ECTE250

DELIVERABLE 6:
FINAL DESIGN REPORT

BY: TEAM E

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SMART PARKING SYSTEM

1. Executive Summary

This report provides an insight into the detailed design, analysis of outputs, circuit technicalities, progress planning, budget and marketing plans of the project prototype "smart parking system". It includes all the details of the tasks completed over the duration of this course, including team roles, key contributions as well as the issues faced while designing the prototype and how it was debugged. Other specifics are included in the appendix.

2. Team Roles

2.1 Summary of Rotating Roles

The following roles were taken by each team member over the course of the project:

Table 1: Roles taken throughout the Project

	Week 2 – Week 4	Week 5 – Week 7	Week 8 – Week 11	Week 12 – Week 13
Tanmay Khachane	Managing Director	Project Planning	Sales & Marketing	Secretary
Aksha Sajeev	Project Planning	Secretary	Managing Director	Sales & Marketing
UmmKulsoomEmad	Secretary	Quality Assurance	Project Planning	Quality Assurance
Omar Bersi	Sales & Marketing	Managing Director	Quality Assurance	Project Planning
Baha Tayem	Quality Assurance	Sales & Marketing	Secretary	Managing Director

2.2 Key Contributions

2.2.1 Omar Bersi: Suggestion of the main idea, and completing the circuits assigned.

2.2.2 Tanmay Vikas Khachane: Designing the state machine, and implementing the circuits and debugging them, and soldering.

2.2.3 Aksha Sajeev: In charge of Arduino Uno with Ethernet Shield, the coding and, helping in the implementation of circuits, soldering, report making and making presentations.

2.2.4 Umm Kulsoom Emad: In charge of making reports, and completing the circuits assigned.

2.2.5 Baha Tayem: Contributed a little for every aspect of the project.

3. Introduction and Overview

The design is a smart car parking system that is equipped with sensors placed at strategic spots in the parking space. The idea of this particular design is to help drivers align their cars in the proper spot while parking. If the car comes in contact with the sensors, notifications will be sent to the driver's phone informing him or her that they have parked properly or to re-park. The notifications would be sent with the help of wireless networks, fulfilling the concept of Internet of Things. A DC motor is also added which acts as a coolant and would only activate when the car has been parked properly. A flex sensor and some push buttons have been used for the activation of this system and an Analog to Digital converter has been

utilized to convert the signals the system receives for the rest of the circuit to work. Other components of the system include: a 555 timer, de-bouncing circuit(for the push buttons), voltage regulator, and an Ethernet shield to help connect to the Internet.

4. Design Specification

4.1 Final design of overall system

The prototype works in combination with the Arduino Uno to help the driver park his/her car conveniently, in a systematic manner in the parking space.

4.1.1 The working system of the entire system:

In the parking space, two push buttons have been placed on the sides and a flex sensor is placed in the center which is used to detect the car. The flex sensor gets activated when the car parks in the centre. If the car parks on the right or on the left, the pushbuttons are activated which would switch LEDs on and send notifications to the driver, alerting him/her of the flaw. Notifications will also be sent if the car has been parked properly (in the centre).

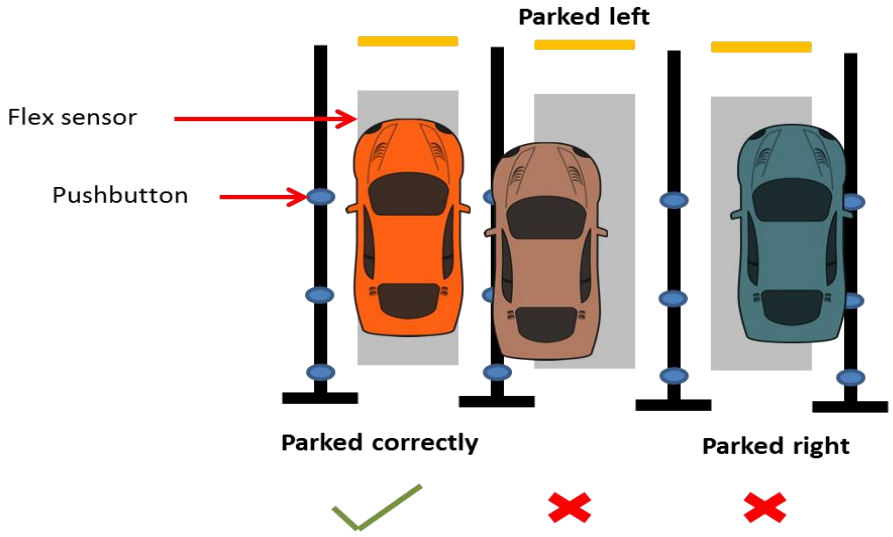

Fig 1: Overview of the idea

4.1.2 The flowchart of the entire system:

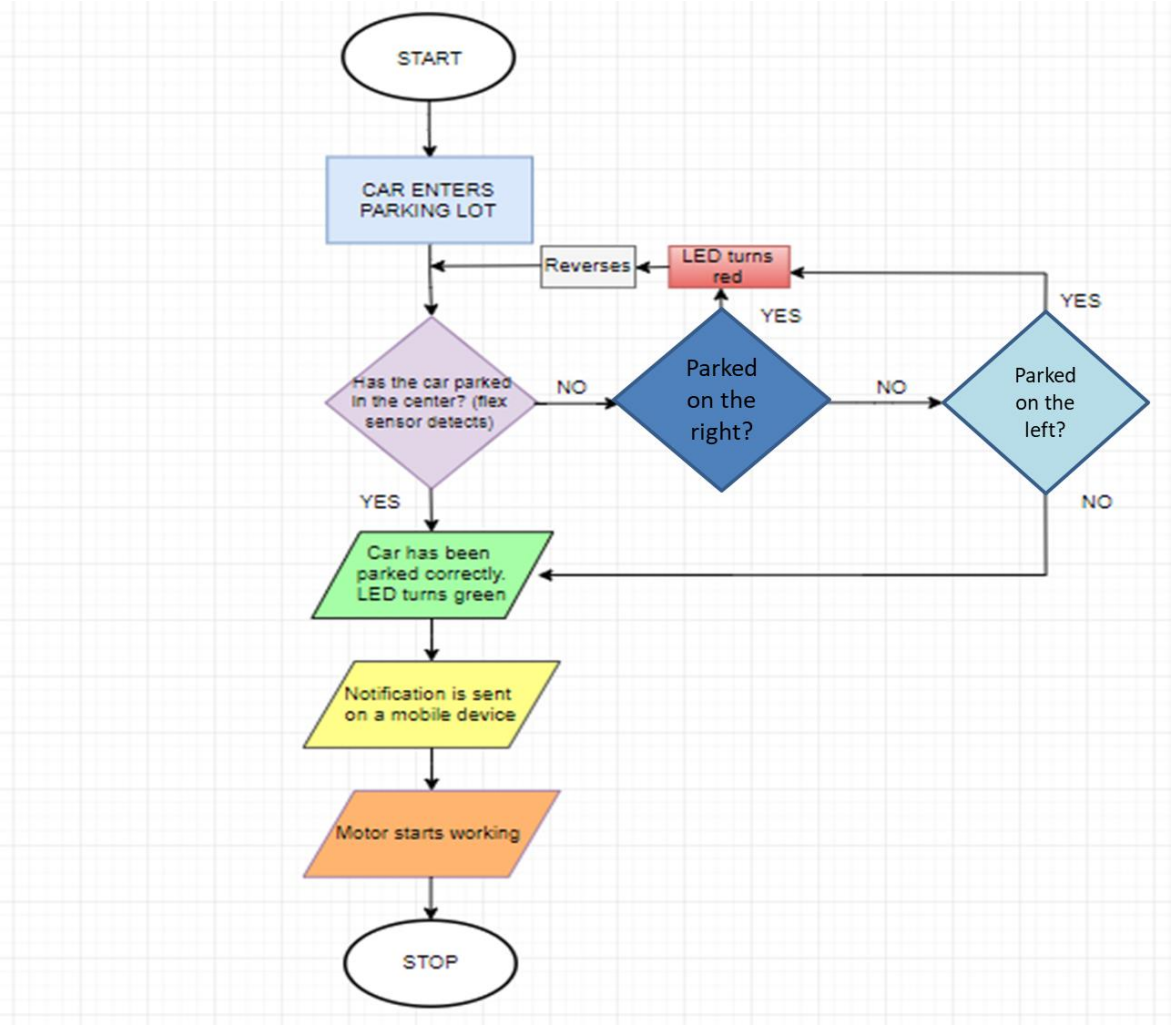

Fig 2: Flowchart of the System

4.2 Technical Implementation

The technical implementation of the entire system, how different components are linked together to form the prototype, is explained using the following block diagram:

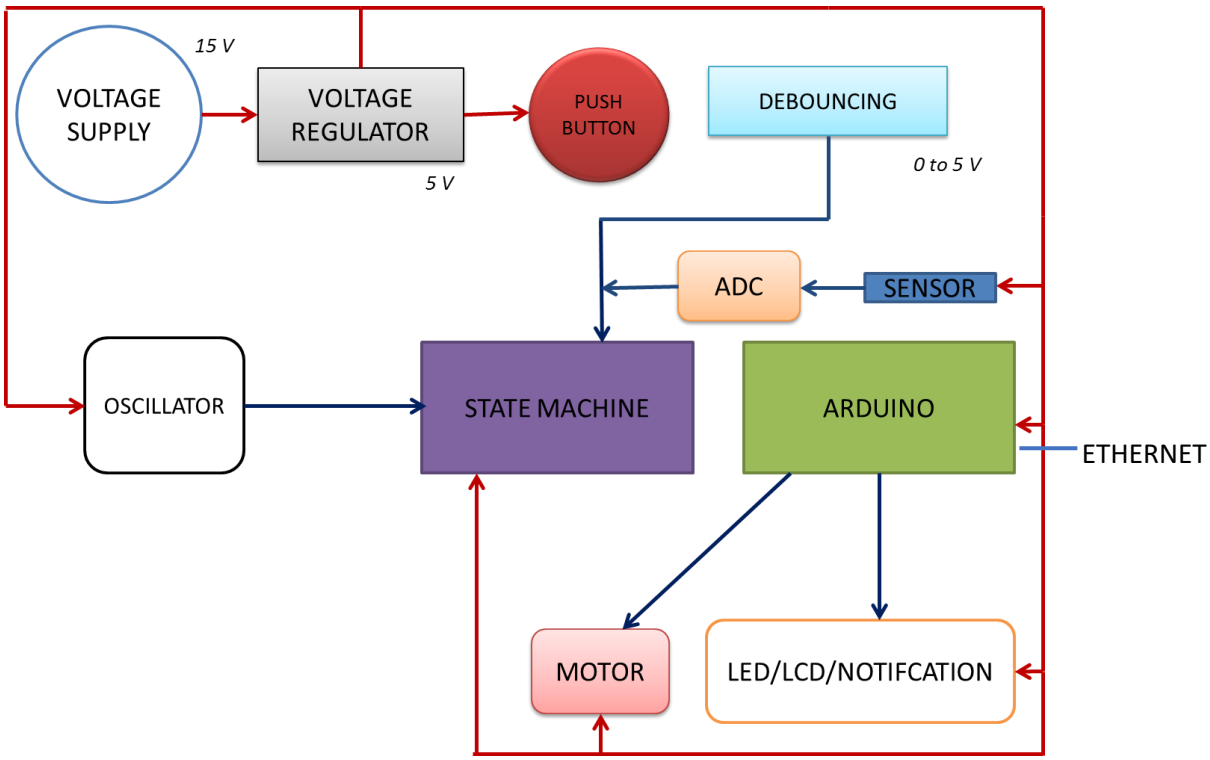

Fig 3: Block Diagram of the System

The designing and functioning of each component showed in the figure above, is explained in the next sub section.

