

Bi-Directional Digital Visitor Counter

1. Abstract

In today's world, there is a continuous need for automatic appliances. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Many times we need to monitor the people visiting some places like shopping malls, conference room seminar halls etc. To provide solution for this we implemented a project called '**Bi Directional Digital Visitor Counter**'. Basic concept behind this project is to measure and display the number of persons entering in any room. This works in a two way. That means counter will be incremented if person enters the room and will be decremented if a person leaves the room

2. Introduction

A counter that can change its state in either direction, under control of an Up-Down selector input, is known as up-down counter. The circuit can count numbers from 0 to 99 in up and down modes depending upon the state of the selector. It can be used to count the number of persons entering a room in the up mode. In the down mode, it can count the number of persons leaving the room by decrementing the count. The circuit divided in three parts: transmitter, controller and counter display. The sensor would observe an interruption and provide an input to the collector which would run the counter in up/down mode depending upon the selector setting. The same count is displayed on a set of 7-segment display through the controller.

3. Electronic Components

The following components were used in making the Bi Directional Digital Visitor Counter with 7 Segment Display:

- Resistors
- Variable resistor (5k)
- Capacitors
- Diodes (1n4148,4001,4007)
- 7806 Voltage Regulator
- Transistors (A564,C945,D1111)
- IR LEDs
- 555 Timer
- Relay
- 737 Sensor
- Base 8 pin for 555
- Transmitter
- BCD 7 segment common cathode
- Decade Up/Down Counter (CD40110B)
- Push buttons

4. Working of Electronic Components

Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.



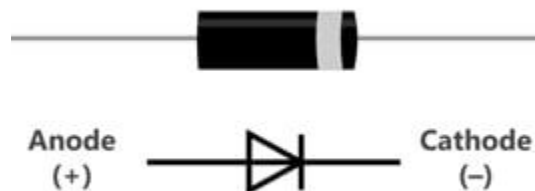
Variable Resistor

It is a resistor of which the electric resistance value can be adjusted. A variable resistor is in essence an electro-mechanical transducer and normally works by sliding a contact (wiper) over a resistive elements.



DIODE

Diode is an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex. The most common type of diode uses a p-n junction. When this junction is forward biased (that is, a positive voltage is applied to the p-side), electrons can easily move across the junction to fill the holes, and a current flows through the diode. And in reverse biased condition, no current flows through the diode.



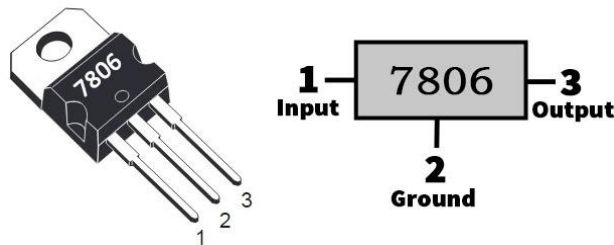
Capacitor

A capacitor is an electrical component that absorbs and stores energy from a battery. The terminals are connected to two metal plates on the inside, which are separated by a non-conducting material. When a capacitor is engaged, it swiftly discharges electricity in a fraction of a second.



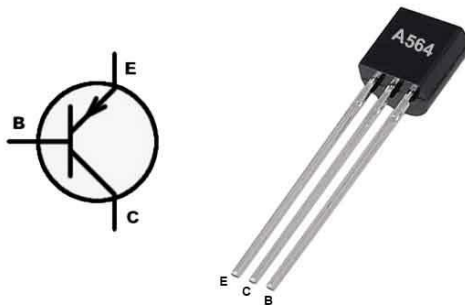
7806 Voltage Regulator

A voltage regulator produces a fixed output voltage of a predetermined magnitude that stays constant independent of changes in the input voltage or load circumstances. It compares the output voltage to a precise reference value and makes adjustments to the pass device to keep the output voltage constant.



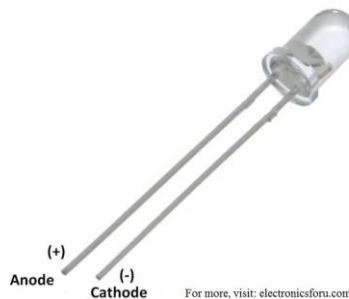
Transistor

A transistor is a miniature electronic component that can do two different jobs. It can work either as an amplifier. When it works as an amplifier, it takes in a tiny electric current at one end and produces output current at the other. It can also work as switches. A tiny electric current flowing through one part of a transistor can make a much bigger current flow through another part of it. In other words, the small current switches on the larger one.



