Faculty of Information Technology
IN 1900- ICT Project

Human Multi Pre Protection System
(For the Bank)

Group No:05

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Date of Submission: 30/11/2021

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1.0 Introduction

The corona epidemic is a dangerous situation facing many countries including Sri Lanka. The total number of deaths due to coronavirus in Sri Lanka today is 14,348 and the number of coronavirus patients is 563 989 and the number of patients currently being treated is 9 250 and the minimum number of deaths per day has crossed the 700 marks (30/11/2021). That is the number of reported and unreported infections is about 1/40 of the approximate population of Sri Lanka. **[1][2]**

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing, or breathe. These particles range from larger respiratory droplets to smaller aerosols. It can be infected by breathing in the virus if you are near someone who has COVID-19 or by touching a contaminated surface and then your eyes, nose, or mouth. The virus spreads more easily indoors and in crowded settings.

The epidemic is affecting the people as above and at the same time the epidemic is having a significant impact on the economic, health, educational and transport sectors of Sri Lanka. The epidemic capacity of the health sector in Sri Lanka has reached its peak and it is spreading uncontrollably, which has had a major impact on the economy. That is, the economy is in a slump.

In such a situation, even if the country is locked down, it is not possible to close the banking system, even if there are restrictions on travel between provinces. Most of the 21.8 million Sri Lankans have not entered the bank for transactions, which means that there has been no significant reduction in bank usage, even due to the epidemic. They carry out their transactions through the bank as usual. But though banking transactions that take place in this way, that is people in the bank, and people in contact with the banking system, the corona germs can spread, and it is very risky. **[3]**

Since banking cannot be stopped and if the banks are not closed, it will help to spread the corona. We suggest providing full pre-protection' to the customers as the best solution.

2.0 Literature Survey

Implementations of our system.

1. Open the door to enter the bank only if you use the sanitizer system, temperature measurement system and UV box.
2. UV box (disinfection procedure). **[4]**
3. Displaying the body temperature and whether it exceeds the limits or not.
4. Opening of the door when a needed message gets displayed.
5. Count the number of customers inside the bank.

As we identified there are systems or machines built for the sanitizing and temperature measuring. Some of them are manual and some are automated. Some systems are maintained by an employee who is cared of.

As we mentioned previously, in our implemented system there isn't an employee. It's automated. That means whole system is automated. The uniqueness of our machine is that. Because some of the existing components of our system are currently in use manually, we have also taken steps through the system to minimize human encounters with each other as it is man-made.

Not only that, after measuring the temperature of the customer the message "Allowed" or "Not Allowed" is also displaying in our system.

Along with that another unique feature of our system is the UV Box. This disinfection process that takes place in the UV box plays a major role in our system and is not significantly active in current systems. Therefore, its much protectable for the consumers.

As we defined our system to a bank, there should be an intentional criterion in that system.

Another special feature is that the sanitizer system, the temperature measurement system, the UV box are all used separately but all of these coexist in the system we designed. Also, the door barrier of our system will open to enter the bank only if you must use our sanitizer system.

As we searched, there were not any procedure to count the necessary number of customers inside the bank. We have also included this procedure in our system.

According to the Covid-19 guidelines provided for the banks, there is a limit of customers that can be taken inside to the bank for a certain period of time.

We are informed that amount as 30. But there is not any automated system to know about the number exactly for the customersat the queue. Not only that, but it's also much protective process for both the customers and the workers.

On the other hand, there isn't a considerable automated way to display the count of customers inside the manager's cabin and also to display whether the manager is available on that certain occasion or not.

Remarkably we have implemented with those criterions also in our Human Multi Pre protection Machine.

It is a quite exceptional point in our item. It is about the displaying of the count of customers inside the bank.

Also, it displays whether the manager is available or not and also the number of customers inside the manager's cabin.

Figure 1:Measuring the body temperature

Figure 2:Sanitizing hands

3.0 Aim and Objectives

3.1 Aim

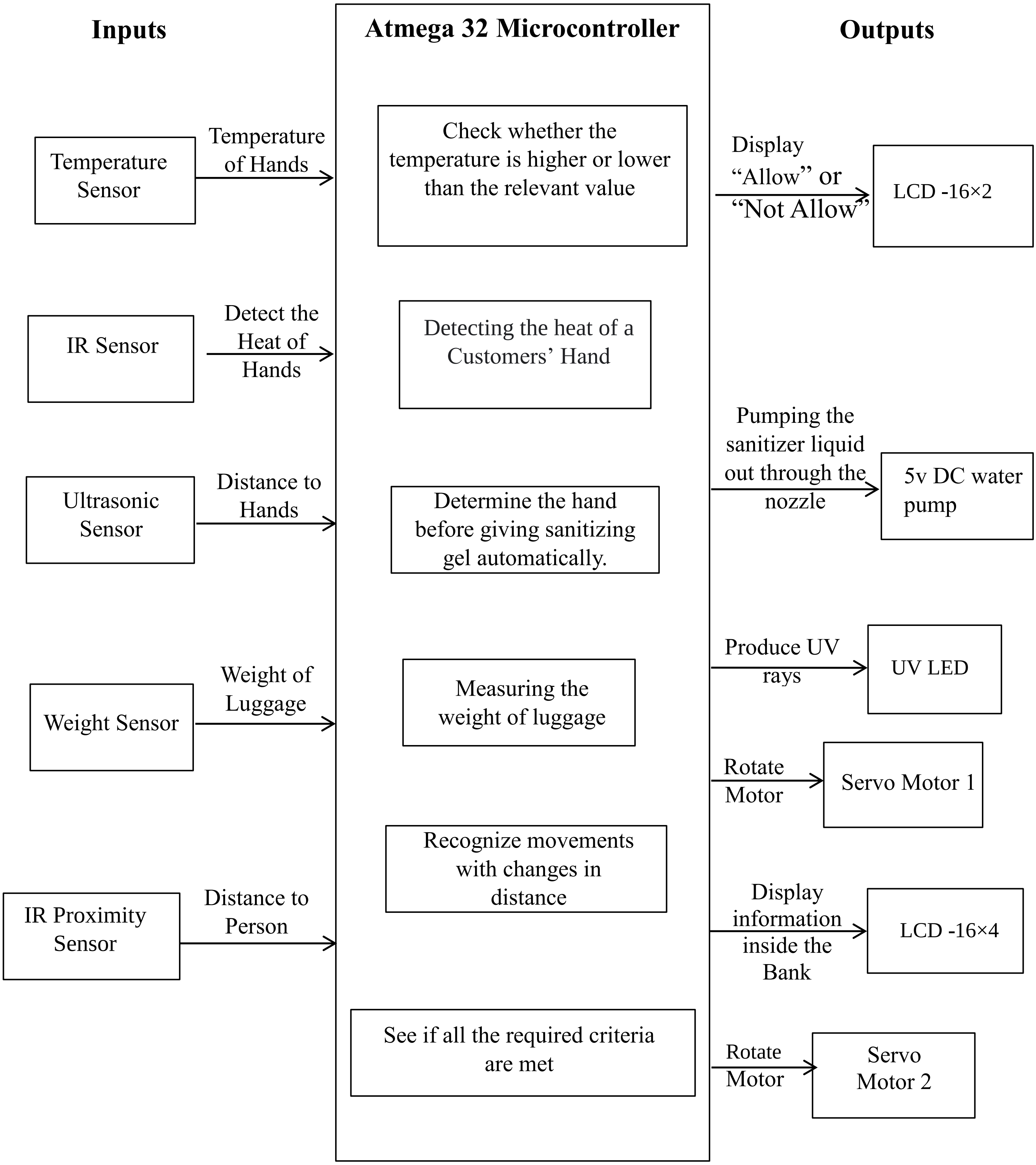
Design and develop an automated system to assist in providing a safer, more efficient banking service while minimizing the spread of corona disease in banking activities in the face of corona disease.

3.2 Objectives

- To ensure the prevention of spreading germs among the customers.
- To make the customers aware of pandemic guidelines by gatherings.
- To count the number of customers inside the bank and limit them through a procedure.
- To display whether the bank manager is available or not.