4.3 Voltage Regulator

The voltage supply is connected to a voltage regulator that uses LM7805CT; the 1st pin is connected to the power supply (15V) and the 3rd pin outputs the regulated voltage (5V). Between the 1st and 3rd pins and their connections, one capacitor is placed on each side which is used for storing the energy. The 2nd pin and the capacitors are grounded. It provides the regulated voltage of 5V to the entire system.

4.4 Oscillator

Oscillators circuit produces periodic, oscillating electronic signal. It is designed using a Schmitt trigger with a resistor (1200Ω) parallel to it. The two inputs of Schmitt trigger are connected together which are in series with a capacitor (1µF). Both the input and output connections of the Schmitt trigger are connected to the oscilloscope. The oscillator times the state machine.

4.5 NE555 – Timer

The frequency of this circuit was set according to the method recommended by the client and depending upon the frequency, the resistor and capacitor values were chosen. The triangular and rectangular waveform generated has to be of 60% duty cycle.

4.6 Debouncing

De-bouncing circuit is required whenever a switch/pushbutton is being used in the circuit and it must be connected to those components to ensure correct functionality and output. The circuit uses a capacitor of 0.1uF, resistor and a pullup resistor of 10k ohms. The purpose of debouncing circuit to remove the spikes/bouncing that appears in the output.

4.7 Flex Sensor Circuit

It is a combination of small circuits like gain circuit and level shifter with a flex sensor. It receives voltage from the positioning of the flex sensor and then gain circuit is used to increase the voltage which is then limited from 0 to 5 volts using the level shifter circuit.

4.8 State Machine

4.8.1 Description of State Machine

State machine is the core of the prototype. It is connected to the Arduino Uno. It consists of D-flipflops and logic gates which help in the transition of states. The inputs of the state machine are flex sensor (positioned at the middle) and two pushbuttons/switches (one position on the left side of the parking space and the other positioned at the right side). The outputs are LEDs and LCD messages at each state, and motor at the fourth and final state.

Table 2: Describing the States

State	State Name	Description	Input for transition of State	Output
00	No Car	When there is no car	Flex Sensor	1.Message on LCD
01	Check Left Side	Checking the left side of the parking space	Pushbutton on left side	1.Message on LCD 2.LED on the left side
10	Check Right Side	Checking the right side of the parking space	Pushbutton on right side	1.Message on LCD 2.LED on the right side
11	Occupied	When the car is parked properly	Flex sensor being not triggered, would reset to 1st State	1.Message on LCD 2.LED on both sides 3.Motor

4.8.2 State Table

To design a state machine, first the state table was made using the inputs and outputs.

where M is the flex sensor in the middle
L is the pushbutton on the left side
R is the pushbutton on the right side

Table 3: State Table

		INPUTS (M, L, R)								OUTPUT Z
States	**Q1 Q0**	000	001	010	011	100	101	110	111	
No Car	0 0	00	00	00	00	01	01	01	01	0
Left	0 1	00	10	01	01	10	10	01	01	0
Right	1 0	00	10	01	01	11	10	01	01	0
Occupied	1 1	00	00	00	00	11	10	01	01	1

The transition equations are:

$$Q_1^* = Q_0ML' + Q_1ML' + Q_1'Q_0L'R + Q_1Q_0'L'R$$

$$Q_2^* = ML + Q_1'Q_0'M + Q_1'Q_0L + Q_1Q_0'L + Q_1MR'$$

The output equation is:

$$Z = Q_1.Q_0$$

4.8.3 State Diagram

With the State Table made, the following State Diagram was designed for the system:

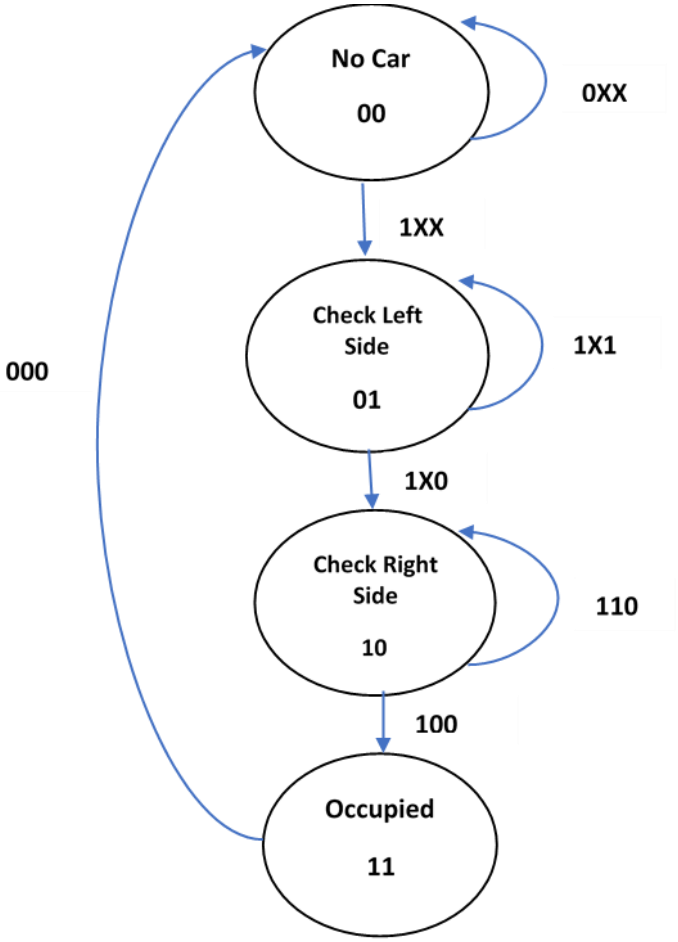

Fig 4: State diagram

4.9 ADC

The 4-bit ADC transforms the continuous values received from the sensor circuit into digital binary outputs (0 or 1). This is achieved by comparing the voltage value from the sensor circuit with the predefined voltage set in the ADC circuit, using a combination of resistors. If the voltage value from the sensor circuit is greater, the transistor acts like a switch and allows 5V flow through it.

4.10 Motor

The DC motor was provided, its circuit is built on the breadboard of Arduino Uno, in combination with an IC of H-bridge. It acts as a coolant for the parked car and its functionality is controlled by coding the Arduino Uno.

4.11 LCD and Arduino Uno

The LCD displays status of the parking spot; the detection of the car, the positioning of the car and the availability of the parking spot. The connections are made on the breadboard of the Arduino Uno. The Arduino is coded to synchronise the state machine with the LCD.

4.12 Modifications

4.12.1 Changes to improve the design of the system:

- Previously, motor was being used to move the LCD, but now it is being used as a coolant for the parked car (as suggested by client).

4.12.2 Changes during the implementation of the system:

- Previously, phototransistors were being used, on both the sides (left and right), to detect the positioning of the car, but now switches/push-buttons are being used for the same purpose.
- Previously, tilt sensor was being used to detect the car, but now flex sensor is being used for the same purpose (as suggested by the client).

5. Testing and Evaluation

5.1 Problems Encountered and their Solutions

5.1.1 The state machine was not giving the desired output for the input given.
Solution: Rebuilt the state machine with a different layout, after separately testing the functionality of every IC used.

5.1.2 The working of all the circuits together as one system.
Solution: Working on the solution in the extended time given by the client.

5.2 Voltage Regulator

The voltage +15V was supplied to voltage regulator and the output voltage was measured with a digital multimeter. The output voltage was 5.006V, which was almost the same as simulated output.

5.3 Oscillator

To check the output of the oscillator circuit, oscilloscope was used which displayed the square waves with the required frequency of 486Hz. The output was the same as the simulated output.

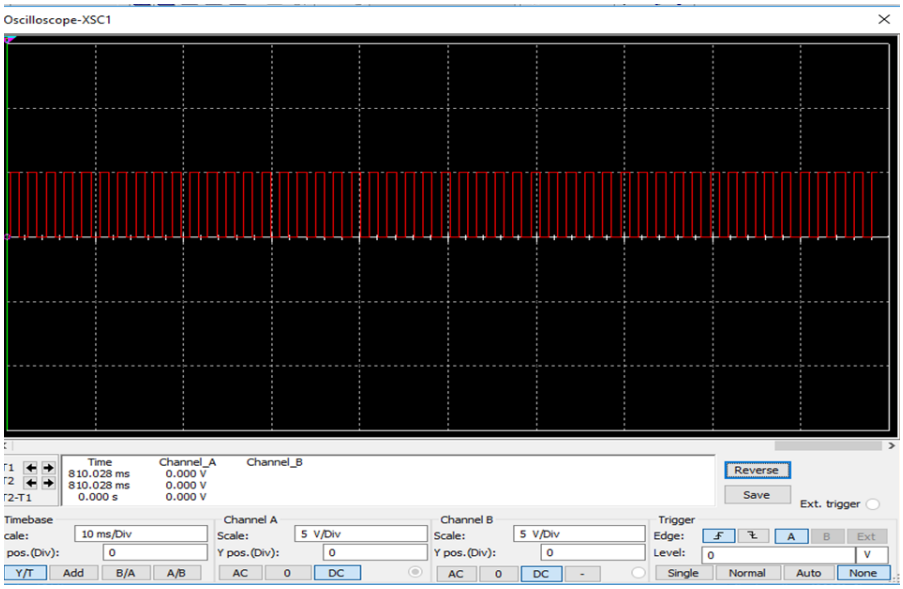

Fig 5: Output Waveform of an Oscillator

5.4 NE555 – Timer

The NE555 – timer's output was compared to the expected output from simulation, by connected it to oscilloscope. The required triangular and square waves were obtained with the accurate frequency 486 Hertz.