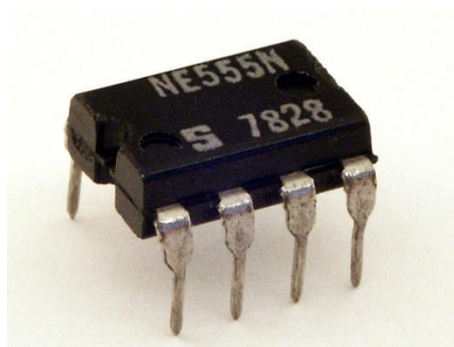
IR LEDS

IR LED emits infrared light, means it emits light in the range of Infrared frequency. We cannot see Infrared light through our eyes, they are invisible to human eyes. The wavelength of Infrared (700nm – 1mm) is just beyond the normal visible light. Everything which produce heat, emits infrared like our human body. Infrared have the same properties as visible light, like it can be focused, reflected and polarized like visible light.



555 Timer

It is a useful precision timing device which can act as either a simple timer to generate single pulses or long time delays, or as a relaxation oscillator producing a string of stabilized waveforms of varying duty cycles from 50 to 100%.



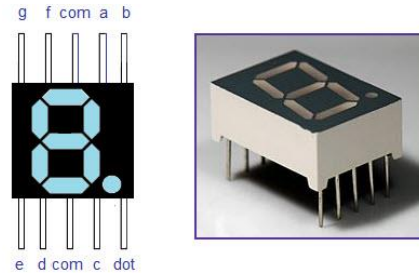
Relay

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit.



BCD 7 segment common cathode

It is a digital display module specialized to display numbers, with LEDs arranged in segments to form numerals.

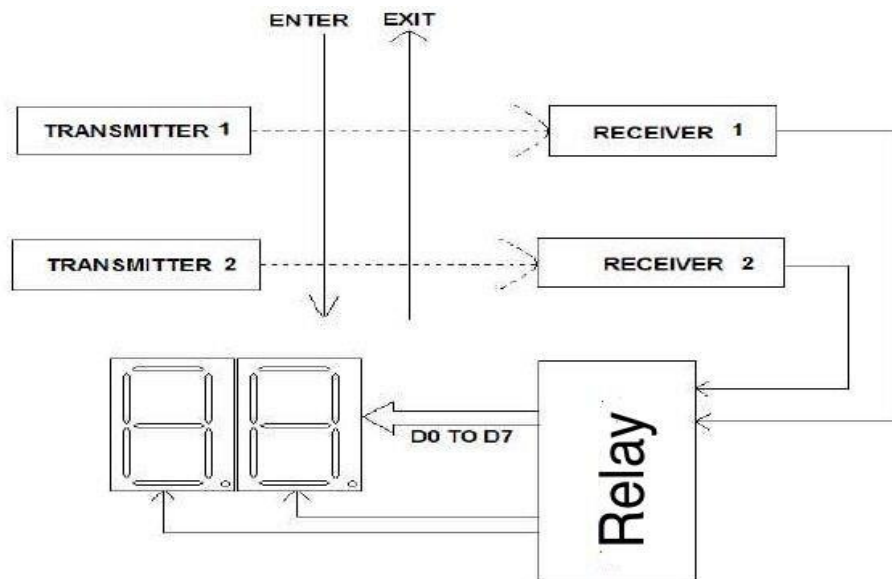


Decade Up/Down Counter (CD40110B)