4.0 System Description

4.0.1. System Block Diagram



4.0.2-3D – Views

Figure 3:Front view of the system

Figure 4:A close-up view of the system

Figure 5:A side view of the system

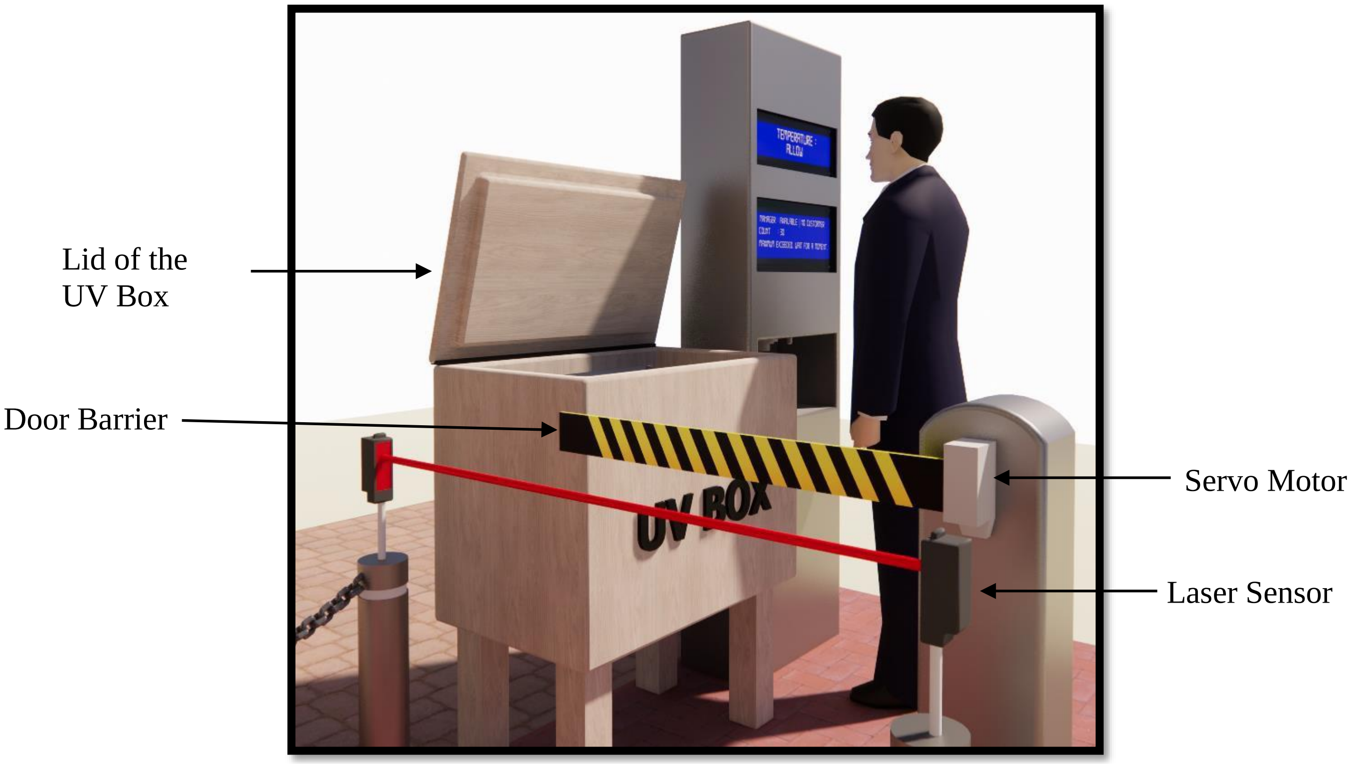


Figure 6:A side view of the system

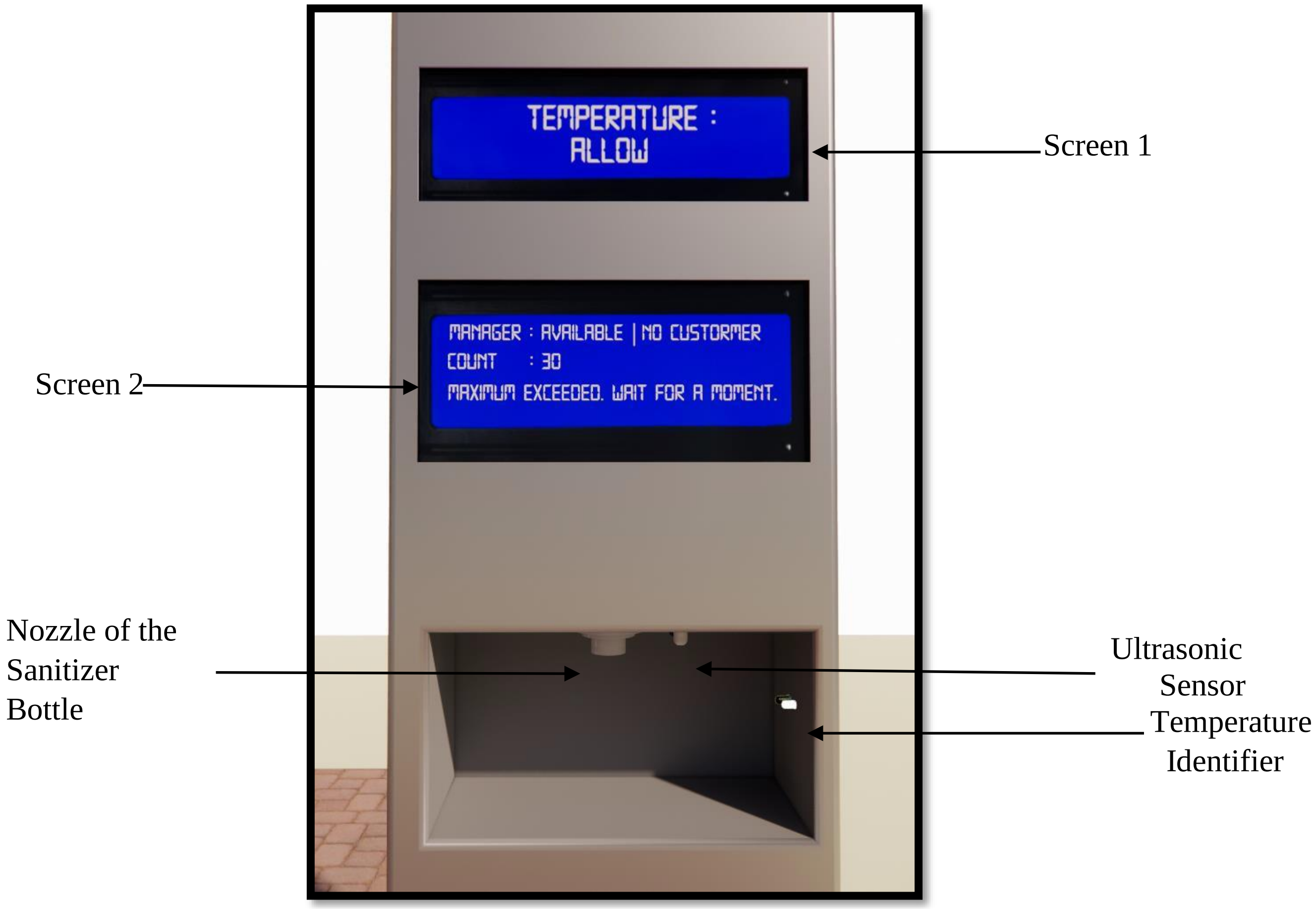


Figure 7:The first part of the system

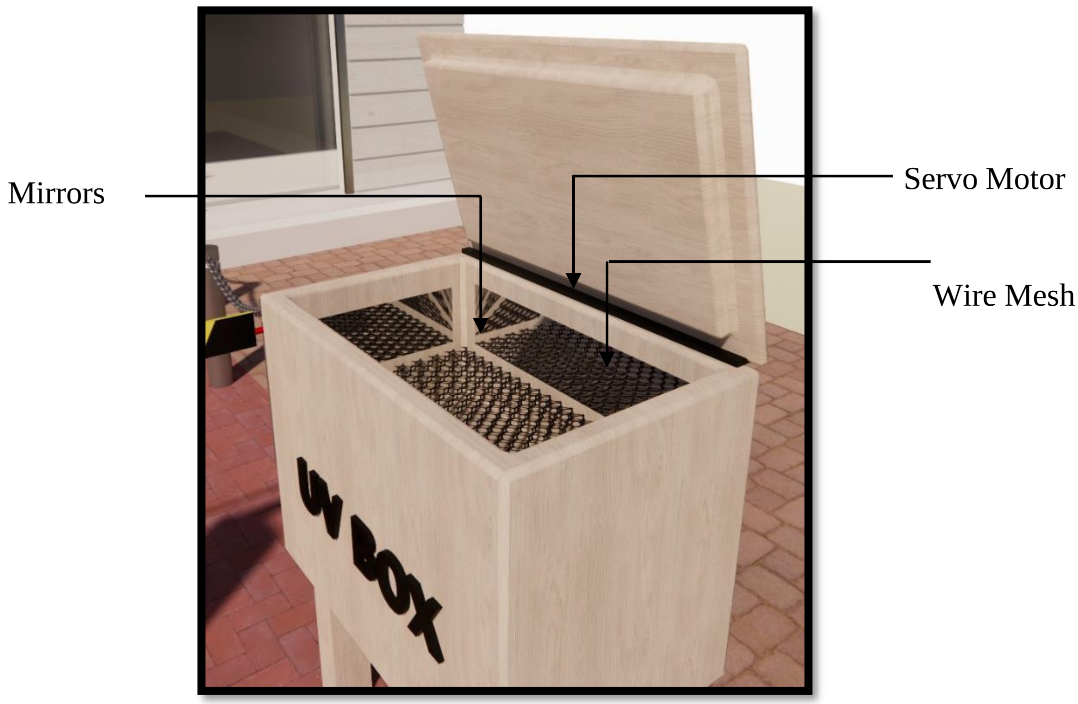


Figure 8:UV Box

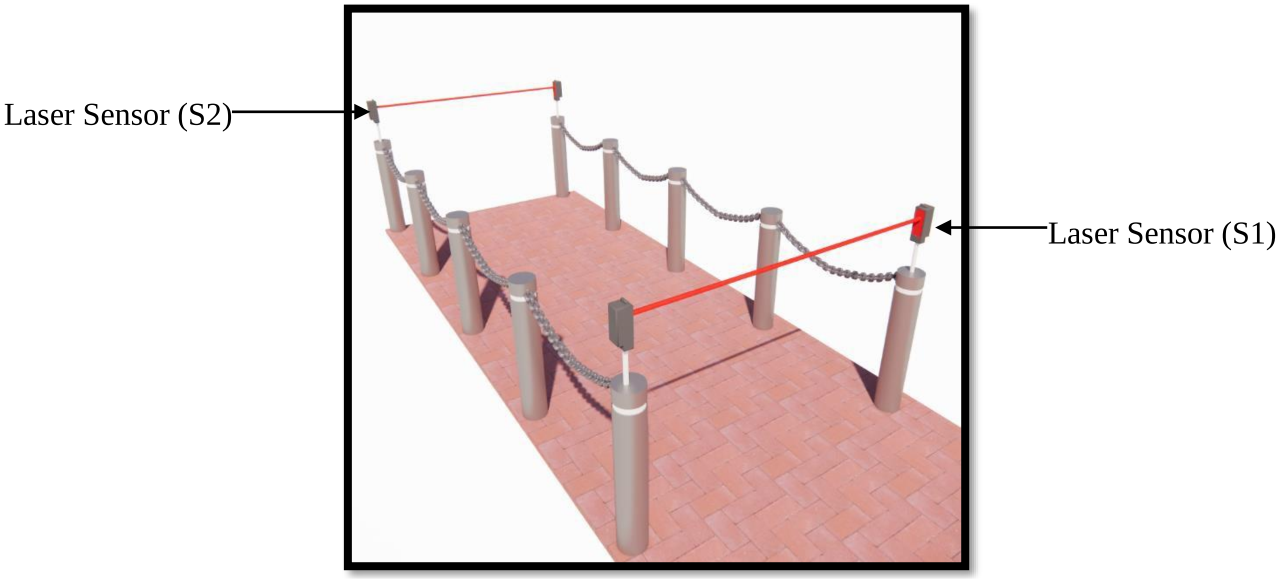


Figure 9:Entrance and exit path to the bank