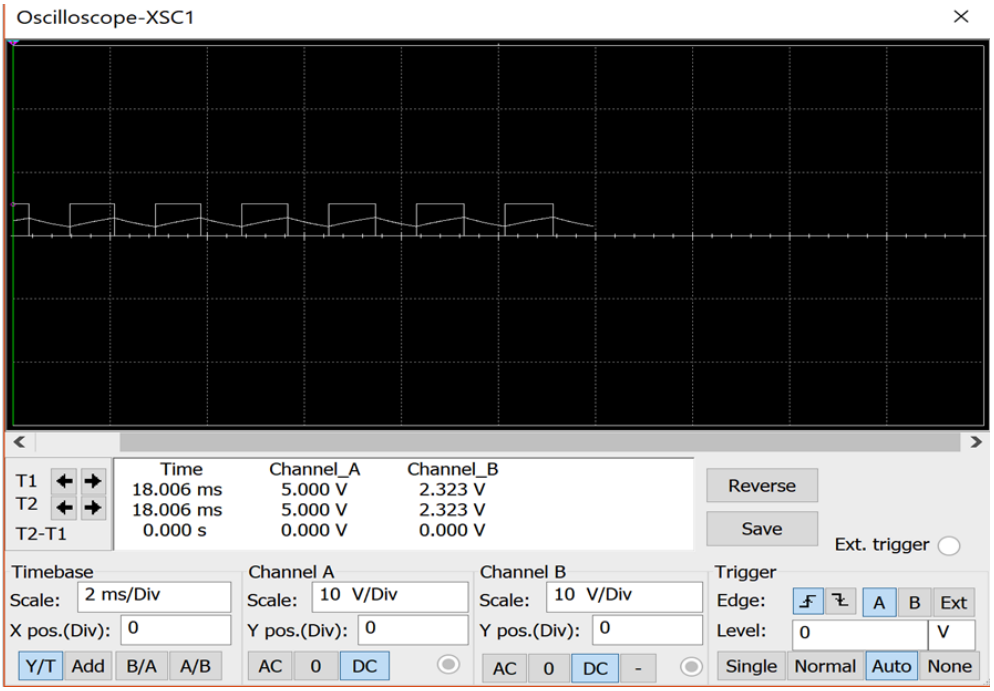

Fig 6: Output Waveform of NE555timer

5.5 Debouncing

The debouncing circuit is tested by using a pushbutton and connecting the output to an oscilloscope and comparing the output waveform to the one which was simulated, and it was the same as expected.

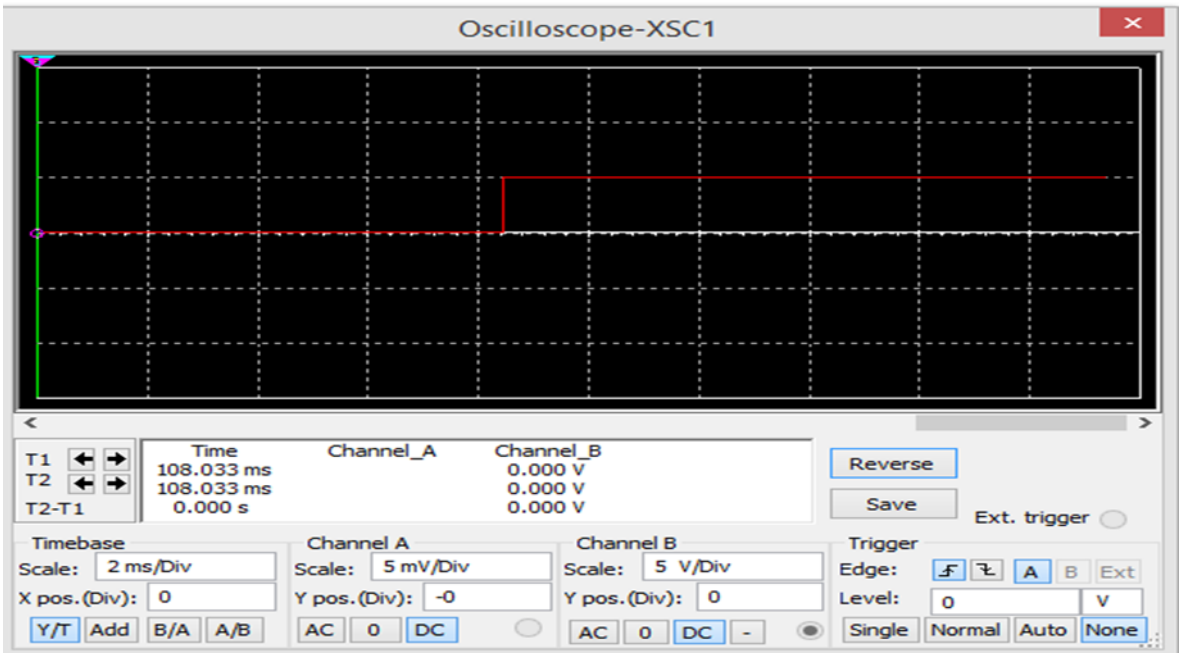

Fig 7: Output Waveform of Debouncing

5.6 Flex Sensor Circuit

The output of this circuit was measured using a digital multimeter, the output was between 0V to 5V depending upon the bent of the flex sensor, as expected.

5.7 State Machine

The state machine was separately tested, for each state, by giving three inputs and comparing them to the expected two output LEDs. Also, it was checked in combination with the Arduino Uno's LCD. The testing result was as required. The timing diagram of the state machine was the same as simulated, and it was checked by using oscilloscope.

5.8 ADC

The output of the ADC has to be checked using a DMM, it should either be 5V or 0V. *(yet to be tested due to extension)*

5.9 Motor

With the coding in Arduino Uno, once the car is properly parked (fourth state is reached), the DC motor turns on and could be used to be connected to a fan as it rotates 360 degrees.

5.10 Arduino Uno and LCD

The Arduino Uno was coded according to the messages which were supposed to be displayed at each state, and by giving inputs of each state, the state machine could be in, the output messages were checked.

6. Breadboard and Perfoboard Implementation

6.1 Implementation of the Circuits

The circuits were designed and then simulated in 'Multisim.' Depending upon the schematics of each circuit, they were implemented on the breadboard. However the circuits underwent changes. Every circuit worked individually on the breadboard. Once the breadboard prototype worked, the circuits were transferred to the perfoboard by soldering. The connections and layout of the circuits on the perfoboard were different than those on the breadboard. *(Working on the perfoboard as per the extension given)*

6.2 Power Analysis of the System

6.2.1 Power Analysis Methodology

Power analysis is performed by supplying two different voltages to the system and measuring the current drawn using a digital multimeter. Then by using the formula, the power is calculated.

$$P = VI$$

The following three the steps must be conducted at every existing state that the state machine works in.

i. In the first step, 15V is connected to the VCC and -15V is connected to the ground of the system, and the current drawn at the state is measured, and then the power P_a is calculated.

ii. In the second step, 15V is connected to the VCC and 0V is connected to the ground of the system, and the current drawn at the state is measured, and then the power P_b is calculated.
(Note: the voltage used in the power formula for the first and second step is the difference in the supply voltage)

iii. In the third step, we subtract the P_b from P_a and the P_{state} for every state is found.
for example: $P_{00} = P_{a,00} - P_{b,00}$

Depending upon the power, P_{state} calculated at each state, estimation is made for the percentage of power distribution for every state.
For example: $P_{00} \rightarrow 10\ \%$
$P_{01} \rightarrow 21\ \%$
$P_{10} \rightarrow 21\ \%$
$P_{11} \rightarrow 48\ \%$

With the percentages, the weighted average mark, WAM of the system can be calculated.
For example: $WAM = P_{00}(0.1) + P_{01}(0.21) + P_{10}(0.21) + P_{11}(0.48)$

6.2.2 Power Analysis Estimation

The following assumptions are made for the power consumption and time spent on each state of the state machine:
Note: Assumptions are made since all the circuits didn't work together as one system.

Table: Time and Power Distribution

State	State Name	Time Spent	Power Consumed
00	No Car	55%	10%
01	Check Left Side	7%	21%
10	Check Right Side	7%	21%
11	Occupied	31%	48%

For the first state, the time spent is the most as no car would be parked, and the power is supplied continuously but not being used for any component, therefore the power consumption is least.

For the second and third state, the time spent is the same and it is the least time spent comparatively as the driver would change the car's position. The power consumed is more than the first state as the pushbuttons could be triggered making the output LEDs on.

For the fourth state, the time spent is the lesser than the first state, but the power consumed is most because in this state both LEDs would be on and motor would be used as a coolant.

7. Progress of the Team

7.1 Project Planning

Below is a Gantt chart used for visualizing the design plan spanning over 13 weeks.

