Topic

BI-DIRECTIONAL VISITOR COUNTER FOR POWER AUTOMATION IN SHOPPING MALL

OVERVIEW

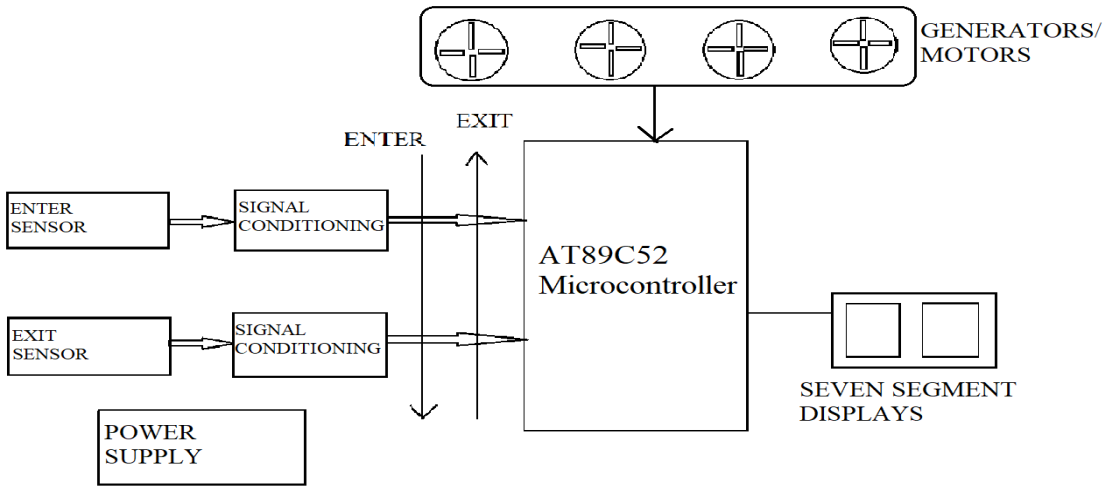
Objective: The aim of this project is to make a model based on a microcontroller to count the number of people entering a mall then enable the required number of motors or engines based on the number of people inside the mall using Proteus Simulation Software**.**

Materials & Method: The "Bi-directional Visitor Counter for Power Automation in shopping mall" project uses the ***AT89C52 microcontroller*** that takes over the role of controlling the motors required for operation of the mall and quite accurately count the number of people/visitors in the mall. The signals from the **Infrared (IR)** sensors (here in Proteus Software we use switches) will be received by the model and this signal will work under the guidance of the program stored in the ROM.

Results: The project is a real-life model capable of carrying out the mission of counting in both directions. Not only will it raise the counter when any individual enters the mall through the entry, but also when any person exits the mall through the exit, the value of the counter decreases accordingly.

Conclusion: In today's world, with the rise in standard of living, there is a continuous need for automation, a sense of urgency for evolving circuits that would ease the complexity of life. The knowledge of the number of people in a space is of great value in current times, like during COVID to improve the regulation.

BLOCK DIAGRAM



CIRCUIT COMPONENTS

1. Resistor
2. Diode
3. Electrolytic Capacitor
4. Ceramic Capacitor
5. 11.0592Mhz Crystal Oscillator
6. AT89C52(Microcontroller)
7. RAM and ROM in 8052
8. Electric Motor
9. Electric Relay
10. BC547 Transistor
11. 7-Segment Displays

Resistor:

For example, a resistor is positioned in series with a motor to restrict the current flowing through the motor. Resistors limit the flow of electric current.

Electrolytic Capacitor:

An electrolytic condenser is a condenser where one electrode consists of a special metal on which an oxide layer is formed. This layer of thin oxide serves as the capacitor's dielectric. An electrolyte coats the oxide layer's surface and functions as the capacitor's second electrode.

Ceramic Capacitors:

A ceramic capacitor is a condenser with a fixed value in which the ceramic material serves as the dielectric. It is made of two or more ceramic alternating layers and a metal layer serving as the electrodes. The electrical behavior and thus the applications are described by the composition of the ceramic material

11.0592MHz Crystal Oscillator:

It provides 11.0592 Mhz frequency clock pulses. For Intel 8052 microprocessors, it is a typical clock that uses the mechanical resonance of a vibrating piezoelectric material crystal to produce an electrical signal with a very precise frequency. This frequency is widely used to keep track of time, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The quartz crystal is the most common type of piezoelectric resonator used, so oscillator circuits incorporating them have become known as crystal oscillators.

