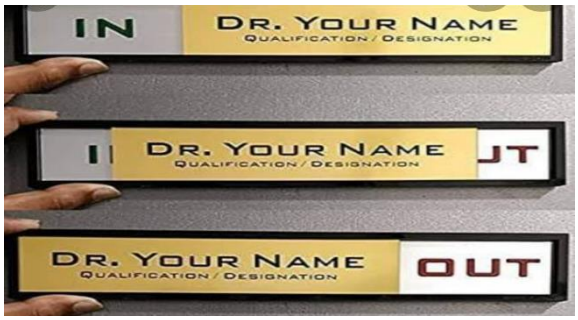

Fig1 IN/OUT Sliding Sign Board

Signage: Signage is generally defined as any kind of graphic display intended to convey information to an audience. What is the purpose of signage?

Typically, signage tends to serve a few common purposes: to promote, identify, provide information, and give directions or to raise safety awareness.

Sign Board: These sign boards can enhance the experience of customer or user, with great and elegantly designed sliding sign to provide information about availability of the person sitting on his chair in his covered room.

Sensors: A sensor is a device that receives a signal or stimulus and responds to the stimulus in the form of an electrical signal. The output signals correspond to some forms of electrical signal, such as current or voltage.

The sensor is a device that receives different kinds of signal i.e. physical, chemical or biological signal and converts them into an electric signal. The sensors are classified into different types based on the applications, input signal, and conversion mechanism, material used in sensor characteristics such as cost, accuracy or range. This mini project brings different approach on the same information. This concept replaces manual operating system by automatic sensor based system. Sensors are smart enough to sense the availability of the person sitting on his chair in his covered room. Sensors for Availability using Virtual Interface (SAVI): With help of data provided by the sensors attached in the room, Light emitting Diodes (LEDs) attached in the sign boards are designed to display the information of IN/OUT availability.

2. BLOCK DIAGRAM

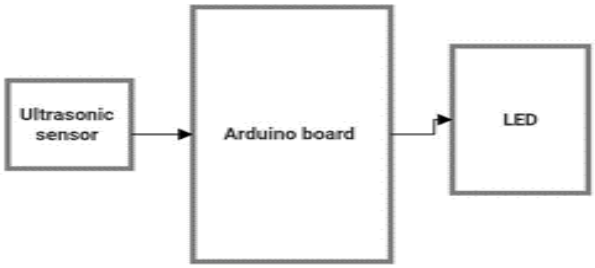

Fig 2 Block diagram of circuit

The fig 2 shows the block diagram of sensors for availability using virtual interface. As shown in the block diagram arduino acts as processing or controlling device .Ultrasonic sensor and power supply are given as input to arduino and led act as output unit.

3. MAJOR COMPONENTS USED

The design and development of this mini-project requires hardware and software tools as listed below.
Hardware requirements: Arduino Uno R3 development board, Ultrasonic Sensors, Connecting wires, Light Emitting Diodes (LEDs).
Software Requirement: Arduino IDE.

3.1 Arduino Uno R3 development board

Arduino UNO R3 (see Fig 3.1) is the perfect board to get familiar with electronics and coding. This versatile microcontroller is equipped with the well-known ATmega328P and the ATMega 16U2 Processor.

Fig 3 Arduino Uno development board

3.2 Ultrasonic sensors

Ultrasound is a high-pitched sound wave whose frequency exceeds the audible range of human hearing. An HC-SR04 ultrasonic distance sensor actually consists of two ultrasonic transducers. One acts as a transmitter that converts the electrical signal into 40 KHz ultrasonic sound pulses. The other acts as a receiver and listens for the transmitted pulses.

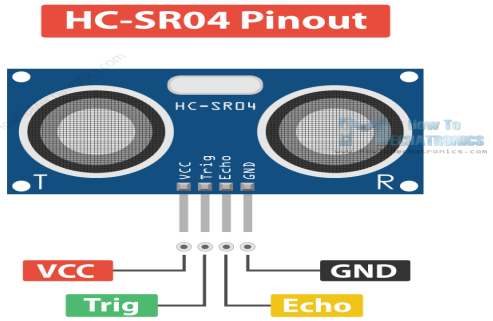

Fig 4 Ultrasonic sensors

When the receiver receives these pulses, it produces an output pulse whose width is proportional to the distance of the object in front.This sensor provides excellent non-contact range detection between 2 cm to 400 cm (~13 feet) with an accuracy of 3 mm. Since it operates on 5 volts, it can be connected directly to an Arduino or any other 5V logic microcontroller.

VCC supplies power to the HC-SR04 ultrasonic sensor. You can connect it to the 5V output from your Arduino.

Trig (Trigger) pin is used to trigger ultrasonic sound pulses. By setting this pin to HIGH for 10µs, the sensor initiates an ultrasonic burst.