		Tas...	Task Name	Duration	Start	End	Completion
1			**Smart Parking Assistance**	**82 days**	**08/02/2018**	**03/06/2018**	**82%**
2	✓		**⊟ Deliverable 1**	**12 days**	**08/02/2018**	**19/02/2018**	**100%**
3	✓		Pitching Ideas	4 days	08/02/2018	11/02/2018	100%
4	✓		Rough design, assigning roles	1 day	12/02/2018	12/02/2018	100%
5	✓		Gantt chart	1 day	13/02/2018	13/02/2018	100%
6	✓		Designing the presentation	6 days	14/02/2018	19/02/2018	100%
7	✓		M1: Presenting	0 days	19/02/2018	19/02/2018	100%
8			**⊟ Deliverable 2**	**17 days**	**20/02/2018**	**08/03/2018**	**90%**
9	✓		Designing the state machine	16 days	20/02/2018	07/03/2018	100%
10			Report making	8 days	01/03/2018	08/03/2018	70%
11			M2: Submission of report	0 days	08/03/2018	08/03/2018	70%
12	✓		**⊟ Deliverable 3**	**11 days**	**09/03/2018**	**19/03/2018**	**100%**
13	✓		Simulation	11 days	09/03/2018	19/03/2018	100%
14	✓		M3: Submission of simulations	0 days	19/03/2018	19/03/2018	100%
15			**⊟ Deliverable 4**	**30 days**	**20/03/2018**	**17/04/2018**	**70%**
16			Breadboard	30 days	20/03/2018	17/04/2018	70%
17			M4: Submission of breadboard	0 days	17/04/2018	17/04/2018	20%
18			**⊟ Deliverable 5**	**14 days**	**18/04/2018**	**01/05/2018**	**30%**
19			Perfoboard and ethernet shield	14 days	18/04/2018	01/05/2018	30%
20			M5: Submission of perfoboard	0 days	01/05/2018	01/05/2018	30%
21	✓		**⊟ Deliverable 6**	**16 days**	**02/05/2018**	**17/05/2018**	**100%**
22	✓		Final design report	16 days	02/05/2018	17/05/2018	100%
23	✓		M6: Submission	0 days	17/05/2018	17/05/2018	100%
24	✓		**⊟ Deliverable 7**	**13 days**	**02/05/2018**	**14/05/2018**	**100%**
25	✓		Final presentation	13 days	02/05/2018	14/05/2018	100%
26	✓		M7: Presenting	1 day	14/05/2018	14/05/2018	100%
27			Trade show	1 day	03/06/2018	03/06/2018	0%

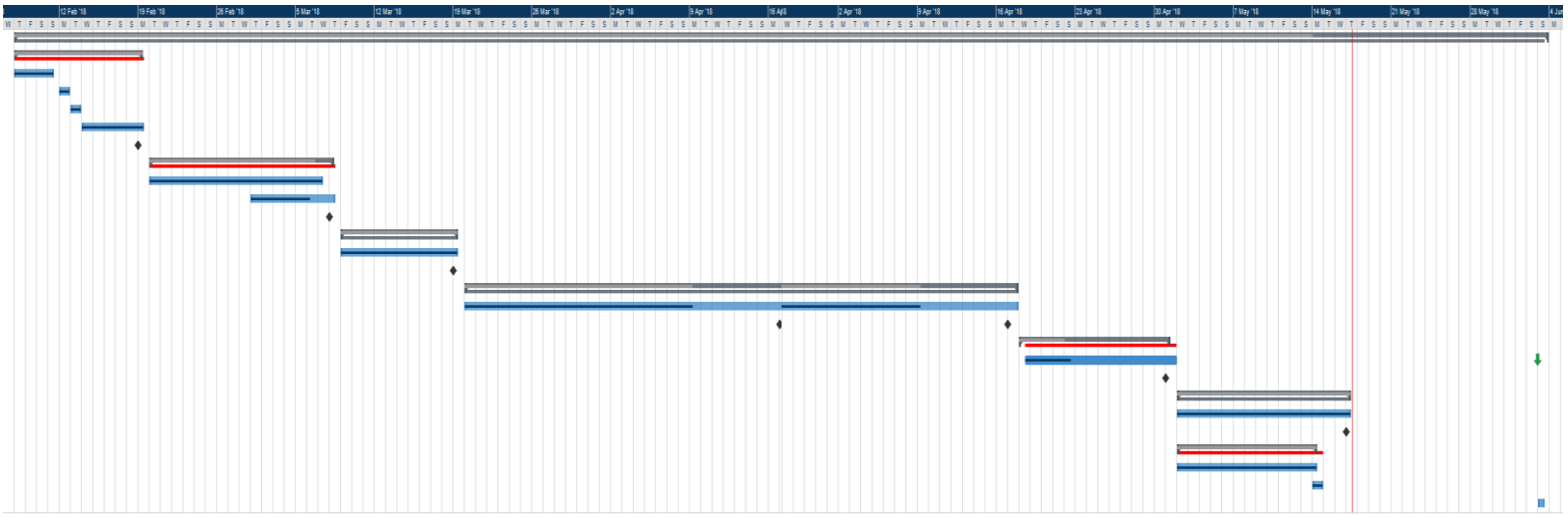

Fig 8: Gantt

For deliverable 5, the team has taken an extension to complete the perfoboard prototype.
The tasks distributed among the group members are as follows:
Omar: ADC and 555 timer
Tanmay: Opto-couplers, state machine
Kulsoom: Voltage regulators and oscillators
Baha: De-bouncing circuits
Aksha: Ardunio and Ethernet shield

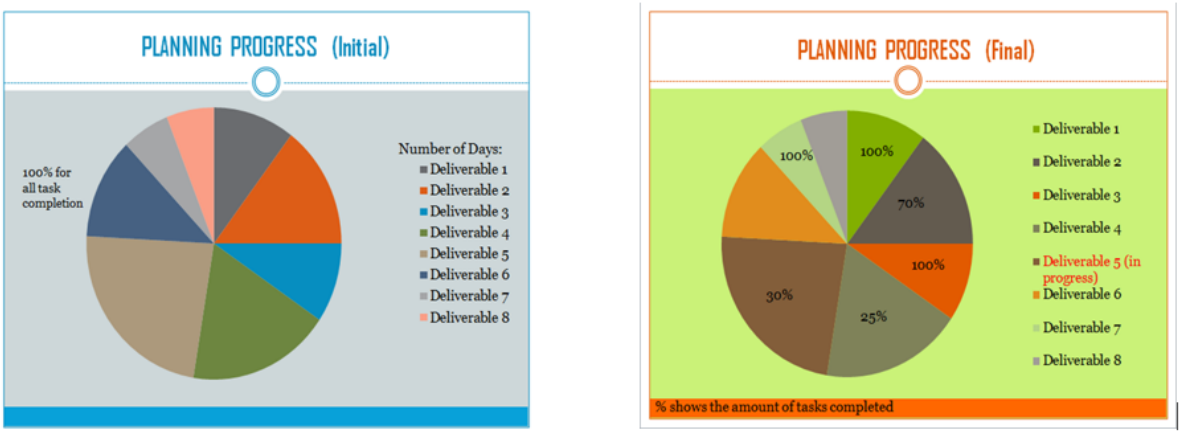

Fig 9: Planning Progress Charts

*Note: size of each sector shows the duration

7.2 Budget

The client accorded us with 900 AED which is, inclusive of price of the 'Arduino kit', used for our project, worth 600 AED, and exclusive of the cost of the labors. The remaining amount 300 AED, is for the supplies and consultation that we might need at any stage of our project.

The table below is a list of the components (and their cost) that was calculated at the beginning of the project planning.

Component	Quantity	Price
Voltage Source	1	Provided in lab
Dc motor	1	Arduino kit
Arduino board	1	Arduino
Flex sensor	1	Arduino kit
LCD	1	Arduino kit
NE555 timer	1	2 AED
LEDS	3	Arduino kit
Breadboard	1	Arduino kit
Perfoboard	1	Provided in lab
Photo transistors	2	Arduino kit
D flip flops	2	3 AED * 2 = 6AED
AND Gate	4	3 AED * 4 = 12AED
NOR Gate	4	12 AED
NAND Gate	4	12 AED
Opamps	4	4 AED * 4 = 16AED
Voltage regulator	1	3 AED
74HC132 (Schmitt Trigger)	2	6AED*2 = 12 AED
5 Volt SPST	1	7 AED
Total cost (out of the 300 AED)		*82 AED*

After the entire prototype was designed, a new budget plan was procured to adhere to the new additional materials and their cost.

Sr. No	Item / Description	Max Qty	Price / Unit (AED)	Qty Issued	Total Price (AED)
1	NE555 timers	2	4	1	4
2	TL074/LF347 opamps	4	5	2	10
3	TL071/LF351 opamps	4	4		0
4	74LS00 (Quad 2-input NAND gate)	4	3		0
5	74HC02 (Quad 2-input NOR gate)	4	3	2	6
6	74LS04 (HEX inverter gate)	4	3	2	6
7	74LS08 (Quad 2-input AND gate)	4	3	4	12
8	74HC74 (Dual D type flip flops)	4	3	2	6
9	74HC86 (Quad 2-input XOR)	4	3		0
10	74LS90 (Decade Counter)	2	4		0
11	74LS73 (Dual JK type flip flops)	4	7		0
12	74HC151 (8 input multiplexer)	2	4		0
13	74HC138 (3-to-8 demultiplexer)	2	4		0
14	74HC161 (4 bit binary counter)	2	5	1	5
15	74HC164 (8 bit serial in parallel out shift	2	4		0
16	74HC132 (Quad 2 input NAND gate	4	6		0
17	BC557 (PNP transistors, complement BC547 NPN in Arduino Kits)	5	1		0
18	IRF9532 (P-Channel MOSFET, to complement IRF520 N-Channel MOSFET in Arduino Kits)	2	4		0
19	5 Volt SPST DIL Reed Relay	4	7		0
20	BD139 (NPN transistor for push pull	2	3	4	12
21	BD140 (PNP transistor for push pull circuit)	2	3		0
22	7805 (+5 VDC Voltage regulator, 1 amp)	4	3	1	3
23	LM2936 (+3.3V Voltage regulator 50mA, input 4-26Volts DC)	2	6		0
24	ULN2003 (Darlington pairs array IC)	1	7		0
25	BD649 (NPN Darlington pair)	2	6		0
26	BD650 (PNP Darlington Pair)	2	6		0
27	1N4728 (3.3V Zener diode)	4	1		0
28	1N4732 (4.7V Zener diode)	4	1		0
29	1N4743 (13V Zener diode)	4	1		0
30	ESP8266 WiFi Module	0	25		0
31	ADXL345 3-Axis Accelerometer	0	66		0
32	Bread Board	1	50.00	1.00	50
33-	16 Pin IC Base	5	2.40	2.00	4.8
34-	14 Pin IC Base	40	0.44	16.00	7.04
35-	8 Pin IC Base	6	1.75	1.00	1.75
36-	Female header array/ 3 Round Pin IC Base	1	3.00		0
			Total		127.59 AED

The labour budget also changed through the course of the project.