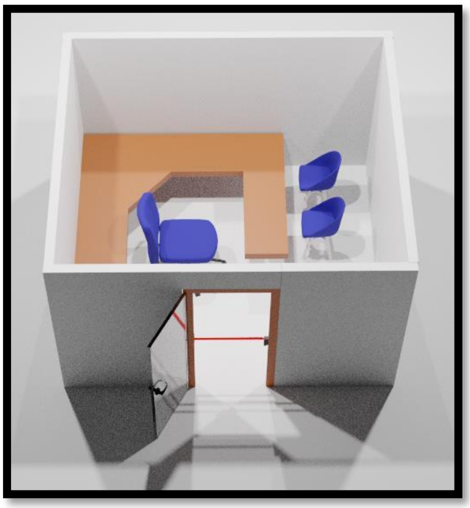


Figure 10:Manager's room

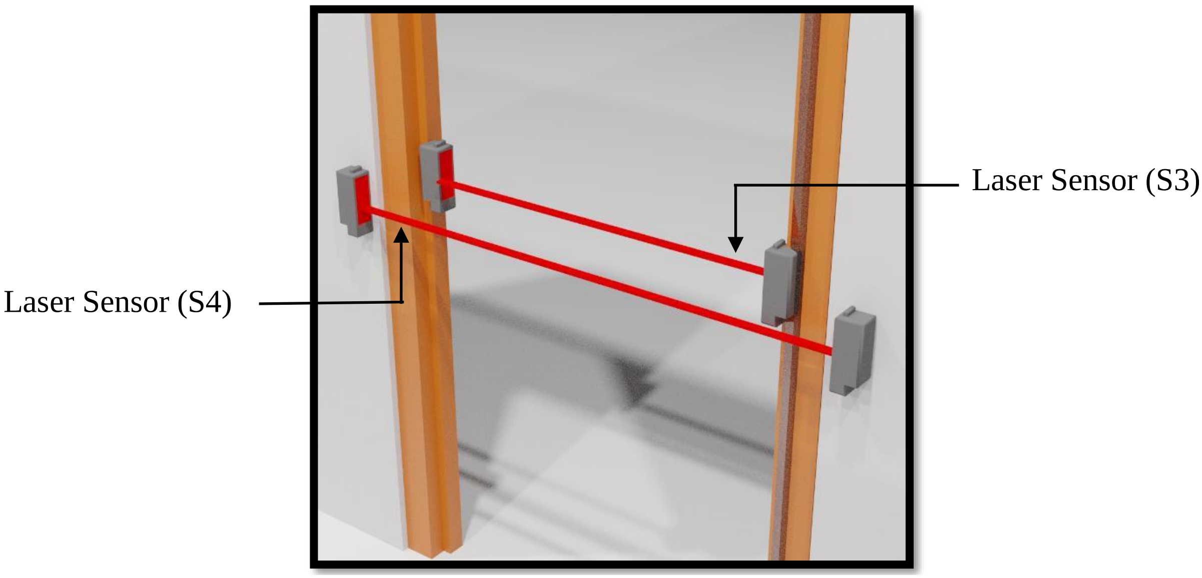
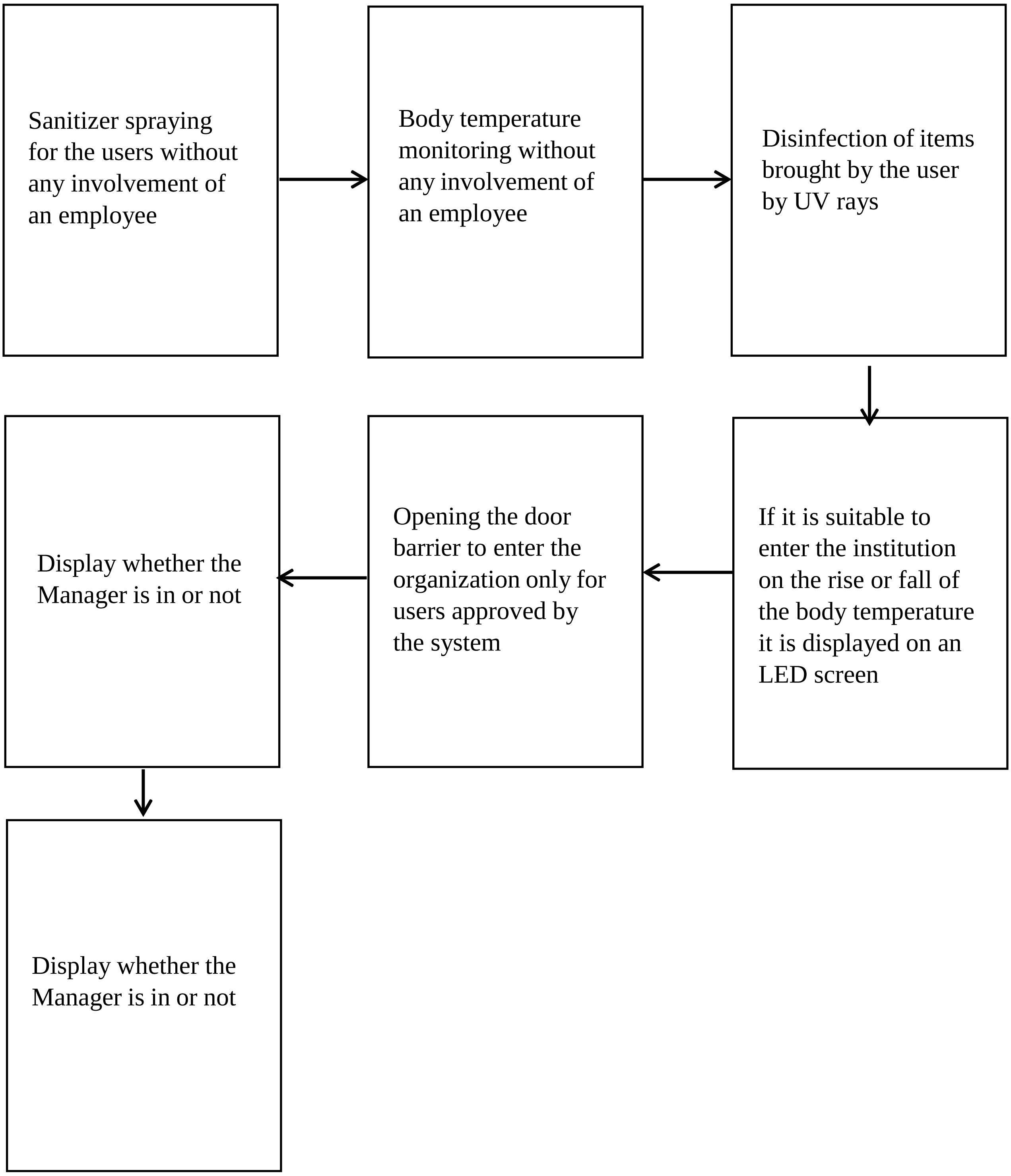


Figure 11:Entrance of the Manager's room

4.0.3.Diagram and Figure



5.0 Testing and Implementation

First of all, we studied all the components that we need for our project. Then we learned how to program Atmega32 Microcontroller in Atmel Studio and we did the cording part for each sensor andvalve. After that, we simulated each and every coding part using Proteus.