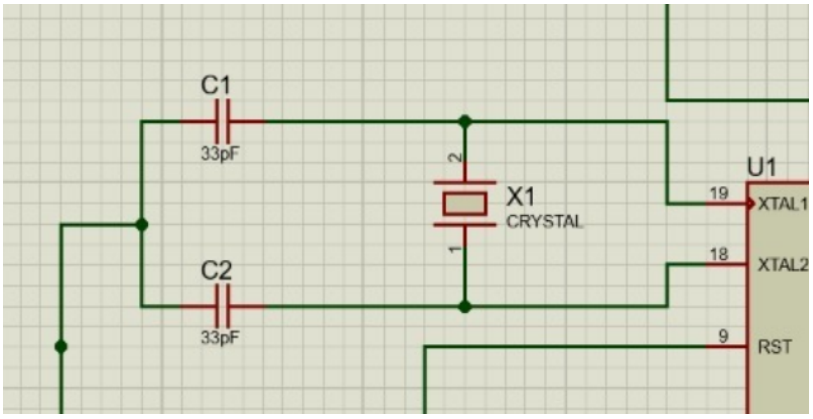


Figure4:11.0592MHzCrystal Oscillator and Schematics

By taking a voltage signal from the quartz resonator, amplifying it, and feeding it back to the resonator, the crystal oscillator circuit sustains oscillation. The resonant frequency is the rate of expansion and contraction of the quartz, and is determined by the cut and size of the crystal. When the energy of the output frequencies produced corresponds to the losses in the circuit, the oscillations sustained.

AT89C52:

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to much-embedded control applications.

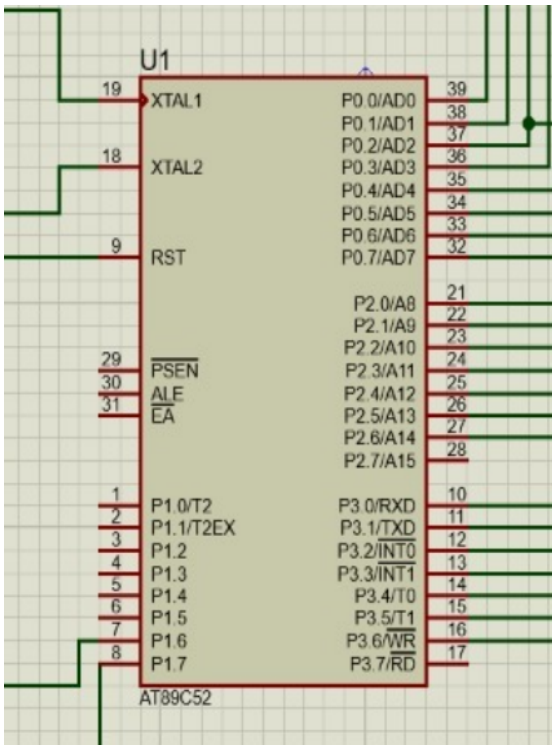


Figure 9: AT89C52

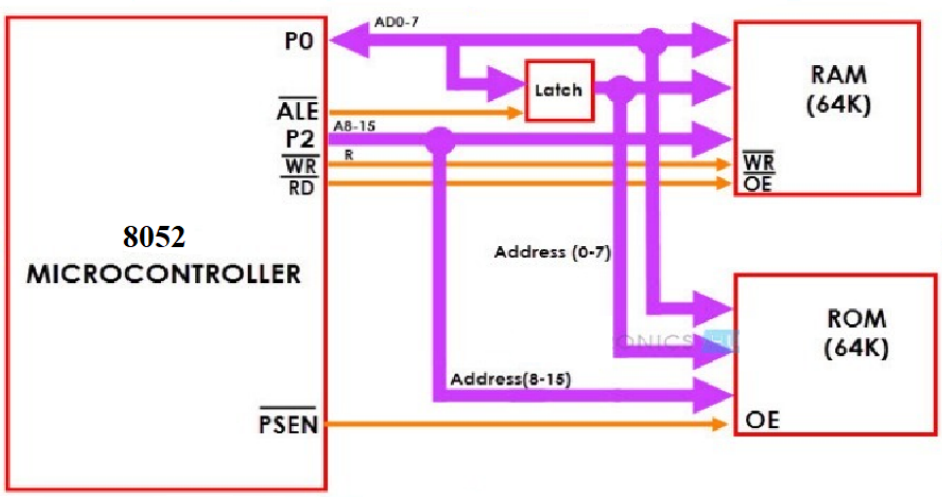


Figure 11: RAM and ROM in 8052

External Memory Code :

Code (or program) memory that exists off-chip is External Code Memory. Sometimes, this is in the form of an external EPROM.

Code Memory:

The memory of the code is the memory that contains the actual program 8052 to be executed. This memory is limited to 64K and comes in several shapes and sizes: on-chip code memory can be found, either burned as a ROM or EPROM into the microcontroller. In an external ROM or, more generally, an external EPROM, code can also be stored entirely off-chip. Also, Flash RAM is another common way to store a program. It is also possible to use different combinations of these memory types—that is, it is possible to have 4K of code memory on-chip and 64k of code memory off-chip in an EPROM.