Tasks	Estimated time spent by 1 member in a week (hours): (Number of hours * 7 days)	Labor Cost for 5 engineers per deliverable: (300 AED * estimated time*5)
Deliverable 1	7	10500 AED
Deliverable 2	14	21000 AED
Deliverable 3	21	31500 AED
Deliverable 4	84 (for 3 weeks)	126000 AED
Deliverable 5	76 (for 19 days)	114000 AED
Deliverable 6	50 (for 2 weeks)	75000 AED
Deliverable 7	14	21000 AED
Deliverable 8	14	21000 AED
Estimated Total Labor Cost	*280 hours*	*420000 AED*

Table: Initial labour cost

Tasks	Estimated time spent by 1 member in a week (hours): (Number of hours * 7 days)	Labor Cost for 5 engineers per deliverable: (300 AED * estimated time*5)
Deliverable 1	7	10500 AED
Deliverable 2	14	21000 AED
Deliverable 3	21	31500 AED
Deliverable 4	107	160500 AED
Deliverable 5	50 + ongoing	114000 AED
Deliverable 6	50	75000 AED
Deliverable 7	14	21000 AED
Deliverable 8	14	21000 AED
Estimated Total Labor Cost	*280 hours + ongoing*	*454500 AED + ongoing*

Table: Final labour cost

8. Commercialisation and Marketing

The commercialisation is the process of launching a new product, and marketing of a product is an approach to promote the product in order to sell it. It is important to have a marketing strategy to show the buyers that such a product exists.

For the prototype of 'Smart Parking System,' the following strategies could be adopted:

i) Participating in different trade fairs where prototypes are being exhibited.
ii) Distributing flyers and pamphlets of our prototype
iii) Contacting the builders that are constructing projects which require a parking lot, e.g. malls, theme parks, etc.
iv) Using technology for free advertisements, and conducting webinars so that we gain attention of the buyers from all over the world

9. Appendices

9.1 Appendix A: Weekly Reports

This appendix would include the minutes of the meeting for the entire session, starting from Week 2 up to Week 13.

GROUP E – Week 2

MINUTES of Meeting of Group E (ECTE250) held on 12th February, 2018 in UOWD Library Room No.11 from 9:30-11:30.

PRESENT: Tanmay Vikas Khachane, Managing Director
Umm Kulsoom Emad, Secretary
Omar Mohammad Salih, Finance and Sales/Marketing
Aksha Sajeev, Project Planning and Control
Baha Tayem, Quality Assurance and Sustainability

Business

1. Roles were assigned to every individual in the team.
2. Fixed a weekly time according to every member's convenience.
3. Following ideas were proposed:
   i. Finding the car parked in a lot.
   ii. Automated Light System in a Parking lot.
   iii. Displaying the Time for traffic light to be green.
   iv. Automatic Fog Light-On System for Cars.
   v. Barrier System for parking entrance.
4. Possibilties of how ideas could be implemented.
5. Constraints and limits like budget and availability of parts.

Other Business

1. Team rules and regulations, and the importance of being responsible as a team member.

Date for Next Meeting

19th February, 2018

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Signed by the Chair

Date: 14/2/2018

GROUP E – Week 3

MINUTES of Meeting of Group E (ECTE250) held on 18th February, 2018 in UOWD Library Room No.7 from 10:30-12:30.

PRESENT: Tanmay Vikas Khachane, Managing Director
Umm Kulsoom Emad, Secretary
Omar Mohammad Salih, Finance and Sales/Marketing
Aksha Sajeev, Project Planning and Control
Baha Tayem, Quality Assurance and Sustainability

Business

1. Fixed the block diagrams and flowcharts of the proposals.
2. Discussed the states of the state machines.
3. Rehearsed the presentation.
4. Possible question and answers, asked by audience, were discussed.

Date for Next Meeting

25th February, 2018

....

Signed by the Chair

Date: 22/2/2018

GROUP E – Week 4

MINUTES of Meeting of Group E (ECTE250) held on 26th February, 2018 in UOWD Library Room No.11 from 9:30-10:30.

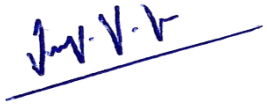
PRESENT: Tanmay Vikas Khachane, Managing Director
Umm Kulsoom Emad, Secretary
Omar Mohammad Salih, Finance and Sales
Baha Tayem, Quality Assurance and Sustainability

Business

1. State diagram was discussed for the state machine.
2. Deliverable 2 work was discussed.

Date for Next Meeting

4th March, 2018



....

Signed by the Chair

Date: 28/2/2018

GROUP E – Week 5

MINUTES of Meeting of Group E (ECTE250) held on 4th March, 2018 in UOWD Library Room No.6 from 10:30-12:30.

PRESENT: Omar Mohammad Salih, Managing Director
Aksha Sajeev, Secretary
Baha Tayem, Finance and Sales/Marketing
Tanmay Vikas Khachane, Project Planning and Control
Umm Kulsoom Emad, Quality Assurance and Sustainability

Business

1. Rotating roles were exchanged.
2. Discussion about deliverable 2, which including the following:
    a. Changes in State Machine were made.
    b. Design was modified.

Date for Next Meeting

12th March, 2018

OMAR BURSI

....

Signed by the Chair

Date: 6/3/2018

GROUP E – Week 6

MINUTES of Meeting of Group E (ECTE250) held on 12th March, 2018 in UOWD Library Room No.3 from 9:30-11:00.

PRESENT: Omar Mohammad Salih, Managing Director
Aksha Sajeev, Secretary
Umm Kulsoom Emad, Quality Assurance and Sustainability

Business

1. Comments by Dr. Stefano on deliverable 2 were discussed.
2. The approach towards the follow up of deliverable 2 was decided.
3. The tasks were assigned for deliverable 3 to every team member.
4. The internal deadline for every member were fixed, as the tasks are dependent.

Date for Next Meeting

19th March, 2018

OMAR BARSI

....

Signed by the Chair

Date: 6/3/2018

GROUP E – Week 7

MINUTES of Meeting of Group E (ECTE250) held on 19th March, 2018 in UOWD Library Room No.6 from 9:30-11:30.

PRESENT: Omar Mohammad Salih, Managing Director
Tanmay Vikas Khachane, Project Planning and Control
Aksha Sajeev, Secretary
Baha Tayem, Finance and Sales/Marketing
Umm Kulsoom Emad, Quality Assurance and Sustainability

Business

1. Rechecking the simulation circuits for deliverable 3.
2. Peer checking by team members, the report made for deliverable 3.
3. Making necessary changes in the simulations and report.
4. Assigning tasks for deliverable 4 to each group member.
5. Discussing the change of rotating roles.

Date for Next Meeting

Date yet to be decided because of vacations.

Omar Mohammad Salih
....

Signed by the Chair

Date: 22/3/2018

GROUP E – Week 8

MINUTES of Meeting of Group E. We currently are not having any meeting as we are working on deliverable 4.

Business

- Re-testing the designed circuits for deliverable 4.
- Report for deliverable 4 will be completed by the beginning of next week.
- Assigning tasks for deliverable 5 to each group member.
- We made the necessary calculations of the frequency,R1 & R2 and the duty cycle for the NE555 timer

Date for Next Meeting

Date yet to be decided because of compact work on the deliverables.

Aksha Sajeev..... .....

Signed by the Chair

Date: 22/3/2018

GROUP E – Week 9

MINUTES of Meeting of Group E. We currently are not having any meeting as we are working on deliverable 4 and 5.

Business

- Re-working and double checking on the designed circuits for deliverable 4.
- As soon as we finish we will start with working on deliverable 5

Date for Next Meeting

Date yet to be decided because of vacations.

Aksha Sajeev..... .....

Signed by the Chair

Date: 22/3/2018

Week 10

GROUP E – Week 11

MINUTES of Meeting of Group E. We currently are not having any meeting as we are working on deliverable 5.

Business

- We will be working on deliverable 5 throughout next week.
- Draft report for deliverable 6 will also be completed throughout the next week.

Date for Next Meeting

Date yet to be decided because of compact work on the deliverables.

Aksha Sajeev..... .....

Signed by the Chair

Date: 22/3/2018

Week 12

GROUP E

MINUTES of Meeting of Group E (ECTE250) held on 6th May, 2018 in UOWD.

PRESENT: Tanmay Vikas Khachane, Secretary Umm Kulsoom Emad, Finance/ Sales and Marketing Omar Mohammad Salih, Project Planning Baha Tayem, Managing Director Aksha Sajeev, Quality Assurance Business

1. Assigned tasks to every team member according to deliverable six and seven.

2. Discussed the approach for the extension.

Date for Next Meeting

13th May, 2018

Baha Tayem

....

Signed by the Chair

Date: 28/2/2018

Week 13

GROUP E

MINUTES of Meeting of Group E (ECTE250) held on 13th May, 2018 in UOWD.

PRESENT: Tanmay Vikas Khachane,

Secretary Umm Kulsoom Emad, Finance/ Sales and Marketing

Omar Mohammad Salih, Project Planning

Baha Tayem, Managing Director

Aksha Sajeev, Quality Assurance

Business

1. Assign tasks to all members related to the next few deliverables.

2.Set internal deadlines for the deliverables.

Date for Next Meeting

No more official meetings to be held.

Baha Tayem

....

Signed by the Chair

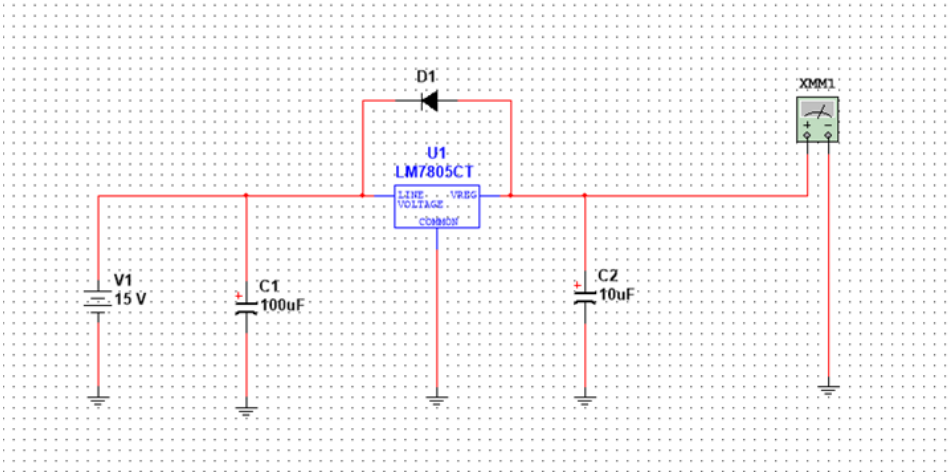
Date: 17th May 2018

9.2 Appendix B: Schematics of the Circuits

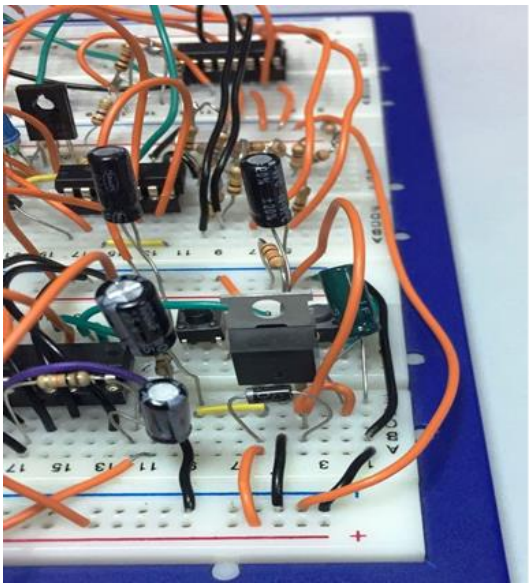
This appendix includes the schematics, breadboard and perfoboard connections of all the circuits.