01.Following figure shows the simulation process of 16*2 LCD Display.

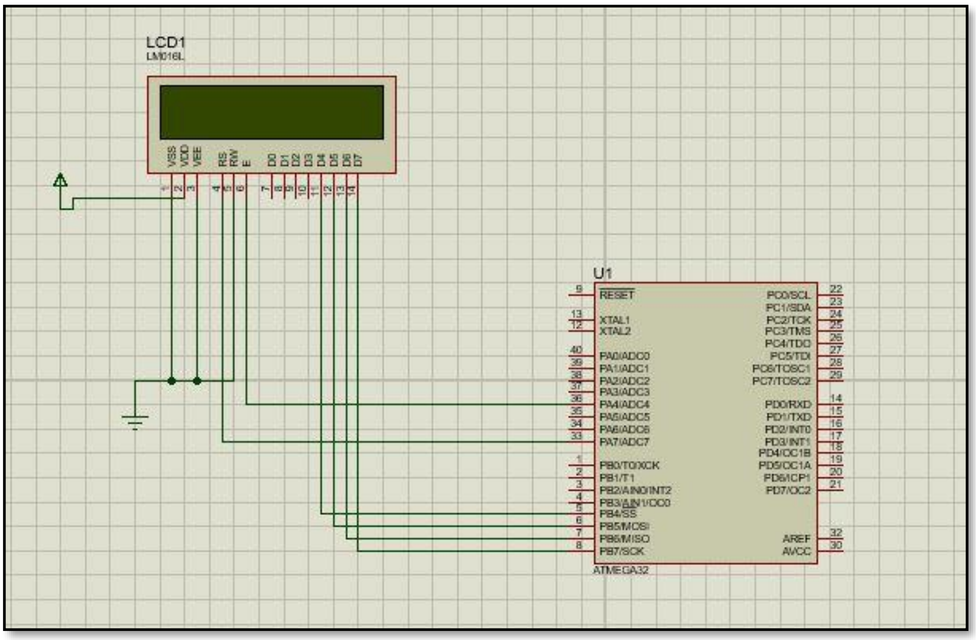


Figure 12:Simulation Process of LCD Display

02.Following figure shows the simulation process of 16*4 LCD Display.

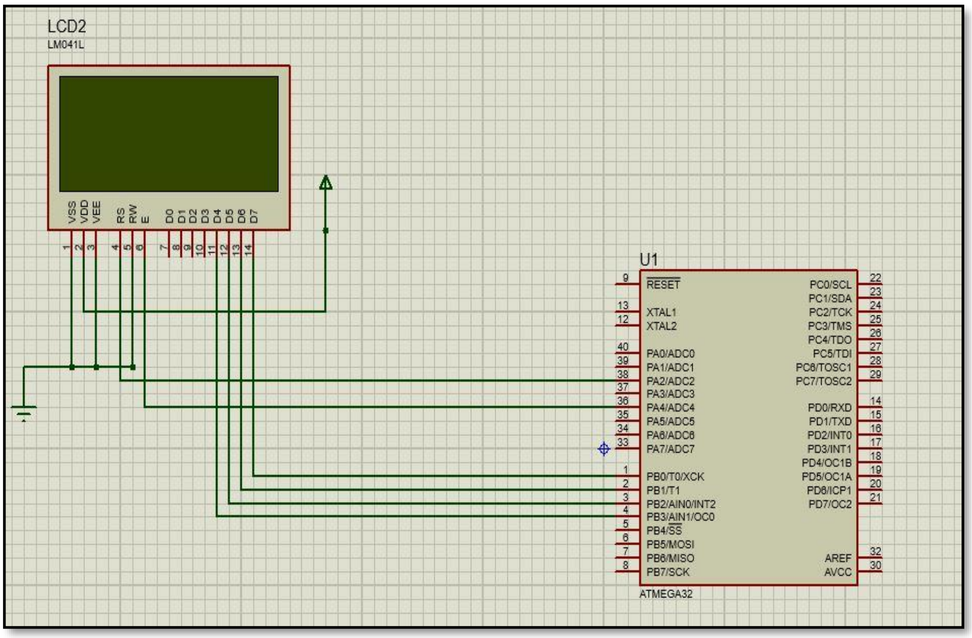


Figure 13: Simulation Process of LCD Display

03.Following figure shows the simulation process of Temperature sensor.

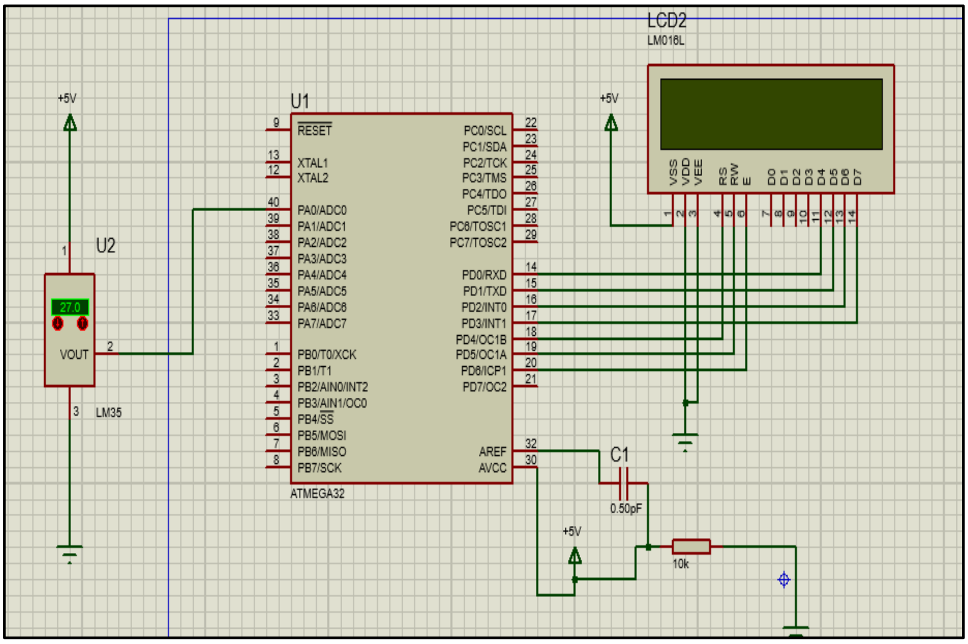


Figure 14:Simulation Process of Temperature Sensor

04.Following figure shows the simulation process of IR sensor.

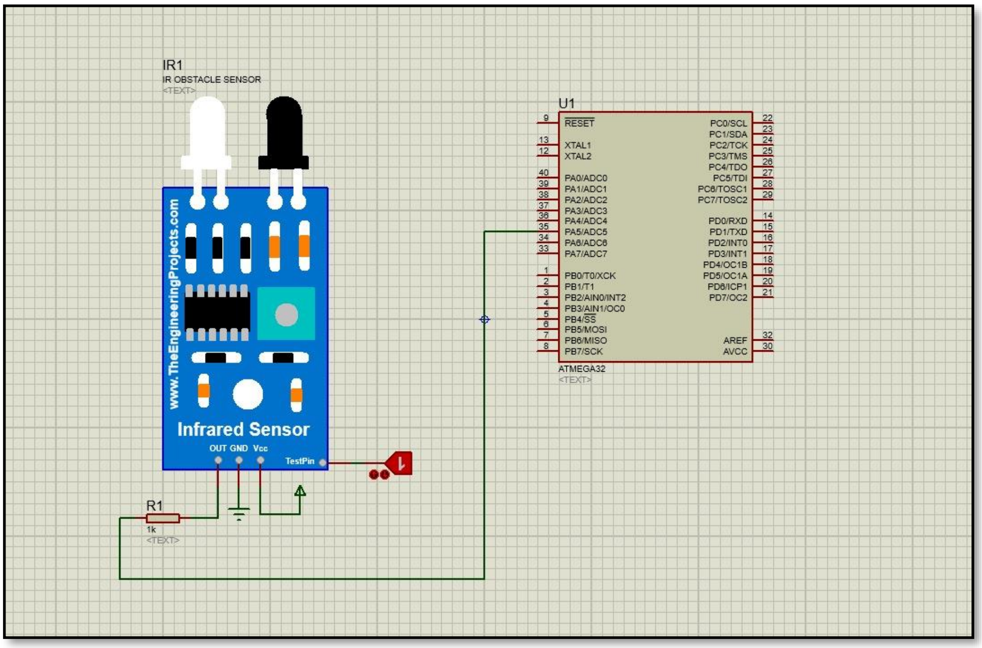


Figure 15: Simulation Process of IR Sensor

05.Following figure shows the simulation process of Weight sensor.