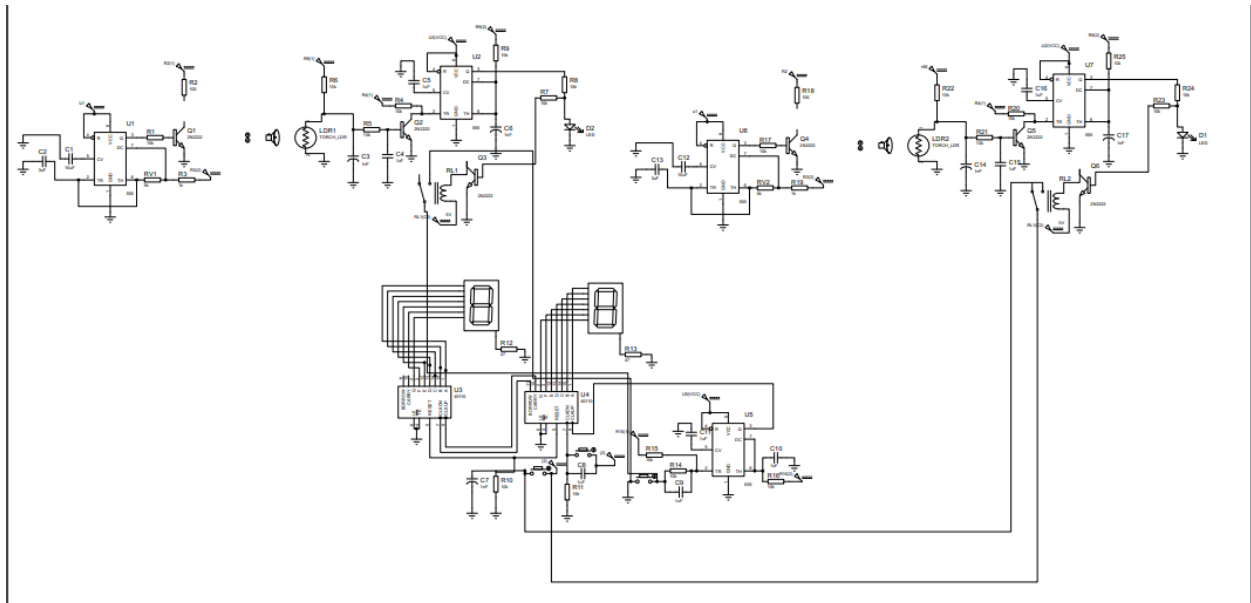
It is a dual clocked up/down counter with a special preconditioning circuit that allows the counter to be clocked, via positive going inputs, up or down regardless of the state or timing of the other clock line.