Key: B – Figure Number and Label (B as it belongs to appendix B)

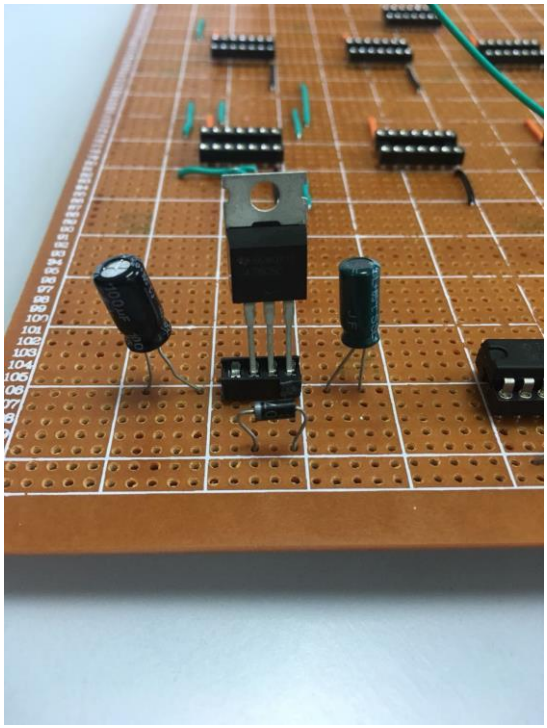
1. Voltage Regulator



B – Fig 1.1: Schematics for Voltage Regulator

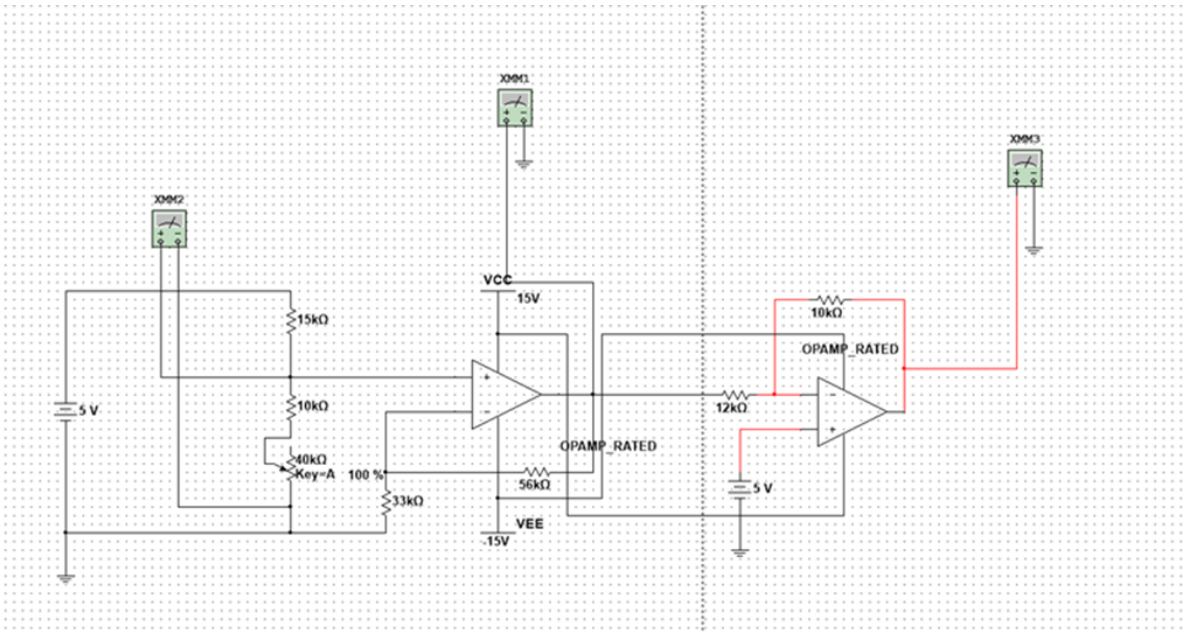


B – Fig 1.2: Breadboard Connection for Voltage Regulator

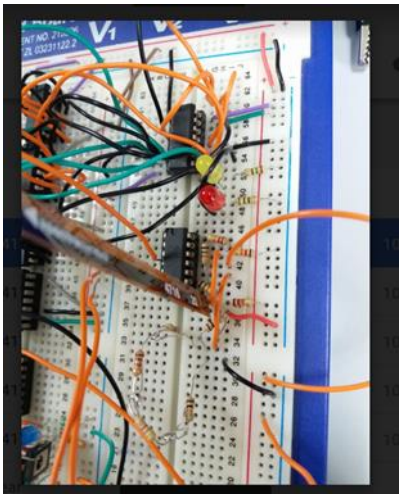


B – Fig 1.3: Perfoboard Connection for Voltage Regulator

2. Sensor Circuit

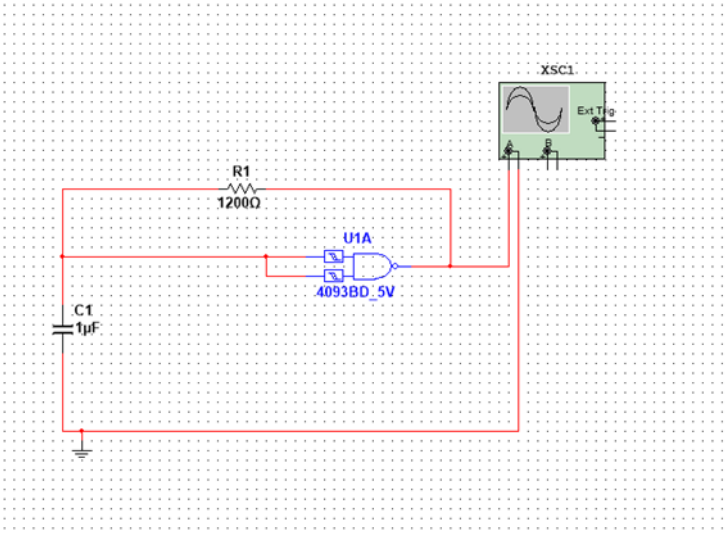


B – Fig 2.1: Schematics for Sensor Circuit

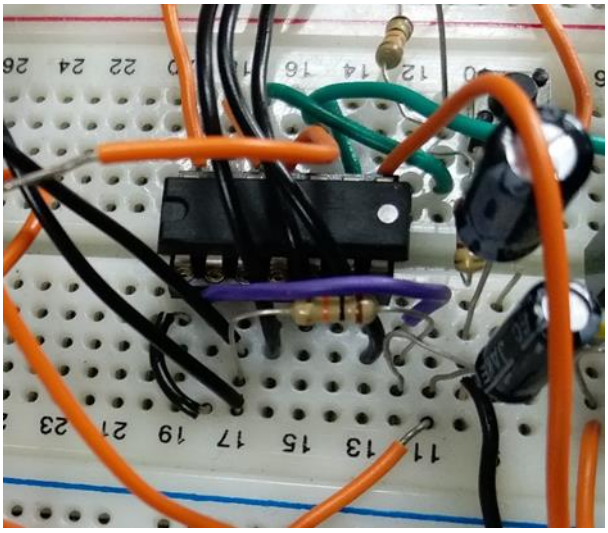


B – Fig 2.2: Breadboard Connection for Sensor Circuit

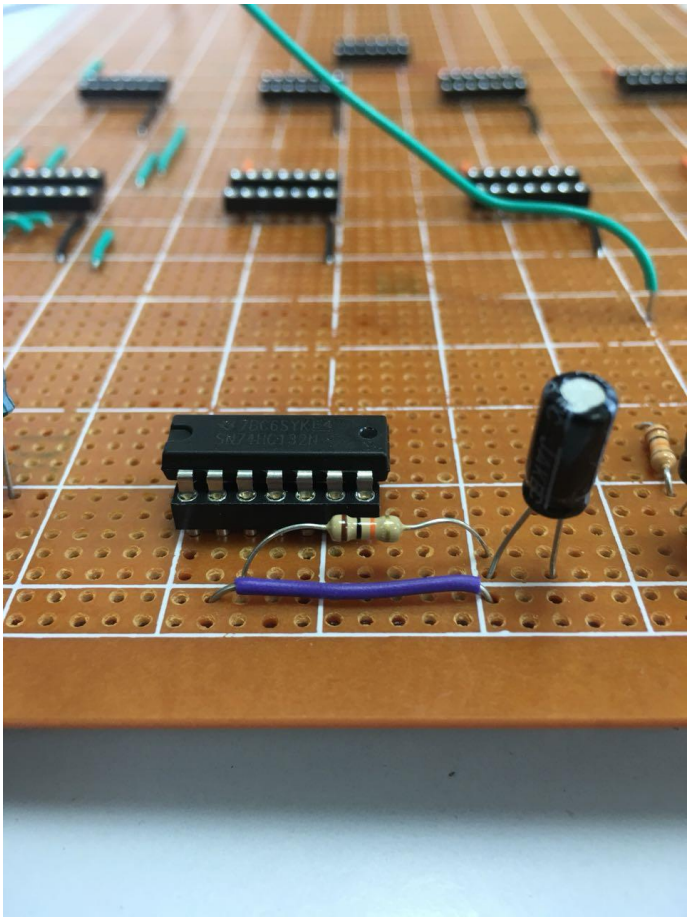
3. Oscillator



B – Fig 3.1: Schematics for Oscillator

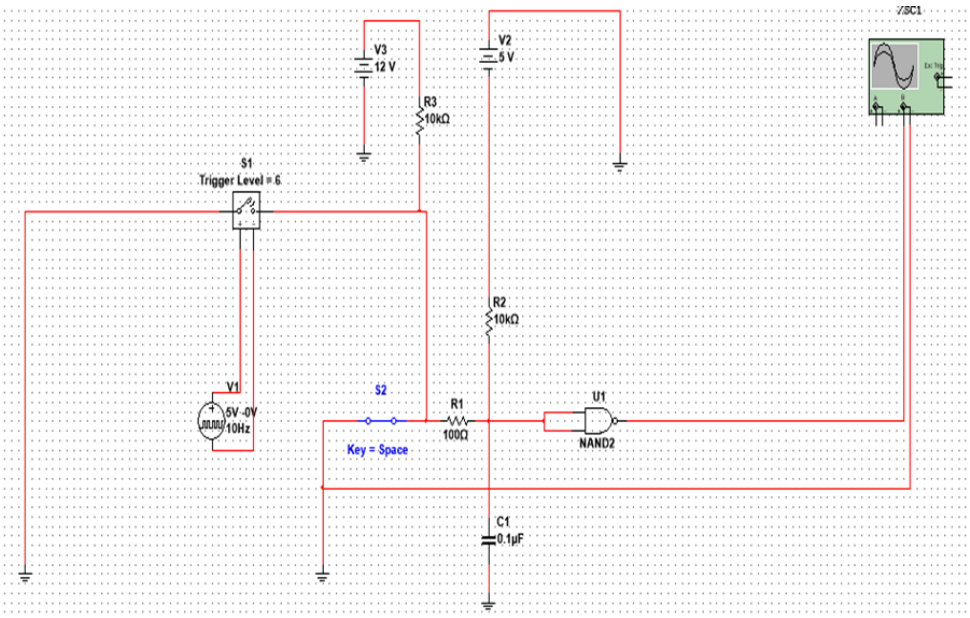


B – Fig 3.2: Breadboard Connection for Oscillator

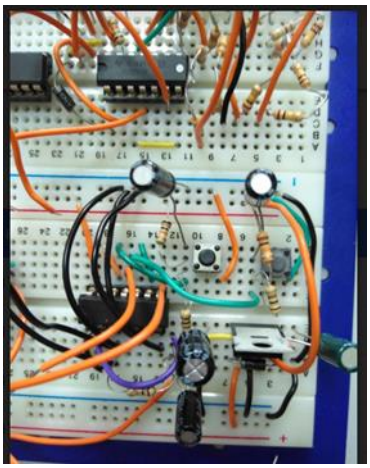


B – Fig 3.3: Perfoboard Connection for Oscillator

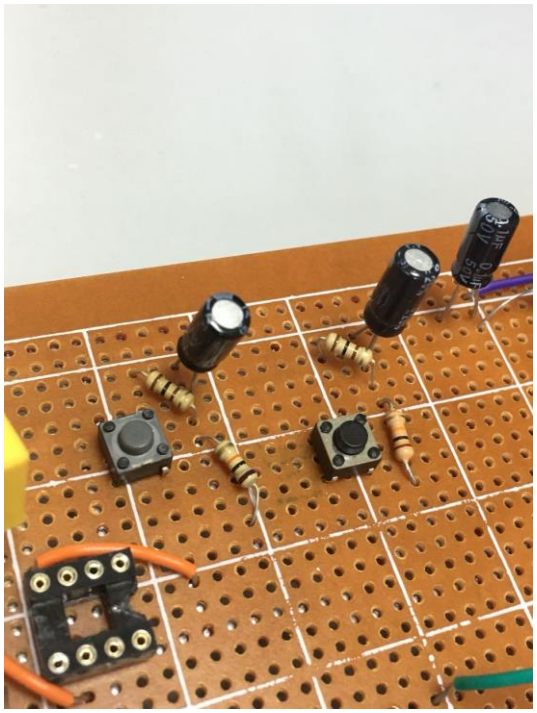
4. Debouncing



B – Fig 4.1: Schematics for Debouncing

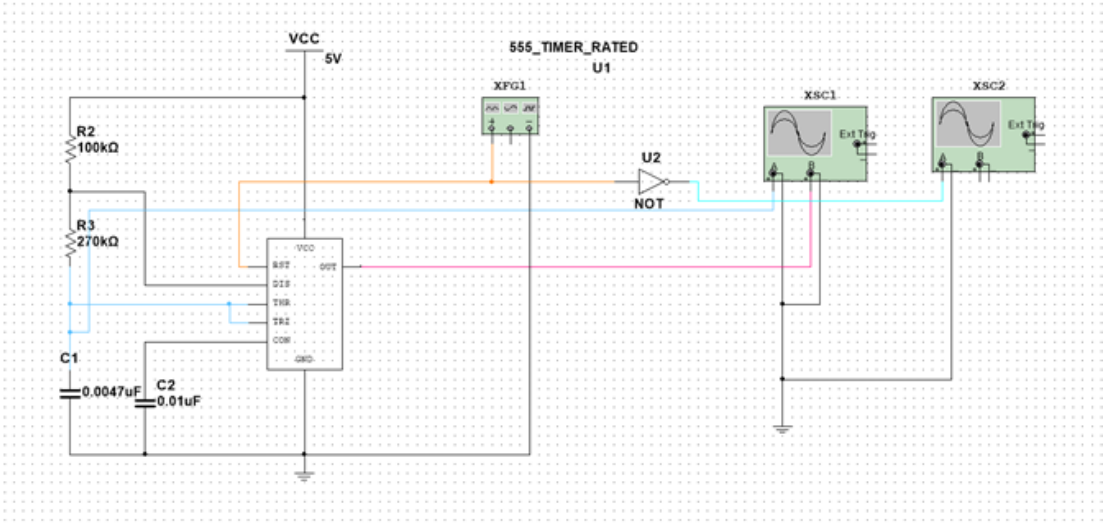


B – Fig 4.2: Breadboard Connection for Debouncing

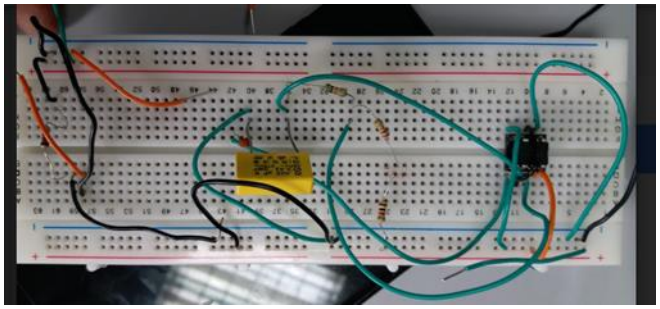


B – Fig 4.3: Perfoboard Connection for Debouncing

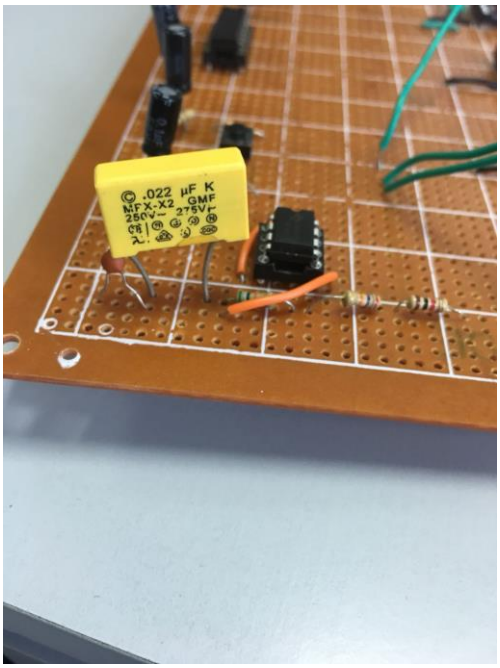
5. NE555 Timer



B – Fig 5.1: Schematics for NE555 Timer

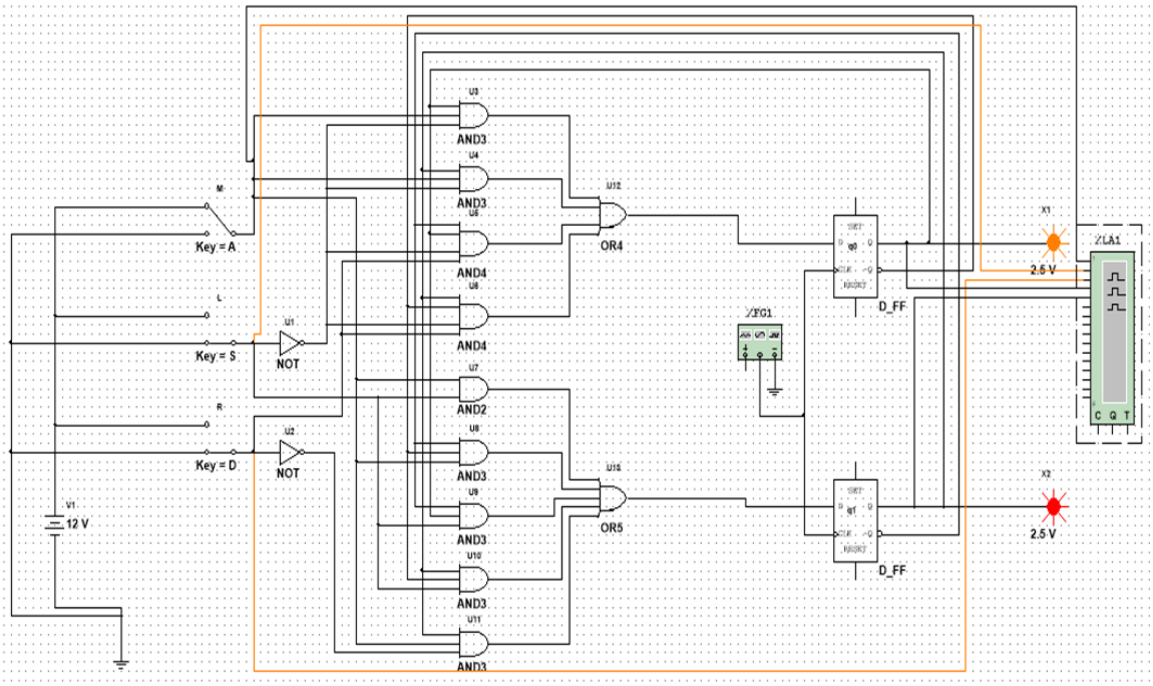


B – Fig 5.2: Breadboard Connection for NE555 Timer

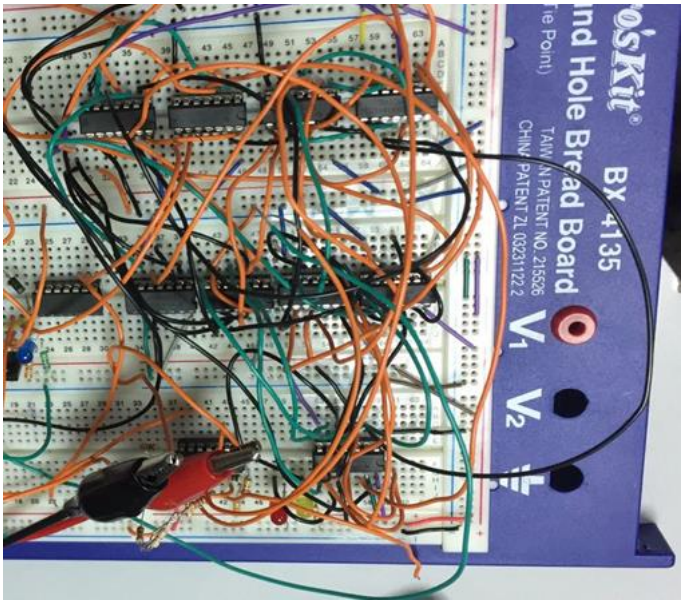


B – Fig 5.3: Perfoboard Connection for NE555 Timer

6. State Machine



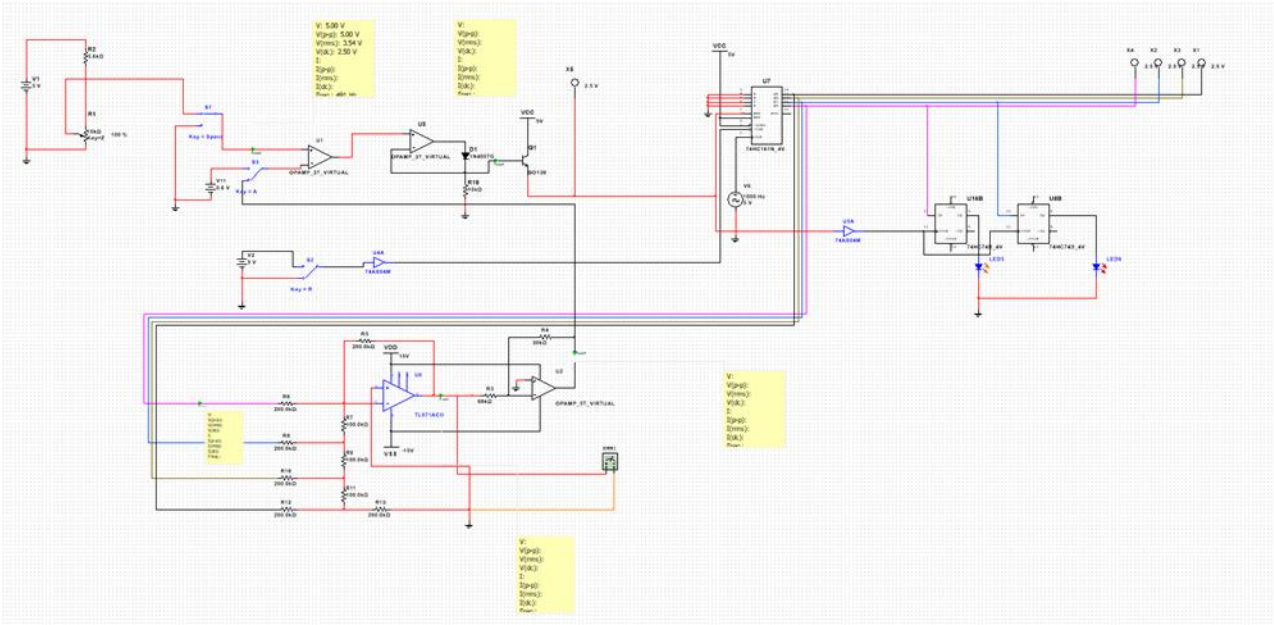
B – Fig 6.1: Schematics for State Machine



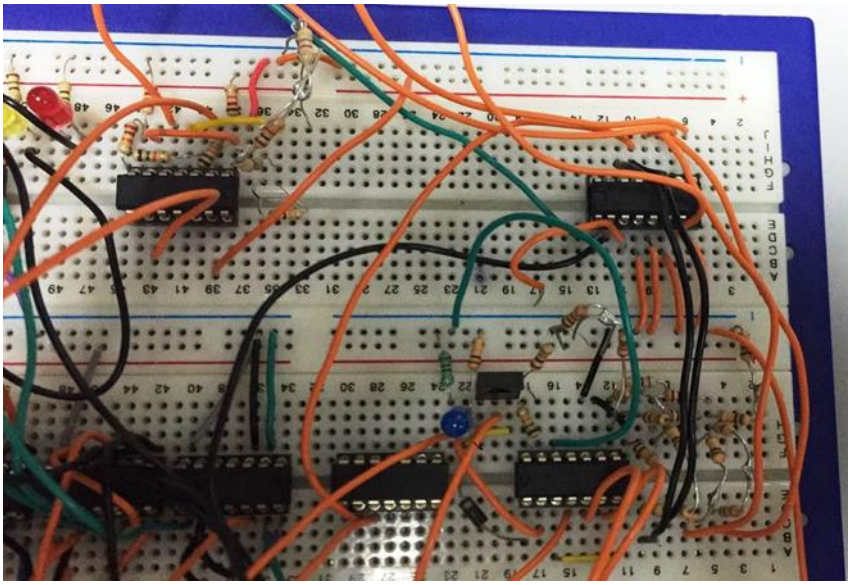
B – Fig 6.2: Breadboard Connection for State Machine