Echo pin goes high when the ultrasonic burst is transmitted and remains high until the sensor receives an echo, after which it goes low. By measuring the time the Echo pin stays high, the distance can be calculated.

GND is the ground pin. Connect it to the ground of the Arduino.

3.3 LED

Fig 4 LED

Light Emitting Diode or simply LED is one of the most commonly used sources of light now-a-days. Unlike (almost) legacy filament bulbs, LEDs (and fluorescent bulbs) need a special circuit to make them work. They are simply called as LED Drivers. The reason for such wide range of implementation of LEDs is its advantages over traditional incandescent bulbs and the recent compact fluorescent lamps (CFL). Few advantages of LEDs over incandescent and CFL light sources are mentioned below:

- Low Power Consumption
- Small Size
- Fast Switching
- Physically Robust.

3.3 Arduino IDE

Before we start controlling the world around us, we need to set up the software to program our board. The Arduino Software (IDE) allows us to write programs and upload them to our board. In the Arduino Software page we will find two options: If we have a reliable Internet connection, we should use the online IDE (Arduino Web Editor). It will allow us to save our sketches in the cloud, having them available from any device and backed up. We will always have the most up-to-date version of the IDE without the need to install updates or community generated libraries. If we would rather work offline, we should use the latest version of the desktop IDE. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

4. WORKING

Now that we have a complete understanding of how the HC-SR04 ultrasonic sensor works we can start connecting it to our Arduino! Connecting the HC-SR04 to Arduino is very easy.

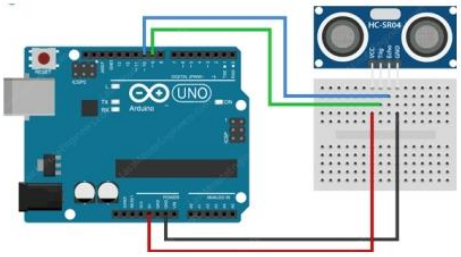

Fig 5 Connecting the HC-SRO4 to arduino

Start by placing the sensor on your breadboard. Connect the VCC pin to the 5V pin on the Arduino and the GND pin to the ground pin. Now connect the trig and echo pins to digital pins #9 and #10 respectively. When you are done you should have something that looks similar to the illustration shown below.

5. CODE EXPLAINATION

The sketch starts by including the newly installed NewPing library.

```
#include”newping.h”
```

First the Arduino pins are defined to which the Trig and Echo pins of the HCSR04 are connected. We have also defined a constant called MAX_DISTANCE. It
will set a maximum distance where pings beyond that distance are read as no ping “clear”. MAX_DISTANCE is currently set to 400 [default = 500cm].

```
#define TRIGGER_PIN 9

#define ECHO_PIN 10

#define MAX_DISTANCE 400
```

After this, an instance of NewPing library named sonar is created.NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);In the setup, we initialize the serial communication with PC.

```
void setup()

{

Serial.begin(9600);

}
```

In the loop, we simply call the ping_cm() function and print the result on the serial monitor. This function sends a ping and returns the distance in centimeters.

```
void loop()

 {

Serial.print("Distance = ");

Serial.print(sonar.ping_cm());

Serial.println(" cm");

delay(500);

}
```

6. RESULTS

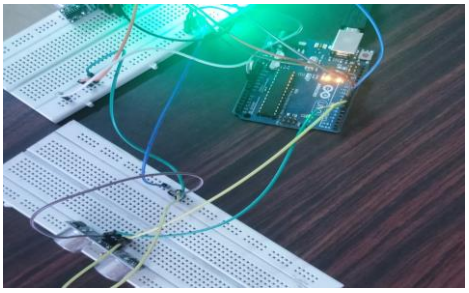

Fig 6 Making of project on board

Fig 5.1 is explaining the on board connections made to perform
1) Collect all components
2) Connect Arduino Uno R3 board to PC
3) Write program in Arduino IDE development platform
4) Upload the program on to microcontroller at Arduino kit
5) Do connect Ultrasonic sensor and LED as per circuit designed
6) Observe results for test, record, rebuild and etc procedures to achieve accurate results.

Here the results obtained by testing sensor to identify whether the faculty is available or not on the chair.
LED ON indictes person is available.
LED OFF indictes person is absent.

Fig 7 Testing on sensor

7. CONCLUSION AND FUTURE SCOPE

Sensors are smart enough to sense the availability of the person sitting on his chair in his covered room. This mini project brings different approach on a sign board displaying whether the person is IN or OUT. This concept replaces manual operating system of boards that have various designs (like sliding, hanging, rotating) by automatic sensor based system.

Future Scope:

- This concept may be implemented for following features
- Increase the coverage area of sensors
- Accuracy improvements
- Installing on vehicles at front and rear to detect obstacles

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