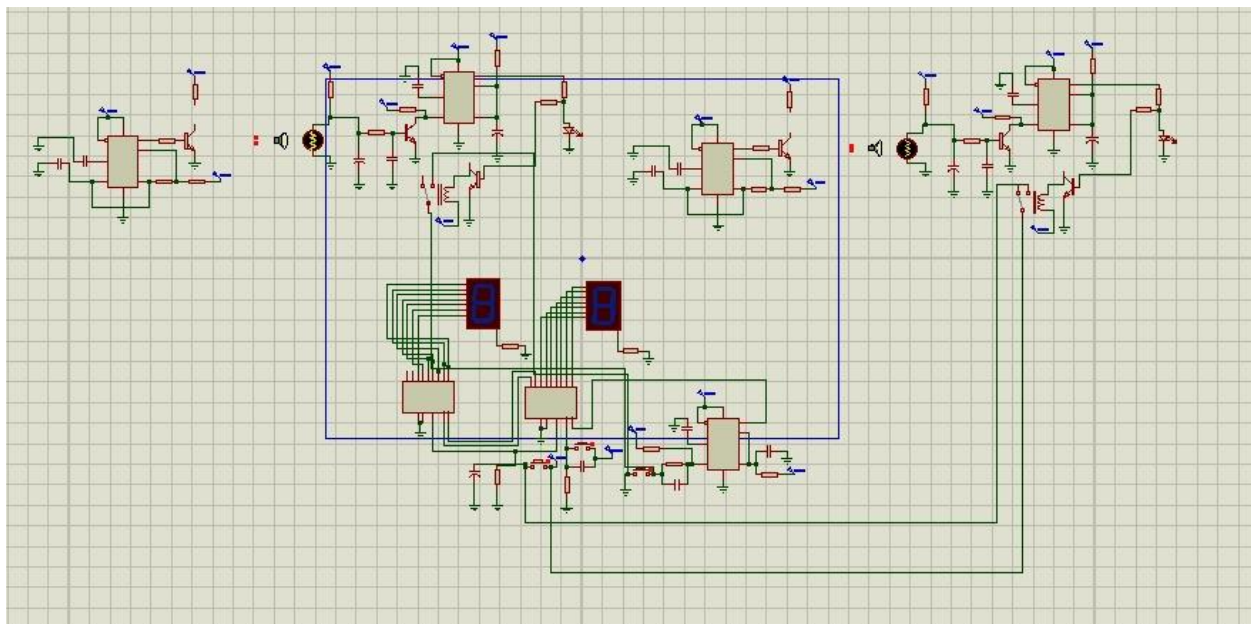
5. Block Diagram



6. Circuit Diagram



7. Proteus Simulation



8. Working

Transmitter

The power passes through the capacitors to 555 timer. The capacitors removes the ripples. 555 timer acts as a power amplifier in the transmitter circuitry. After the 555 timer, power transistor D313 is added. It solidifies the voltage that is coming from the timer. On the base, variable resistor is added. The variable resistor varies the flow of electrons from emitter to collector. In short, the variable resistor, controls the intensity of IR-LEDs. After power transistor, infrared LEDs are connected. It transmits the infrared rays, the receiver receives it.

Receiver

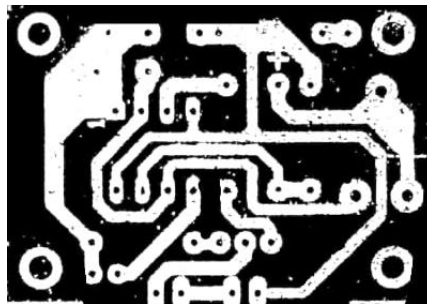
On the receiver side, a sensor/receiver receives the IR-rays. The sensor sends the signal to the 555 IC. The IC further gives output to relay. A led turns on whenever the signal is received. Relay also turns on each time the signal is interrupted. A variable resistor sets the relay time. A zener diode and a capacitor is added before the relay to stop the voltage in backward direction.

Timer

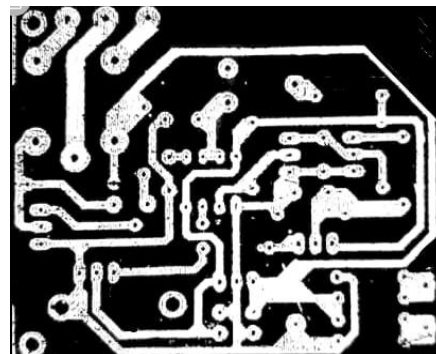
The push button is in parallel with the relay. As the relay turns on, the contacts of push buttons shorts, and then the counter counts (increment/decrement). 40110 ICs drives the bcd 7 segments (common cathode). Three push buttons are added in the circuit for add, reset, and subtract.