B – Fig 6.3: Perfoboard Connection for State Machine

7. ADC



B – Fig 7.1: Schematics for ADC



B – Fig 7.2: Breadboard Connection for ADC

8. Arduino Uno

B – Fig 8.1: Breadboard Connection for LCD on Arduino Uno

9.3 Appendix C: Source Code

Arduino Uno Code

```
#include <Dhcp.h>
#include <Dns.h>
#include <Ethernet2.h>
#include <EthernetClient.h>
#include <EthernetServer.h>
#include <EthernetUdp2.h>
#include <Twitter.h>
#include <util.h>

#include <SPI.h>

#include <LiquidCrystal.h>

byte mac[] = {0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xED};

IPAddress ip(192, 168, 1, 169);

EthernetServer server(80);


int Q2;
int Q1;
int Q0;                         //M, L, R

int Contrast=0;

int rs = 7 , enable = 8 , d4 = 5, d5 = 4 , d6 = 3 , d7 = 2;
LiquidCrystal lcd(rs, enable, d4,d5,d6,d7);



void setup()
{

 Serial.begin(9600);

 Ethernet.begin(mac, ip);

 lcd.begin(16, 2);

 analogWrite(9,Contrast);

}

void loop()
{
```

```
 //digitalWrite(counter,HIGH);
 //delay(2);

 //digitalWrite(Timer,LOW);
 //delay(2);

 //digitalWrite(Timer,HIGH);

 EthernetClient client = server.available();

 lcd.setCursor(0,0);

 Q2 = digitalRead(A2);
 Q1 = digitalRead(A1);
 Q0 = digitalRead(A0);

   client.println("HTTP/1.1 200 OK");
       client.println("Content-Type: text/html");
       client.println("Connection: close");  // the connection will be closed after completion of the
response
       client.println("Refresh: 5");  // refresh the page automatically every 5 sec
       client.println();
       client.println("<!DOCTYPE HTML>");
       client.println("<html>");

 lcd.clear();

  if (Q2 == LOW && Q1 == LOW && Q0 == LOW)
  {
    lcd.print("NO CAR PARKED");