Registers:

In the CPU, registers are used to temporarily store information. The data may be a byte of the data to be processed or an address pointing to the information to be retrieved. There's just one data form for the 8052: 8 bits. For an 8-bit data form, before it is processed, any data greater than 8 bits needs to be divided into 8-bit chunks. A(accumulator), B, R0, R1, R2, R3, R4, R5, R6, R7, DPTR (data pointer) and PC are the most widely used registers of the 8052 (program counter). Apart from DPTR and the program counter, all of the above registers are 8-bit registers. For all arithmetic and logic instructions, the accumulator A is used.

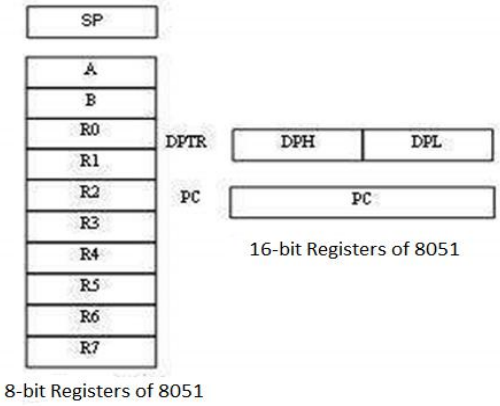


Figure 12: 8-Bit and 16-Bit Register

Relay:

A relay is a switch that is electrically operated. Many relays use an electromagnet to control a switch mechanically, although other operating concepts, such as solid-state relays, are often used. Relays are used where a low-power signal is required to operate a circuit, or where several circuits have to be controlled by one signal.

7-Segment Display:

The LTS 542 is a seven-segment monitor with a single digit height of 0.52 inches. This appliance uses Hi-eff. The red LED chips on the GaP substrate are made from GaAsP and have a red face.
Characteristics:

- Common Anode
- 0.52 Inch Digit Height Height
- Uniform Continuous Segments
- Need for low power
- Appearance of outstanding characters
- Strong Luminosity & High Contrast
- Broad Angle of Viewing

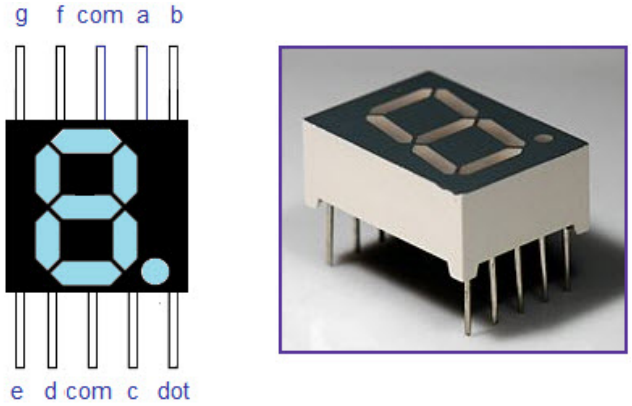


Figure 17: 7-Segment Display

Binary Inputs	Decoder Outputs							7 Segment Display Outputs
D C B A	a	b	c	d	e	f	g	
0 0 0 0	1	1	1	1	1	1	0	0
0 0 0 1	0	1	1	0	0	0	0	1
0 0 1 0	1	1	0	1	1	0	1	2
0 0 1 1	1	1	1	1	0	0	1	3
0 1 0 0	0	1	1	0	0	1	1	4
0 1 0 1	1	0	1	1	0	1	1	5
0 1 1 0	1	0	1	1	1	1	1	6
0 1 1 1	1	1	1	0	0	0	0	7
1 0 0 0	1	1	1	1	1	1	1	8
1 0 0 1	1	1	1	1	0	1	1	9

Figure 18: Truth Table of a 7-Segment Display

Operation:

The bidirectional counter works as a device which can count in both directions regarding the input given into it for a particular function like in our, case we use an entry and an exit-controlled IR sensor which sense the entry to increase the count by one and then when a person leaves the room the count is decreased by one then the count is varied accordingly and then it is directly connected to various motors which run according to various case of input given by the counter.

In our simulation we have two switches SW2 is entry controlled and SW3 is exit controlled switch which when triggered cause the counter to go up or down. When a person enters through the entry the gate that is passing through the IR sensor the person restricts the signal and it triggers the IR sensor which in turn sets the microcontroller to increase the input by 1 and triggers the motor to start. When similar things happen with the exit gate the IR sensor once again gets the message to stimulate the microcontroller to decrease the count by 1, This process continues till the person is passing through the entry and exit gates.

The counter in turn is connected to the motor, which works differently based on different inputs given to it by

the microcontroller.