9. PCB Layout

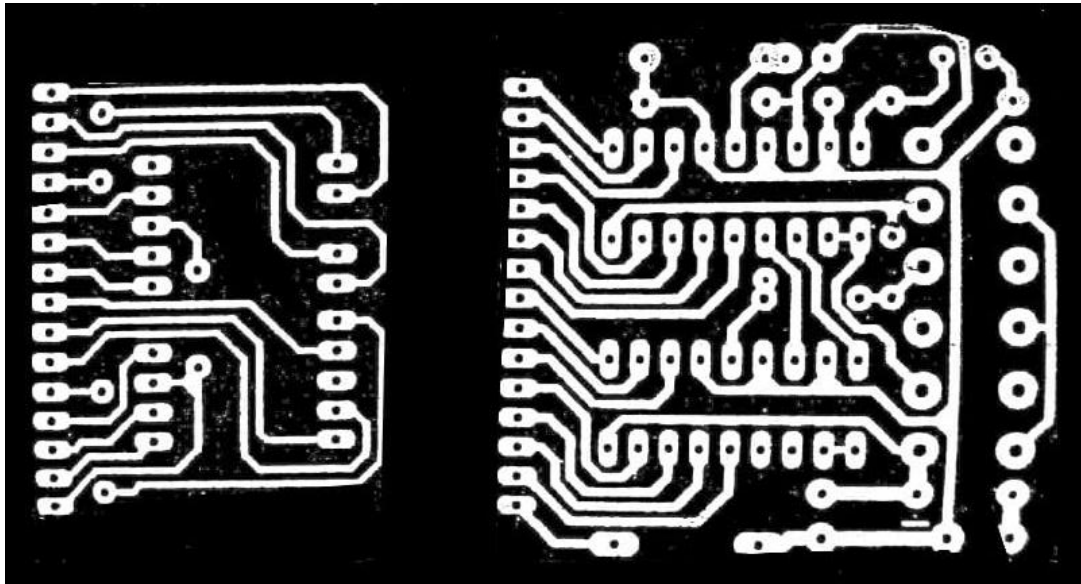
Transmitter



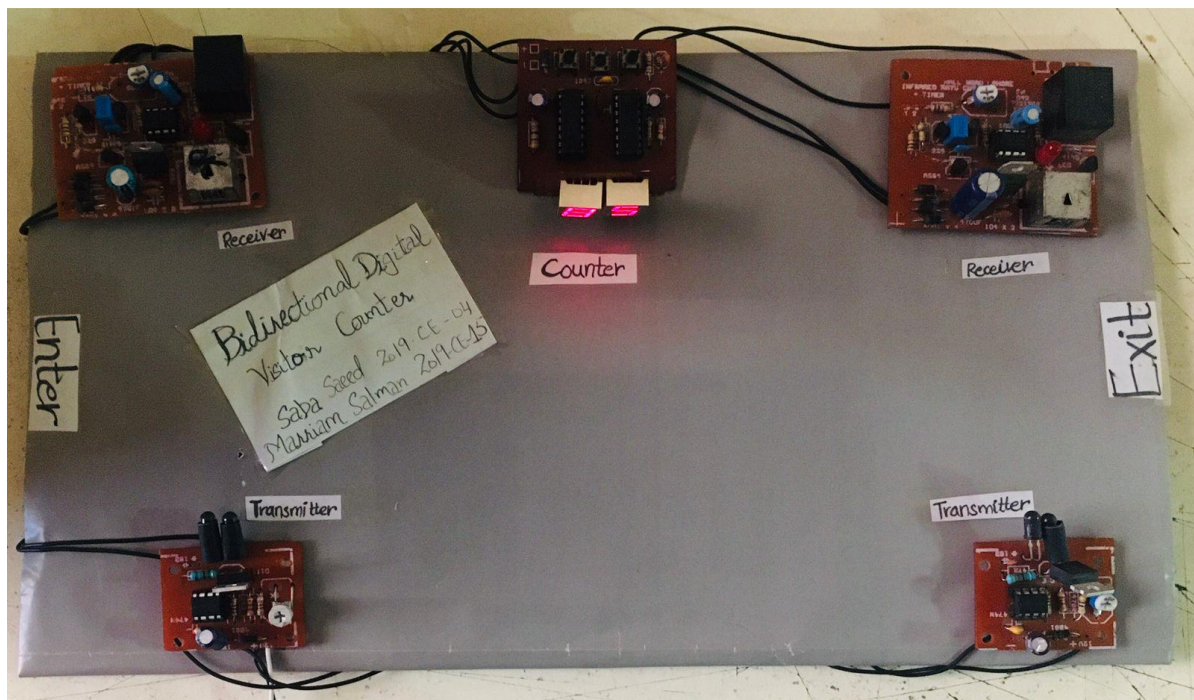
Receiver



Timer



10.Final Circuit



11.Conclusion

This Project is a real-life model which have the ability to perform the task of counting in both direction. Not only it will increase it's counter when any person will enter the room but also when any person leaves the room,counter's value reduce considerably.

12.Applications

- For counting purposes.
- It can be used at homes and other places to keep a check on the number of persons entering a secured place.
- This will help control the crowd inside to ensure practical social distancing during the pandemic.

References

- [1] <https://www.slideshare.net/Abhishekvb/a-report-on-bidirectional-visitor-counter-using-ir-sensors-and-arduino-uno-r3>
- [2]https://www.academia.edu/28704418/Mini_Project_Report_Digital_Visitor_counter_using_8051_Microcontroller_AT89C51_NALLA_NARASIMHA_REDDY_GROUP_OF_INSTITUTIONS_INTEGRATED_CAMPUS_Nalla_Narasimha_Reddy_Group_of_Institutions