Team Shunya Project Assignment(Self Mini Project)

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0.1 Implementation of footfall counter system (counting people in the room using Arduino)

Here is the two ways . By using them we can count the number of people in a room.

0.1.1 Implementation 1.)

With the help of Arduino UNO we can make automated counter system which is an efficient way to count the number of people who are entering or leaving the room. We can make such type of Arduino UNO based system by using Infrared sensor,piezoelectric sensors and development board Arduino UNO. We use the series of piezoelectric sensors which are placed under a mat between the two infrared sensors. The sensors collect the data and sends to the arduino which maintains the count.We can operate this system using low voltage.(IR sensors use Infrared light to determine whether or not an object is present)

0.1.2 Implementation 2.)

In this implementation we can use Arduino Nano R3 board.With this board we use Ultrasonic Sensor ,$16 * 2$ LCD,Relay and for power supply we use battery and breadboard.The advantage of this system is it can easily work in sunlight because sometimes IR sensor doesn't in sunlight. This system counts the number of people and then display the entire data in 16*2 Lcd display that how many persons are entering inside or exiting any room.

0.1.3 Sensors used in Implementation 1

In this Arduino UNO based counter system we used two Infrared Sensors which are placed at entry and exit of a room.
Also we uses the series of piezoelectric sensors which are placed under a mat

between two Infrared Sensors.
(We can use $16 * 2$ LCD instead of piezoelectric sensors for this project as well).

0.1.4 Sensors used in Implementation 2

In this counter system we uses Ultrasonic sensor based counter system. We uses 1 Ultrasonic sensor ,LCD and some basic electric components. We uses the LCD board to count the number of people who are leaving or exiting the room. (Advantage of Ultrasonic sensor=> It works very well in sunlight but some times the IR sensor doesn't work well in sunlight)

0.1.5 Algorithm behind Infrared sensor based counter system

a.)Infrared Sensors=>An infrared (IR) sensor emits and detects infrared radiation. This infrared sensor has three pins Vcc,gnd and Vin.We connect the Vcc pin to the 5V supply to power up the sensor.The gnd pin is connected to the ground and the Vin pin connected to the one of the digital input/output (I/O) pins of arduino.

b.)Piezoelectric sensors=> The piezoelectric sensor has the ability to convert mechanical stress to electrical energy (AC output).This sensor has two terminals namely positive and negative. The positive terminal is connected to one of the analog pins of Arduino UNO and the negative terminal is connected to the gnd.

c.)Arduino UNO=> Arduino is an open-source microcontroller board based on ATmega328p microcontroller.This board has 14 digital I/O pins for both reading and writing data, and 6 analog pins for reading inpu.It has 3 GND pins. These 3 pins are used as the negative terminal of any sensor or circuit connected to the Arduino.Also there are two power supplies lines .

d.)Method for Project=> This system consists piezoelectric mat. The piezoelectric sensors are distributed evenly on the mat and the connections are made to the analog pin of Arduino UNO board. We have two IR sensors which are installed at either end of the mat at a sufficient height from the ground.These IR sensors are programmed for different works . The first one IR sensor is programmed to detect the entry of a person and it is placed on the exit side of the mat. The second one IR sensor is programmed to detect the exit of a person and it is placed on the entry side of the mat.

When a person enters and passes through the mat, the weight of the person, which is in the form of external stress to the piezoelectric sensor, is converted into an electrical signal.

The electric signal is greater than a certain threshold, and the digital output is high. The threshold value is set so that whenever a person passes through the mat it records the signal and the value is high for a certain period of time. The person then passes by the IR sensor which detects the entry.

The algorithm is designed in such a way that if both piezoelectric and the entry IR sensor are high at the same time, it detects the person and the count is increased by one.

When a person exits and passes through the mat, the weight of the person is converted to an electrical signal, which surpasses the threshold and is set high. The person then passes by the IR sensor which detects the exit. Now since both the sensors (piezoelectric and exit IR sensor) are set high, the system detects the person is leaving and the count is decreased by one.

The person passes through both the IR sensors but since there is a delay in activating the piezoelectric sensor, only one of the sensors get time to detect by the time a person passes through the system and count is detected. This system is worked for multiple entries as well.

We define the two variables. 1st for the people entering the room and 2nd for people exiting the room.We initially set the count as zero and we set the pin mode using commands.
When some person enter in the room then an electrical signal is generated by the help of sensors and its value stores in the 1st variable and if the variable value is same as some predefined value then the count increases by 1. Also we set some random value for delay in the code.
When some person leaves in the room then an electrical signal is generated by the help of sensors and its value stores in the 2st variable and if the variable value is same as some predefined value then the count decreases by 1.
Based on this the system works.

0.2 Implementation of wave generator using Arduino =>

0.2.1 Required materials for wave generator =>

1. Arduino UNO
2. 16*2 Alphanumeric LCD display
3. Rotary Encoder
4. Resistor(5.6K,10K)
5. Capacitor (0.1uF)
6. Perf board, Bergstik
7. Soldering Kit

0.2.2 Algorithm to produce a square wave with a 50% duty cycle =>

First assume that we set the Pin 10 for generating the pulses and Pin 3 for reading the generated pulse.I set the low signal value as 0 and high as 1.Also set some pin modes like pin no.10 for output and pin no. 3 for input. With the help of Timer1.initialize(T) command we can set the value of Time period T.

With the help of Timer1.pwm(Y,X) command where Y is outPin and by giving the some value to the X in between 0 and 100 we can set the duty cycle.We want the duty cycle value as 50% so for this we set X=50.

This command Timer1.pwm(Y,X) sends the pulse to the Pin Y with the

duty cycle X.(Y is a random value for pin and exists at Arduino Board.Here in this algorithm it is 10)

Initially we set the pulse value as zero.With the help of digitalRead(Z) command we can change the value of pulse .Here Z is the Pin number who reads the value of pulse and in this case Z=3.

0.2.3 Principle behind the Wave Generator

A wave generator is one of a class of electronic devices that generates electronic waves with set properties of amplitude, frequency, and wave shape. Let Vs(t) is a specified function of time. A practical wave generator is modeled as an ideal wave generator connected to a series source resistance (output resistance) Rs and other components.The terminal voltage, v(t), is the output of the wave generator and depends on the terminal current, i(t), and Rs, Vs(t) and other components which we use.Sine , square and triangular pulses are are characterized by three parameters: frequency (or period), amplitude, and DC (Offset) value. The pulse train is associated with frequency,amplitude and pulse duration.These parameters can be set to any value in the operation range of the wave generator, using the external controls. In general, Amplitude ranges of signal generators vary from 10 mV to 20 V, and frequency ranges vary from 1µHz to 40 MHz. This means waves for which the amplitude and frequency can be set to any value in these ranges can be generated using these wave generators.

0.2.4 Prepared code for this Project

```
#include <TimerOne.h>
const int outPin=10; //generated pulse signal
const int inPin=3; //reads generated pulse signal
int values=0; //pulse value//expected value will be 0 or 1
void setup{}{
Serial.begin(6900);
pinMode(outPin,OUTPUT);
pinMode(inPin,INPUT);
Timer1.initialize(100); //f=1/(100*10^-6)
Timer1.pwm(outPin,50);
}
void loop{}{
values=digitalRead(inPin);
Serial.print(values); //print the values
}
```