    lcd.setCursor(0,0);
    Serial.println("000 -> NO CAR PARKED ");


    client.println("NO CAR PARKED");
  }
  else if (Q2 == LOW && Q1 == LOW && Q0 == HIGH)
  {
     lcd.print("ERROR!!");
     lcd.setCursor(0, 1);
     lcd.print("PARKED ON RIGHT");
     Serial.println("001 -> ERROR! PARKED ON RIGHT ");

     client.println("ERROR! PARKED ON RIGHT");
  }
  else if (Q2 == LOW && Q1 == HIGH && Q0 == LOW)
  {
     lcd.print("ERROR!");
     lcd.setCursor(0, 1);
     lcd.print("PARKED ON LEFT");
     Serial.println("010 -> ERROR! PARKED ON LEFT ");

     client.println("ERROR! PARKED ON LEFT");
  }
```

```
 else if (Q2 == LOW && Q1 == HIGH && Q0 == HIGH)
 {
   lcd.print("ERROR!");
   Serial.println("011 -> ERROR! ");

   client.println("ERROR!");

 }

 else if (Q2 == HIGH && Q1 == LOW && Q0 == LOW)
 {
  lcd.print("OCCUPIED");
  Serial.println("100 -> OCCUPIED ");

  client.println("OCCUPIED");

 }

 else if (Q2 == HIGH && Q1 == LOW && Q0 == HIGH)
 {
  lcd.print("ERROR!");
  lcd.setCursor(0, 1);
  lcd.print("PARKED ON RIGHT");
  Serial.println("101 -> ERROR! PARKED ON RIGHT ");

  client.println("ERROR! PARKED ON RIGHT");

 }

 else if (Q2 == HIGH && Q1 == HIGH && Q0 == LOW)
 {
   lcd.print("ERROR!!");
   lcd.setCursor(0, 1);
   lcd.print("PARKED ON LEFT");
   Serial.println("110 -> ERROR! PARKED ON LEFT ");

   client.println("ERROR! PARKED ON LEFT");

 }

 else if (Q2 == HIGH && Q1 == HIGH && Q0 == HIGH)
 {
  lcd.print("ERROR");
  Serial.println("111 -> ERROR!");

  client.println("ERROR!");
 }

 else
 {
  lcd.print("ERROR");
  client.println("ERROR!");

}
```

```
 delay(500);
 client.println("</html>");
 client.stop();
}
```