Number of people in the room	Number of motors active
0	0
1-24	1
25-49	2
50-74	3
75-99	4

Table of relation between the number of people to the number of motors active

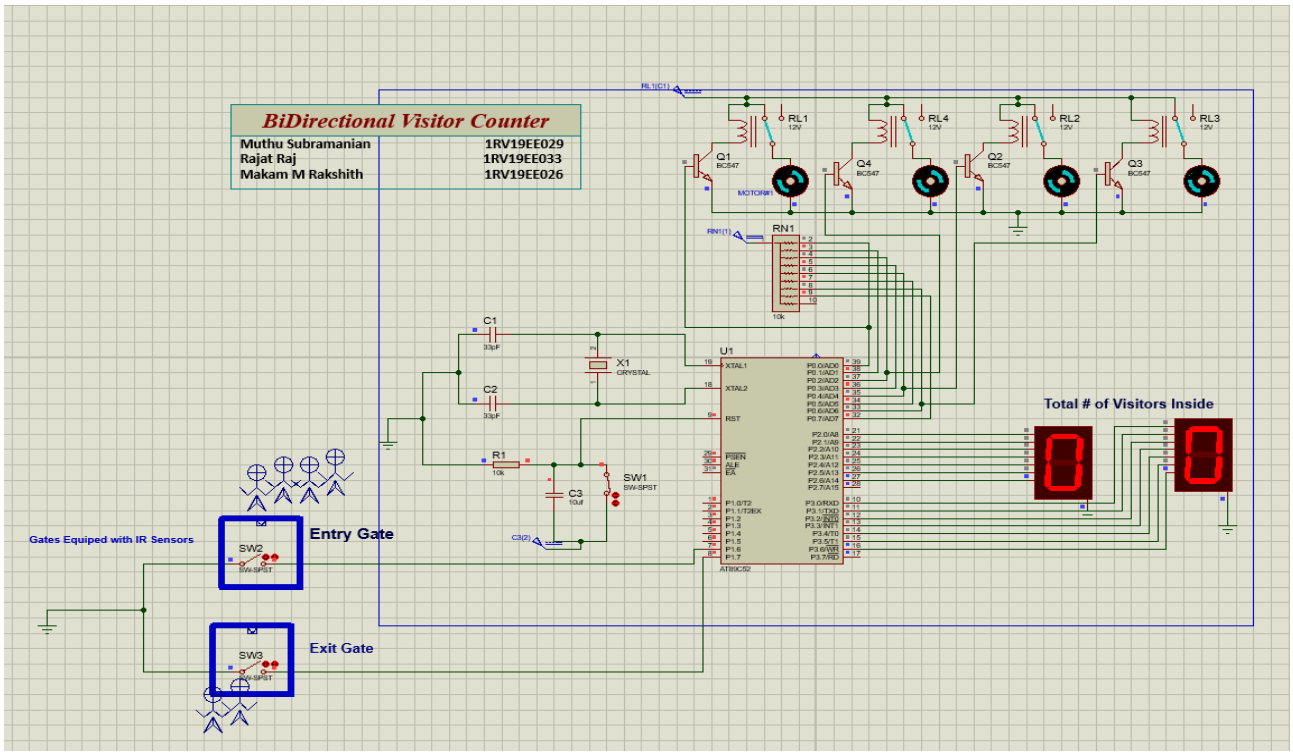


Figure 19: The circuit when there are 0 people, All motors are off; No power generated