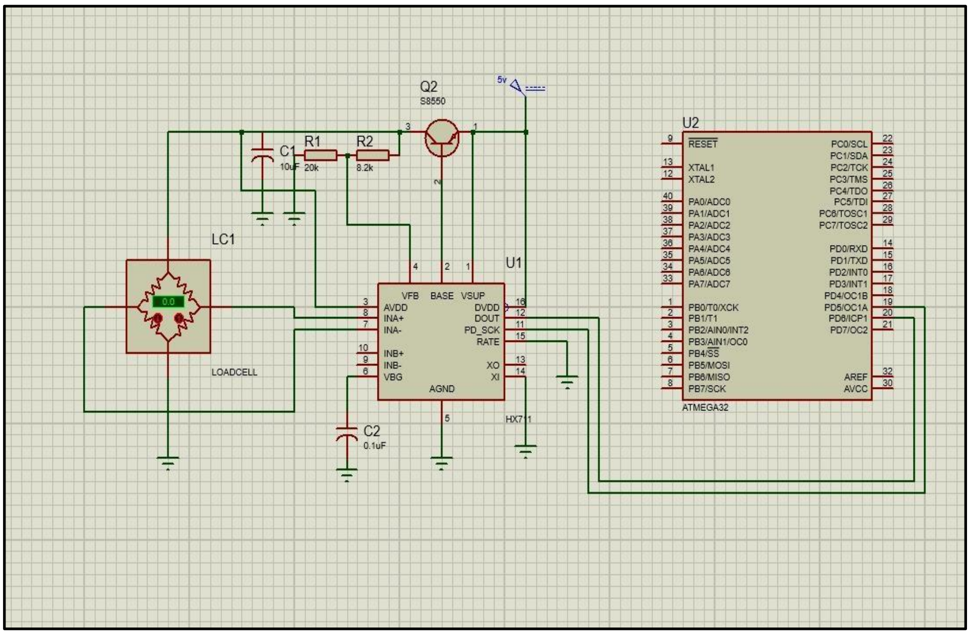


Figure 16:Simulation Process of Weight Sensor

06.Following figure shows the simulation process of Ultra-sonic sensor.

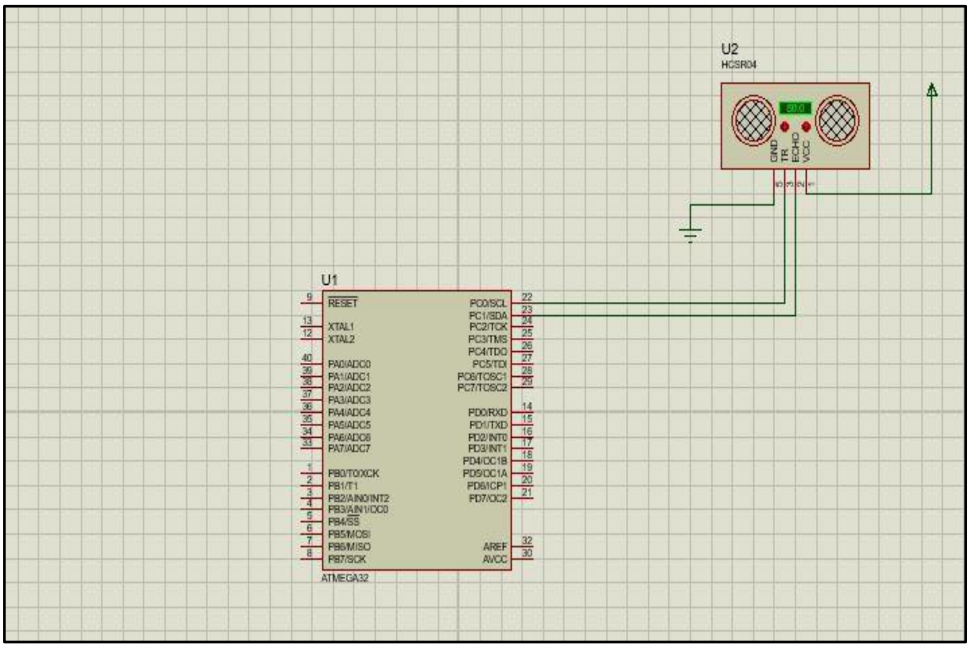


Figure 17:Simulation Process of Ultra-Sonic Sensor

07.Following figure shows the simulation process of DC Motor.

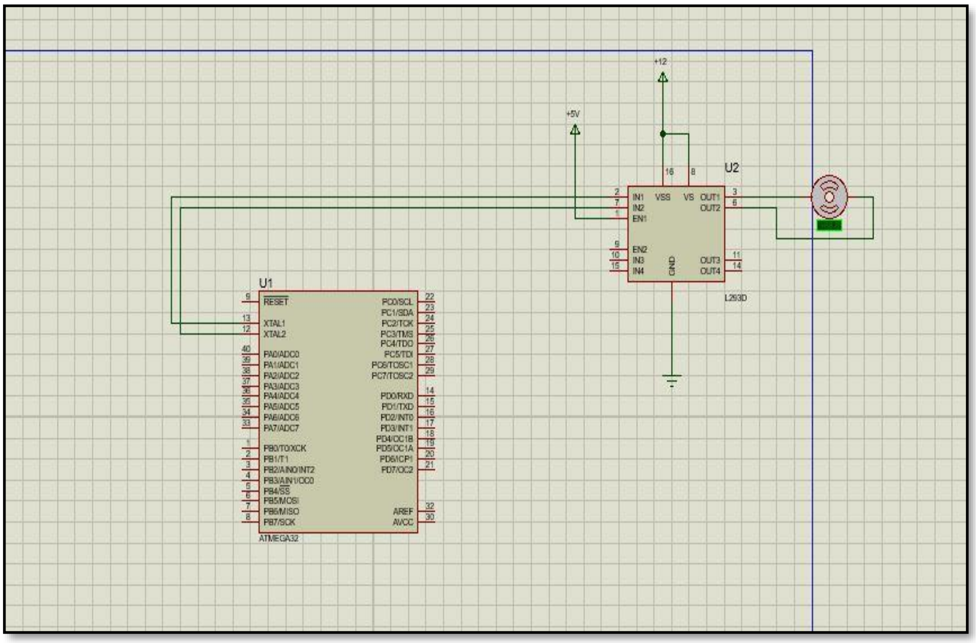


Figure 18:Simulation Process of DC Motor

08.Following figure shows the simulation process of Servo Motor.