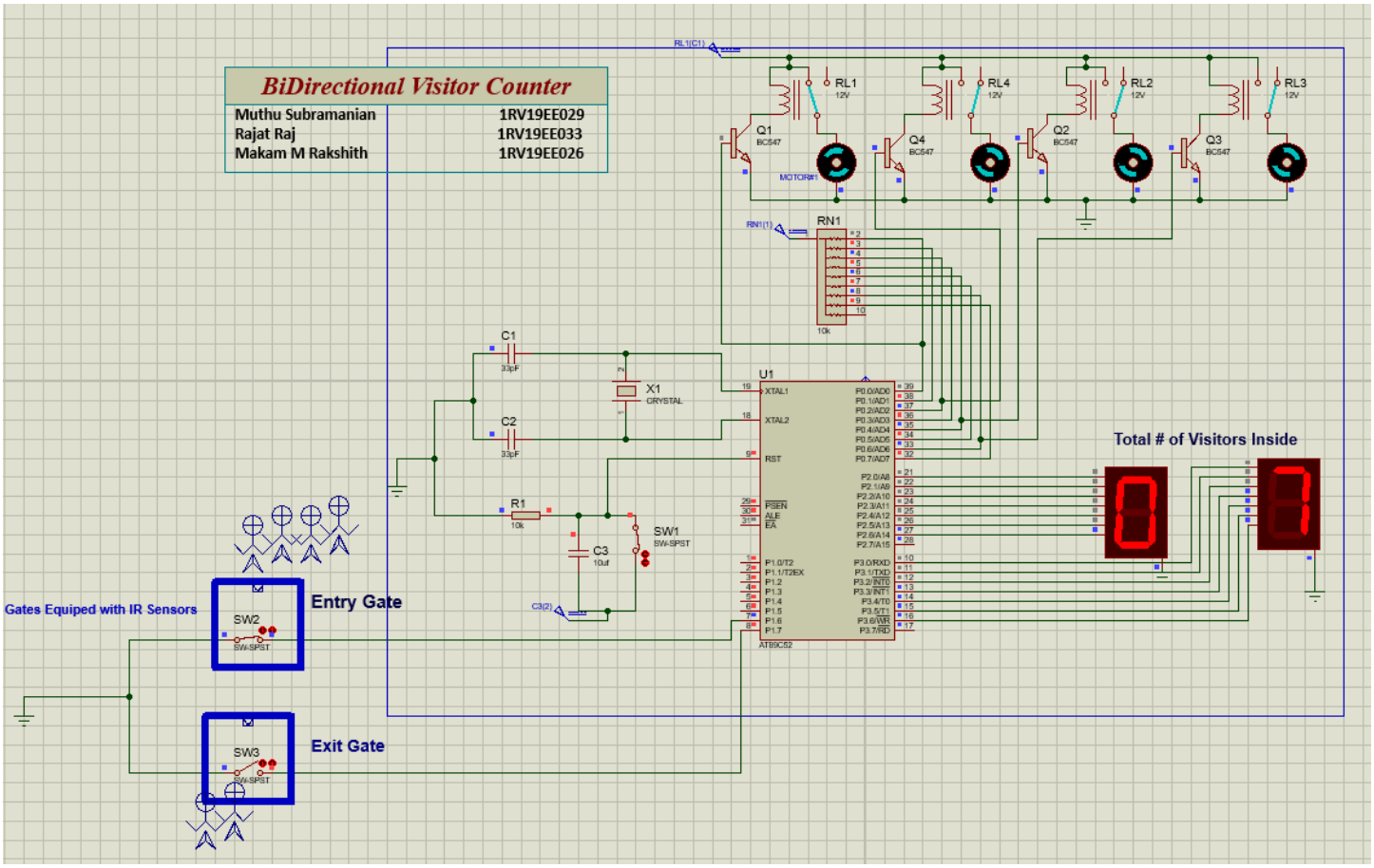


Figure 20: The circuit when number of people are 07 has 1 motor at working condition