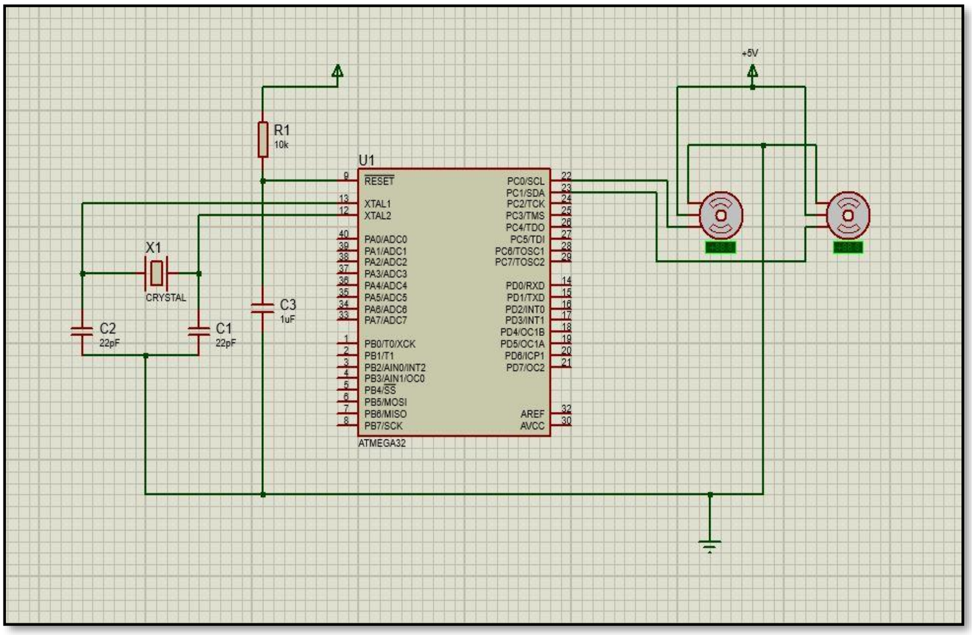


Figure 19:Simulation Process of Servo Motor

09. Following figure shows the simulation process of IR Proximity Sensor.

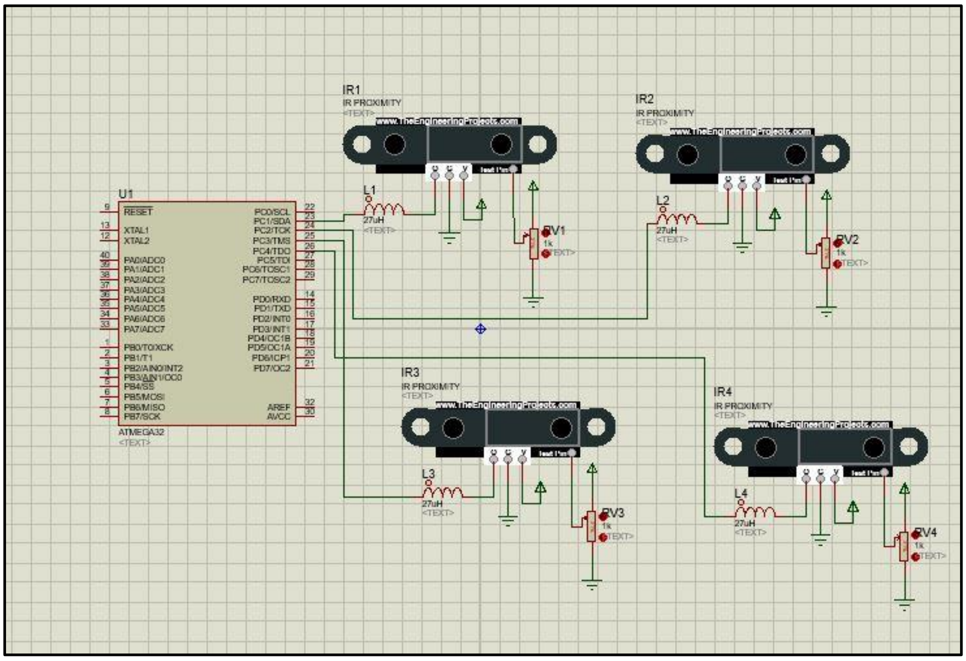
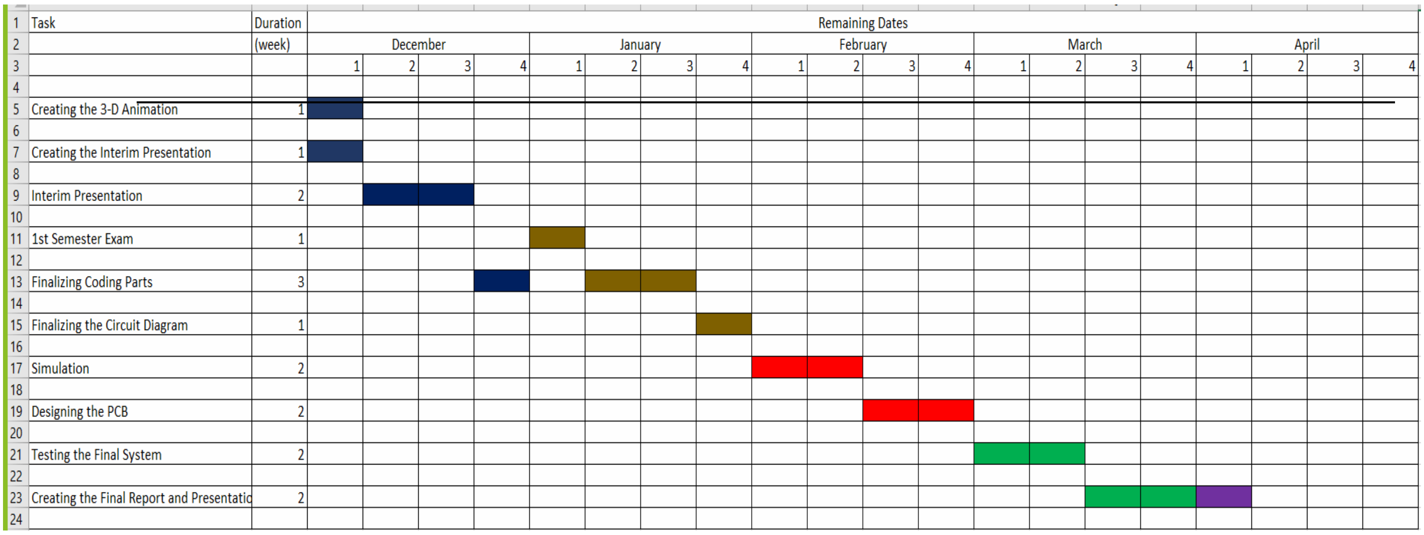


Figure 20: Simulation Process of IR Proximity Sensor

6.0 Action Plan for Remaining Work

Figure 21:Action Plan



7.0 Estimated Cost & Expenditure So Far

Components	Price (Rs:)	Unit	Total (Rs:)
Atmega 32 Microcontroller	690	1	690
Weight Sensor	700	1	700
16*2 LCD Display	520	1	520
16*4 LCD Display	890	1	890
Proximity Sensor	200	4	800
5v DC Water Pump	600	1	600
UV Light	3900	1	3900
L293D Motor Driver Module	450	1	450
Servo Motor	390	1	390
IR Sensor	200	1	200
Temperature Sensor	140	1	140
Ultra-Sonic Sensor	225	1	225
HX711 Converter	200	1	200
TOTAL			**9750**

8.0 Individual Contribution

1. **Name of the student: - Kumarasingha M.M.J.S. (204109D)**
    - ❖ I searched about Power Supply and LCD Display of the system.

01. Power Supply: Draw the Power Supply Designing.

02.LCD Display: **[6]**

- ❖ Be aware about the pins of the LCD Display.
- ❖ Determine how to connect those components with Atmega32 microcontroller.
- ❖ Write the code to implement LCD Display.
- ❖ Draw the full circuit diagram.

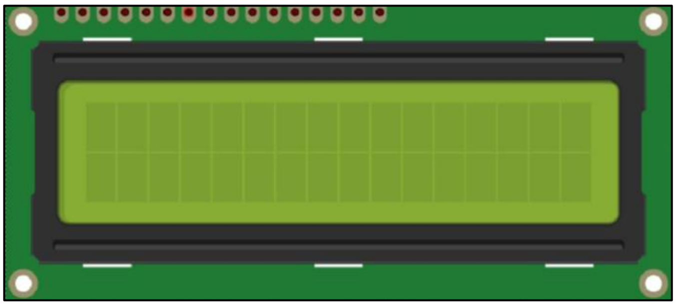


*Figure 22: LCD 16*2 Pin Description*

No.	Pin	Function	Description
1	VSS	Ground	Used to connect the GND terminal.
2	VCC	+5 Volt	Used to connect the supply pin of the power source.
3	VEE	Contrast Control	Used to connect a changeable POT that can supply 0 to 5V.
4	RS	Register Select	Used to connect a microcontroller unit pin and obtains either 0 or 1
5	RW	Read/ Write	This pin toggles the display among the read or writes operation.
6	E	Enable	This pin should be held high to execute Read/Write process.
7-14	D0-D7	Data Pins	Used to send data to the display.
15	LED+	+5 Volt	Connected to +5V
16	LED-	Ground	Connected to GND

Code

```
#ifndef F_CPU
#define F_CPU 16000000UL
#endif
#include<avr/io.h>
#include<util/delay.h>
#include "lcd.h"
#define LCD_DATA PORTB
#define ctrl PORTD
#define en PD7
#define rw PD6
#define rs PD5
int main(void)
{
        DDRB=0xFF;
        DDRD=0xE0;
        init_LCD();
        _delay_ms(10);
        LCD_cmd(0x0C);
        _delay_ms(10);
        LCD_Write_String("Temperature");
        _delay_ms(100);
        LCD_cmd(0xC0);
        _delay_ms(100);
        LCD_Write_String("Allow");
        _delay_ms(100);
        LCD_cmd(0x01);
        _delay_ms(1);
        return 0;
}
```

```c
#ifndef F_CPU

# define F_CPU 16000000UL

#endif

#define LCD_DATA PORTB

#define ctrl PORTD

#define en PD7

#define rw PD6

#define rs PD5

void LCD_cmd(unsigned char cmd)

{

        LCD_DATA = cmd;

        PORTD &= ~(1<<rs);

        PORTD &= ~(1<<rw);

        PORTD  |= (1<<en);

        _delay_ms(10);

        PORTD  &= ~(1<<en);

        return;
}

void LCD_write(unsigned char data)

{
        LCD_DATA= data;

        PORTD |= (1<<rs);

        PORTD &= ~(1<<rw);

        PORTD  |= (1<<en);

        _delay_ms(10);

        PORTD &= ~(1<<en);

        return;

}
```

```
void init_LCD(void)
	{
		LCD_cmd(0x38);
		_delay_ms(1);
		LCD_cmd(0x01);
		_delay_ms(1);
		LCD_cmd(0x02);
		_delay_ms(1);
		LCD_cmd(0x06);
		_delay_ms(1);
		LCD_cmd(0x80);
		_delay_ms(1);
		return;
	}
```

2. **<u>Name of the student: -Jayasinghe J.M.Y.S(204085X)</u>**

<u>01.Ultrasonic Sensor</u>-Determine the hand before giving sanitizing gel automatically. **[7]**

- Be aware about the pins of the Ultrasonic Sensor to the microcontroller.
- Determine how to connect those components with Atmega32 microcontroller.
- Be aware about the coding part of the Ultrasonic Sensor.