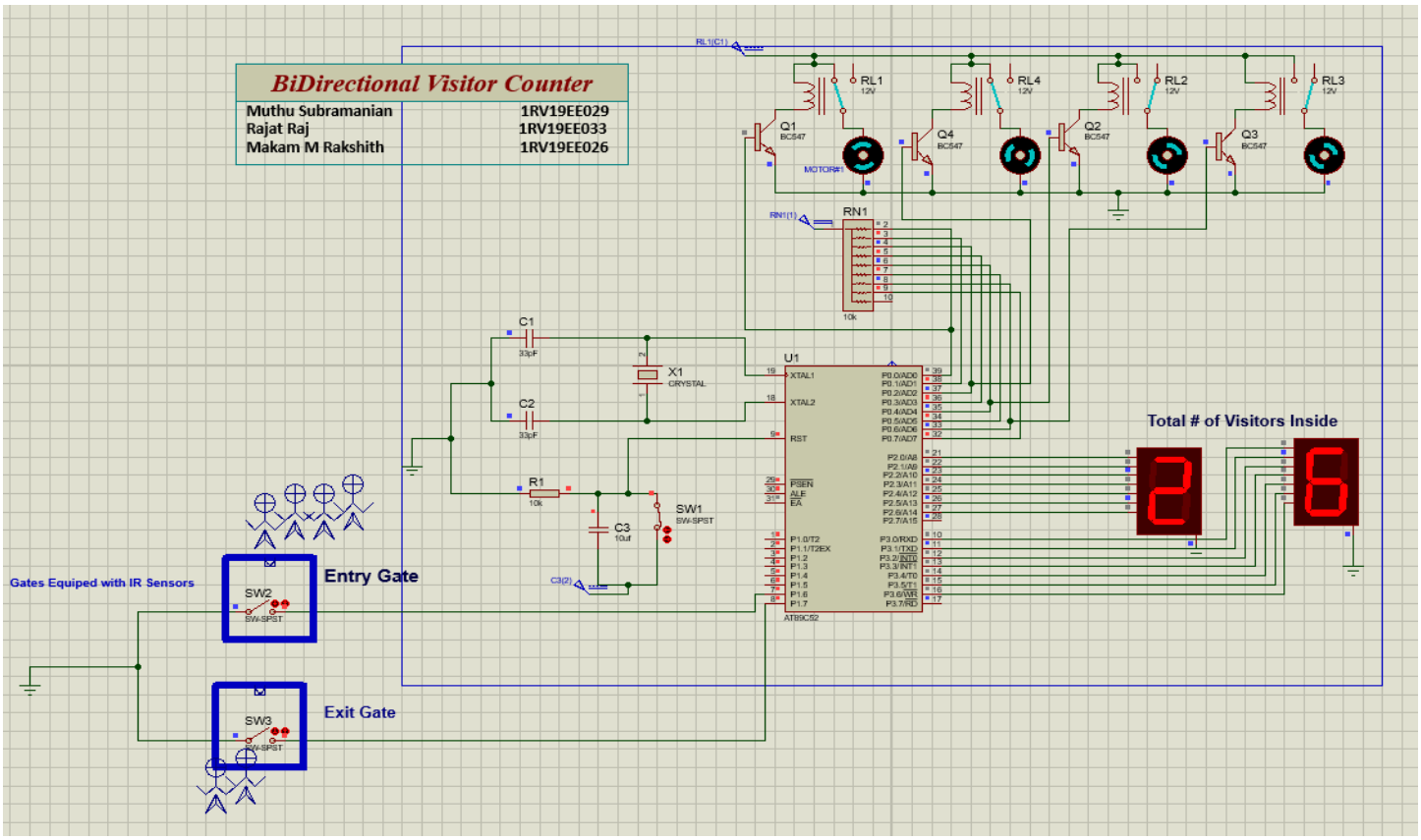


Figure 21: The circuit when number of people are 26 has 2 motors at working condition

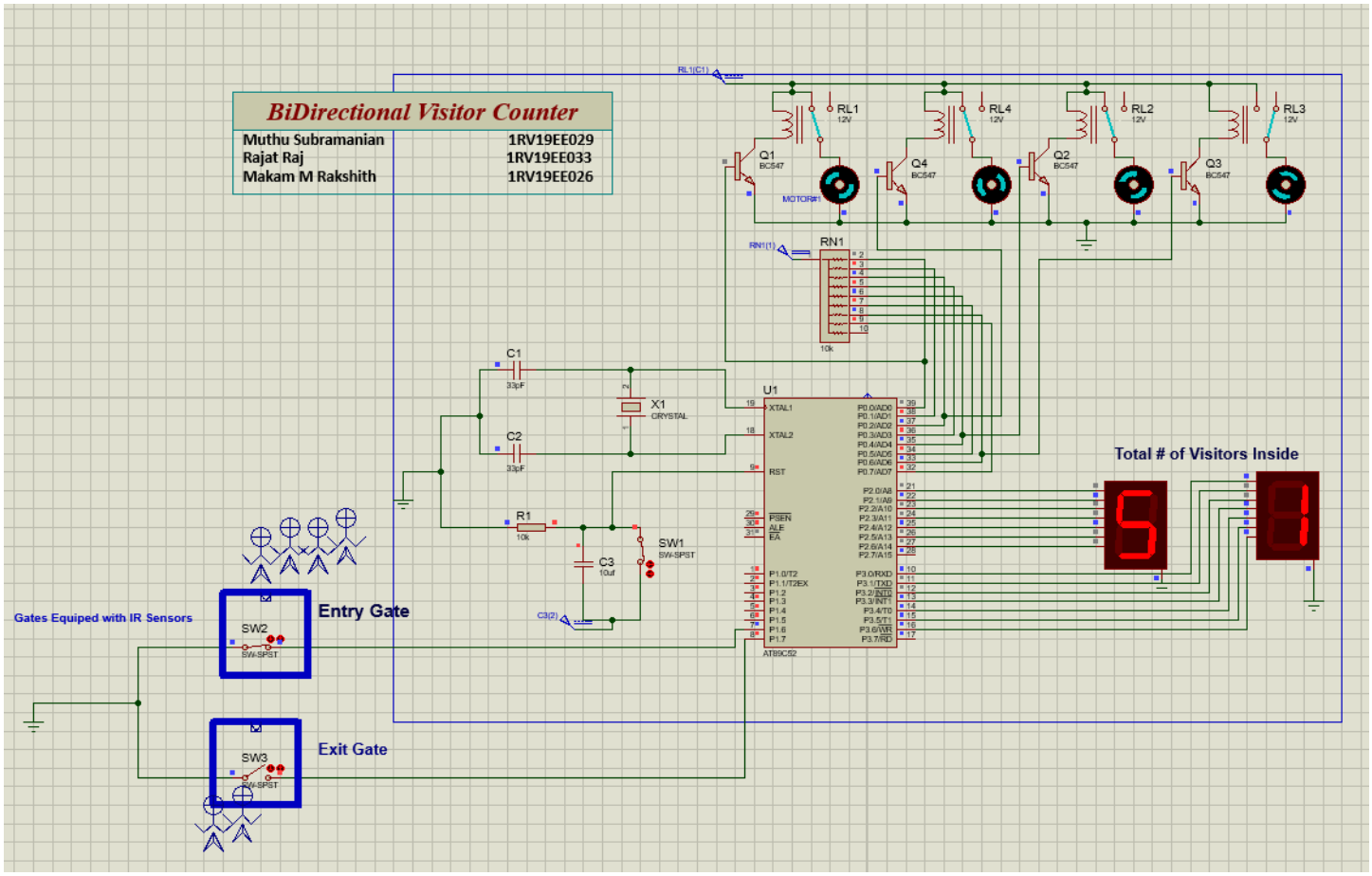


Figure 22: The circuit when number of people are 51 has 3 motors at working condition