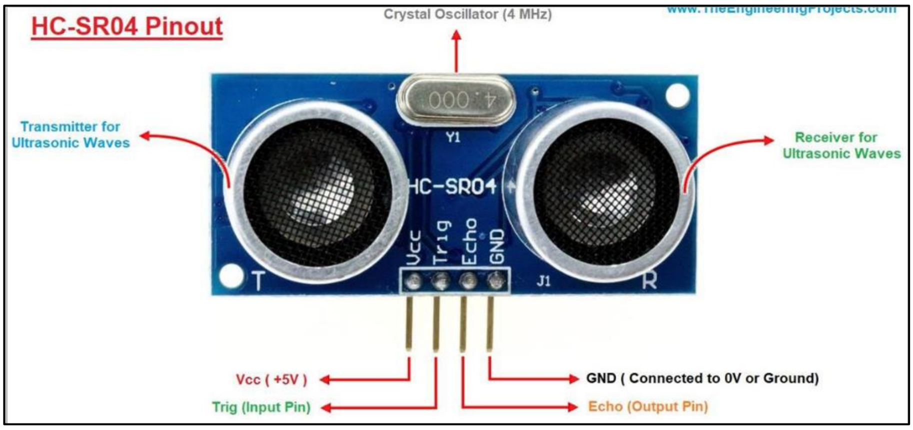


Figure 23:Ultrasonic Sensor

Figure 24:Description about Ultra-Sonic sensor

Working Voltage	DC 5 V
Working Current	15mA
Working Frequency	40Hz
Max Range	4m
Min Range	2cm
Measuring Angle	15 degrees
Trigger Input Signal	10uS TTL pulse
Dimension	45*20*15mm

Code

```
#define F_CPU 8000000UL
#include <avr/io.h>
#include <avr/interrupt.h>
#include <util/delay.h>
#include <string.h>
#include <stdlib.h>
#include "LCD_16x2_H_file.h"

#defineTrigger_pin   PA0

int TimerOverflow = 0;

ISR(TIMER1_OVF_vect)
{
TimerOverflow++;
}

int main(void)
{
char string [10];
long count;
double distance;

DDRA = 0x01;
PORTD = 0xFF;

LCD_Init();
LCD_String_xy(1, 0, "Ultrasonic");

sei();
TIMSK = (1 << TOIE1);
TCCR1A = 0;

while(1)
{

PORTA |= (1 << Trigger_pin);
_delay_us(10);
PORTA &= (~(1 << Trigger_pin));

TCNT1 = 0;
TCCR1B = 0x41;
TIFR = 1<<ICF1;
TIFR = 1<<TOV1;



while ((TIFR & (1 << ICF1)) == 0);
TCNT1 = 0;
TCCR1B = 0x01;
TIFR = 1<<ICF1;
TIFR = 1<<TOV1;
TimerOverflow = 0;

while ((TIFR & (1 << ICF1)) == 0);
count = ICR1 + (65535 * TimerOverflow);

distance = (double)count / 466.47;

dtostrf(distance, 2, 2, string);
```

```
strcat(string, " cm   ");
LCD_String_xy(2, 0, "Dist = ");
LCD_String_xy(2, 7, string);
_delay_ms(200);
}
}
```

<u>02.Weight Sensor</u>   -Measuring the weight of luggage **[8]**

- ❖ Be aware about the pins, input, output of the Weight sensor to the microcontroller.
- ❖ Make sure how to connect those components with the Atmega32 microcontroller.
- ❖ Be aware about the coding part of the Weight sensor.

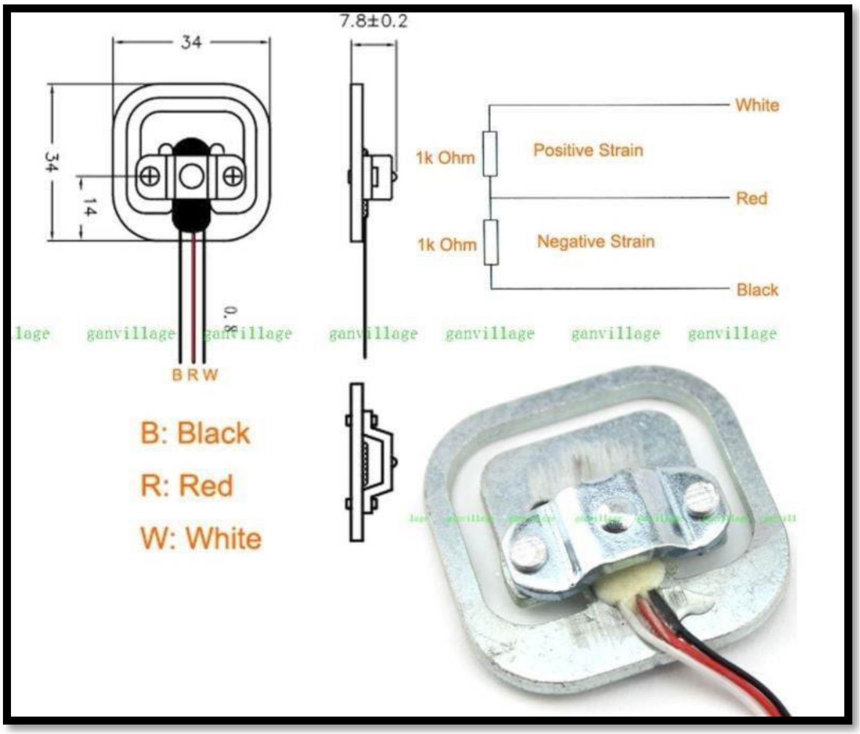


Figure 25:Weight Sensor

Figure 26:Description about Weight Sensor

Capacity	50KG
Rated output (MV/V)	2.0±0.15
Recommended excitation voltage(V)	10~15
Safe overload(%RO)	150
Ultimate overload(%RO)	200
Load cell material	Aluminum
Method of connecting wire	Red (+), Black (-), Green(+), White(-)

3. **<u>Name of the student: -P.A.T.P. Jayarathna(204083N)</u>**

- Studied about Blender software and designed the 3D part of the system and along with that the animation part also been completed.
- Searched about pins and the ports of the IR Proximity sensor to Atmega32 microcontroller.
- Searching about the coding part regarding the IR Proximity sensor.

<u>01. IR Proximity sensor</u>**-** Recognize movements with changes in distance **[9]**

- Be aware about the pins of the IR Proximity Sensor to the microcontroller.
- Determine how to connect those components with Atmega32 microcontroller.

<u>Features:</u>

1. 5VDC operating voltage.
2. I/O pins are 5V and 3.3V compliant.
3. Range: Up to 20cm.
4. Adjustable Sensing range.
5. Built-in Ambient Light Sensor.
6. 20mA supply current.
7. Mounting hole.

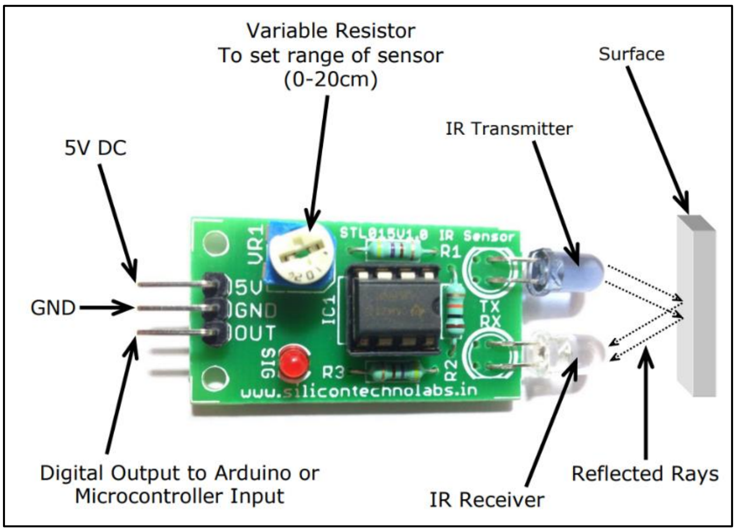


Figure 27: IR Proximity sensor

Code

```
#include <avr/io.h>
#include <MrLcd/MrLCDmega32.h>
#include <avr/interrupt.h>
#include <util/delay.h>
#include <stdlib.h>

static volatile int pulse = 0;
static volatile int i = 0;

int main(void)
{
	int16_t count_a = 0;
	char show_a[16];
	Initialise();
	DDRD = 0b11111011;
	_delay_ms(50);

	Initialise();

	GICR |= 1<<INT0;
	MCUCR |= 1<<ISC00;

	sei();

	while(1)
	{
		PORTD |= 1<<PIND0;
		_delay_us(15);

		PORTD &= ~(1<<PIND0);
		count_a = pulse/58;

		Send_A_String("Distance Sensor");
		GoToMrLCDLocation(1,2);
		Send_A_String("Distance=");
		itoa(count_a,show_a,10);
		Send_A_String(show_a);
		Send_A_String(" ");
		GoToMrLCDLocation(13,2);
		Send_A_String("cm");
		GoToMrLCDLocation(1,1);
	}
}

ISR(INT0_vect)
{
	if(i == 0)
	{
		TCCR1B |= 1<<CS10;
		i = 1;
	}
	else
	{
		TCCR1B = 0;
		pulse = TCNT1;
		TCNT1 = 0;
		i = 0;
	}
}
```

4. **<u>Name of the student: -E.M.S.P.Ekanayaka(204050L)</u>**

❖ I searched about Servo Motor and the Designing part of the system. **[11]**

01.Servo Motor- This servo motor is used to open the lid of the UV box and to open the doorbarrier in Our system.