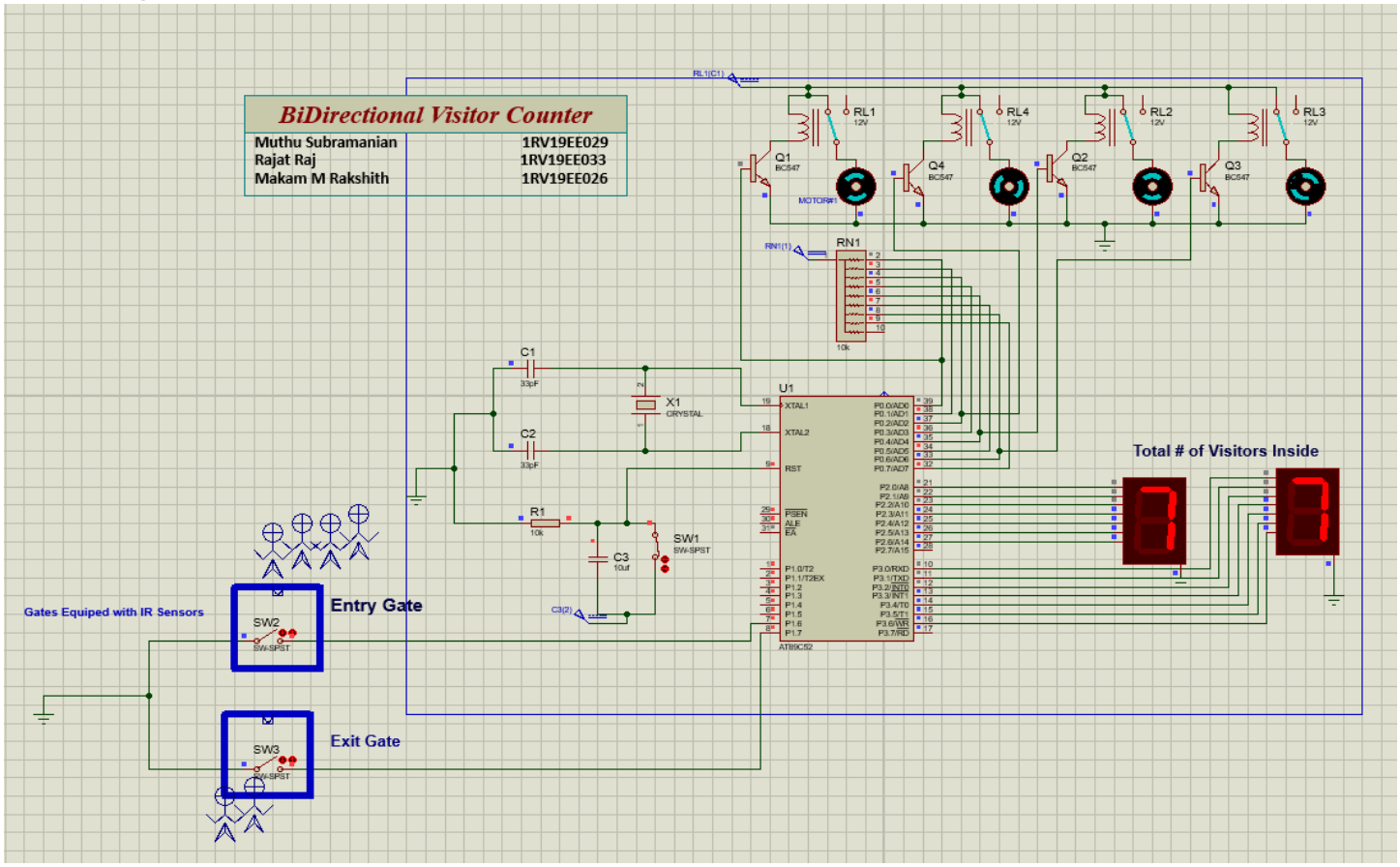


Figure 23: The circuit when number of people are 77 has all motors at working condition