- ❖ Aware about the drivers and Servo Motor.
- ❖ Determine how to connect those components with Atmega32 Microcontroller.
- ❖ Be aware about the coding part of the Servo Motor.

The circuit is shown below how to use a servo motor to operate a UV box door and the door barrier.

Figure 28:Servo Motor

Figure 29: Description about Servo Motor

Operating voltage	4.8V (~ 5V)
Maximum voltage	6V
Current (ideal)	1A
Rotation range	(-90˚)- (+90˚)
Modulation	Analog
Torque (4.8V)	2.5kg/cm
Weight	9g
Temperature range	0 ˚C – 55 ˚C
Operating speed	0.1s/60 ˚C

Code

```
#ifndef F_CPU
#define F_CPU 8000000UL
#endif

#include <avr/io.h>
#include <util/delay.h>

int main(void)
{
	DDRC = 0x01;
	PORTC = 0x00;
	while(1)
	{

		PORTC = 0x01;
		_delay_us(1000);
		PORTC = 0x00;

		_delay_ms(2000);


		PORTC = 0x01;
		_delay_us(1500);
		PORTC = 0x00;

	_delay_ms(2000);


	}
}
```

02. <u>5 V DC water pump</u> **-** Pumping the sanitizer liquid out through the nozzle. **[10]**

- Be aware about the 5 V DC water pump.
- Determine how to connect 5 V DC water pump with Atmega32 microcontroller.

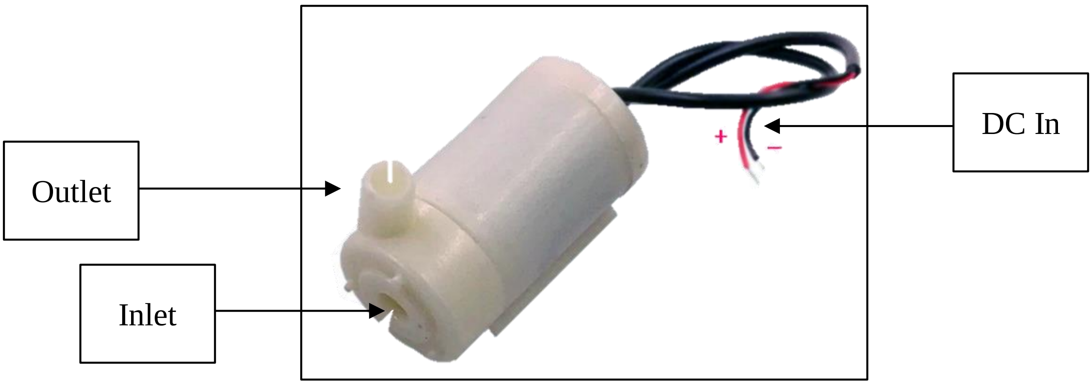


Figure 30: 5V DC Water Pump

Figure 31: Description about 5V DC Water Pump

Positive (Red)	Need to be connected to 12V of DC power supply.
Negative (Black)	Need to be connected to GND of DC power supply

Code

```
#ifndef F_CPU
#define F_CPU 8000000UL
#endif

#include <avr/io.h>
#include <util/delay.h>

int main(void)
{
	DDRC = 0xFF;
	while(1)
	{

		PORTC = 0x01;
		 _delay_ms(4000);

		PORTC = 0x00;
		 _delay_ms(4000);

		PORTC = 0x02;
		_delay_ms(4000);

		PORTC = 0x03;
		_delay_ms(4000);
	}
}
```

5. **<u>Name of the student</u>: <u>-R.R.R.M.A.W.N.T.B.Atugoda(204011U)</u>**

01.IR sensor-Determine the hand before measuring the body temperature. **[12]**

- Be aware about the pins of the IR Sensor to the microcontroller.
- Determine how to connect those components with Atmega32 microcontroller.
- Be aware about the coding part of the IR Sensor and the reflected Infrared ray to the temperature sensor.

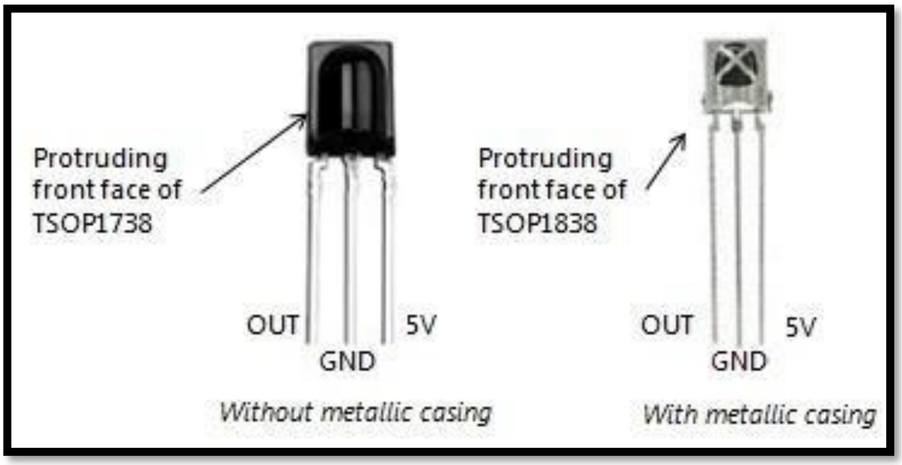


Figure 32:IR Sensor

Specifications	Min	Max
Storage Temperature	-40°C	80°C
Digital Supply Voltage Analog	2.5V	3.6V
Supply Voltage	2.5V	3.6V
Input Voltage	2.5V	3.6V

Code

```
#include <avr/io.h>

#define LED_OUTPUT          PORTD
#define IR_Input            PINC

int main(void)
{
	DDRC = 0x00;
	DDRD = 0xff;

	while(1)
	{
		LED_OUTPUT = IR_Input;
	}
}
```

02.Temperature sensor - Determine the reflected infrared ray and measure the body temperature. **[13]**

- ❖ Be aware about the pins, input, output of the temperature sensor to the microcontroller.
- ❖ Make sure how to connect those components with the Atmega32 microcontroller.
- ❖ Be aware about the coding part of the temperature sensor and input it to the microcontroller and expecting the message “Allowed” or ”Not Allowed” in the display.

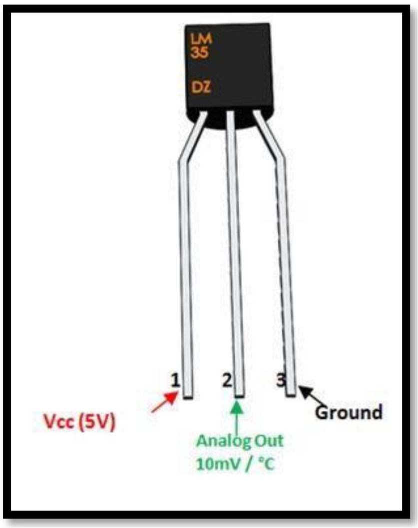


Figure 33:Temperature Sensor

Specifications	Min	Max
Supply voltage	-0.2V	35V
Output voltage	-1V	6V
Output current	0mA	10mA
Maximum junction temperature		150℃

Code

```
#define F_CPU 8000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <string.h>
#include <stdio.h>
#include "LCD_16x2_H_file.h"

#define degree_sysmbol 0xdf

void ADC_Init(){
	DDRA = 0x00;
	ADCSRA = 0x87;
	ADMUX = 0x40;
}

int ADC_Read(char channel)
{
	ADMUX = 0x40 | (channel & 0x07);
	ADCSRA |= (1<<ADSC);
	while (!(ADCSRA & (1<<ADIF)));
	ADCSRA |= (1<<ADIF);
	_delay_ms(1);
	return ADCW;
}


int main()
{
	char Temperature[10];
	float celsius;

	LCD_Init();
	ADC_Init();

	while(1)
	{
	LCD_String_xy(1,0,"Temperature");
	celsius = (ADC_Read(0)*4.88);
	celsius = (celsius/10.00);
	LCD_String_xy(2,0,Temperature);
	_delay_ms(1000);
	memset(Temperature,0,10);

	}
}
```

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