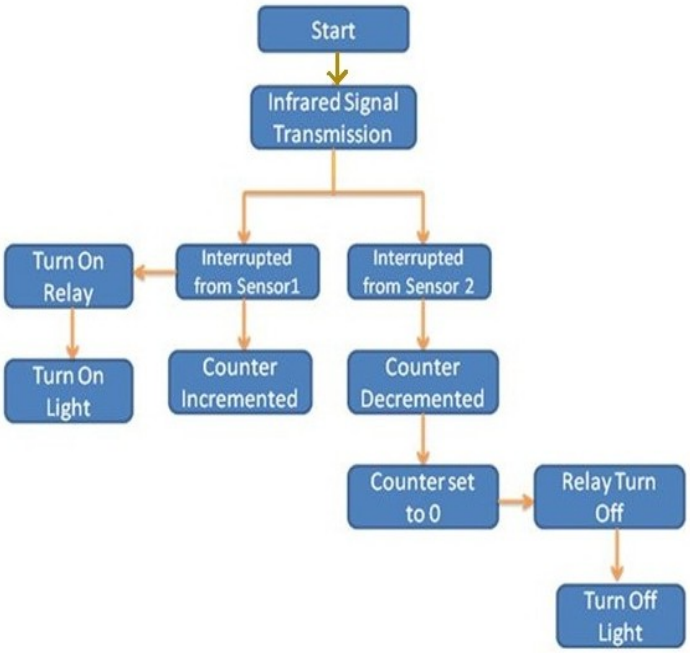


Figure 24: Flowchart

Program/Code:

```
#include<reg51.h>

sbit h=P1^6;        //ENTRANCE GATE
sbit g=P1^7;        //EXIT GATE
sbit r=P0^0;        // MOTOR #1
sbit s=P0^2;        // MOTOR #2
sbit t=P0^4;              // MOTOR #3
sbit u=P0^6;              // MOTOR #4
int m=0;
int n=0;
int a,b;                  //7 SEGMENT DISPLAY
int arr[10]={0x3F,0X06,0X5B,0X4F,0X66,0X6D,0X7D,0X07,0XFF,0X67};

void main()        // MAIN PROGRAM STARTS
{
P2=0x3F;
P3=0x3F;
while(1)  // TO MAKE THE FUNCTION REPEAT FOREVER
{
P1=0xFF;   //INPUT PORT

// IF SOMEONE COMES INSIDE

if(h==0)             // IF ONE PERSON COMES IN
       {
            if(n==99&&m==99)
            {
                  P2=0x67;
                  P3=0x67;
            }
                  else
```

```
            {
                   m=m+1;            // INCREMENT OF M BY 1
                   n=n+1;            // INCREMENT OF N BY 1
                   a=m/10;
                   b=n%10;
                   P2=arr[a];
                   P3=arr[b];
            if(n==0)           // IF NOONE IS INSIDE
            {
                  r=0;
                  s=0;
                  t=0;
                  u=0;
            }
            else if(n>0&&n<=25)
            {
                  r=1;
                  s=0;
                  t=0;
                  u=0;
            }
            else if(n>25&&n<=50)
            {
                  r=1;
                  s=1;
                  t=0;
                  u=0;
            }
            else if(n>50&&n<=75)
            {
                  r=1;
                  s=1;
                  t=1;
                  u=0;
            }
            else if(n>75&&n<=100)
            {
                  r=1;
                  s=1;
                  t=1;
                  u=1;
            }
            while(h==0);
            }
      }

// IF SOMEONE COMES OUT

if(g==0)
{
if(n==0&&m==0)
{
P2=0x3F;
P3=0x3F;
}
else
{
m=m-1;
n=n-1;
a=m/10;
```

```
b=n%10;
P2=arr[a];
P3=arr[b];
   if(n==0) // IF NO ONE IS INSIDE
   {
r=0;
                  s=0;
                  t=0;
                  u=0;
            }
            else if(n>0&&n<=25)
            {
                  r=1;
                  s=0;
                  t=0;
                  u=0;
            }
            else if(n>25&&n<=50)
            {
                  r=1;
                  s=1;
                  t=0;
                  u=0;
            }
            else if(n>50&&n<=75)
            {
                  r=1;
                  s=1;
                  t=1;
                  u=0;
            }
            else if(n>75&&n<=100)
            {
                  r=1;
                  s=1;
                  t=1;
                  u=1;
            }
while(g==0);
}

}
}
}
```

Application:

1. Domestically, this circuit can be used to provide an estimate of the number of people attending a party.
2. It can be used during formal meetings.
3. It can be used to keep a check on the number of people accessing a protected place at homes and other locations.
4. As a home automation system, it can also be used to ensure energy savings by switching loads and fans on only when needed.

Limitations:

1. It is a theoretical circuit and, in practical implementation, can require few adjustments.

2. It is a circuit with a low range and cannot be used in wide areas.
3. The space should not be entered or exited by more than one candidate. It will count him as a single person if it happens.
4. With frequent adjustments to the count value, the output will look confusing after a certain time.
5. We are using a room with a capacity of 99 candidates in this module.

Advantages:

1. The biggest benefit is that saving energy would help. If no one is in the building, the appliances will be switched off.
2. For schools/colleges/companies, it will help to verify whether or not anyone is in the zone. If the display unit data is zero, the peons or safety guards can easily shut the doors.
3. The entire system would automatically function to minimize human work.