Ahsanullah University of Science & Technology
Department of Computer Science & Engineering
Semester Spring 2021

CSE 3216
Microcontroller Based System Design Lab

Project Proposal

Project Name: **3S-BOT**

Submitted To

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Submitted By

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OBJECTIVES:

A security-surveillance-service robot is a robot that does a variety of work related to monitor the behavior, activities, and other changing information of a particular mission, used to gather intel in a sensitive zone, can be used as a security element in a specified area and also as a helping hand to help in our daily needs. So there are many applications of robots like ours.
But we have organized and minimized these purposes to **3 CORE-FUNCTIONS**.

Our **Security-Surveillance-Service** robot focuses on *3-MAIN-CRITERIA* . These are as follows :

SECURITY SURVEILLANCE SERVICE

SECURITY :

3S-BOT can be an efficient security element in a particular zone:

- ➢ Detect unusual movements in a particular area or after a particular time which triggers alarm.
- ➢ Capture security-concerning (Like intruder, theft, robbery) images, videos or audio.
- ➢ Detects any concerning Fire-Flame-Smoke-Gas-Temp in a particular zone.

SURVEILLANCE :

3S-BOT can be used to gather sensitive intel in a trespassing zone:

- ➢ Explores to areas not easily reachable to humans. Such as mines
- ➢ Collect Sample-materials from human-unreachable areas or are corrosive to human touch.
- ➢ Used in Police-Military-Defence activities:
  - ○ Knowing Hostile information in a zone.
  - ○ Monitoring criminal activities in an enclosed area. (like-building , warehouse).
  - ○ Gathering evidence-information for criminal activities (like-capture image in illegal gun factory)
  - ○ Knowing hostage positions before operating a mission in a zone.
  - ○ Gathering or altering criminal intels.

SERVICE:

3S-BOT can also be used in our daily life to fulfill our daily needs more efficiently:

- ➢ Used as a helping arm for delivering objects in a particular area
- ➢ Used as an Automated LAMP that triggers when lights are off and turns off when lights are on. Or as a remote controlled LAMP.
- ➢ Can be used to deliver medical supplies in case of emergencies.
- ➢ Can be used as a camera man that can reach in certain areas unreachable to humans.
- ➢ Can be used for exchanging daily commodities while maintaining distance in covid situations.

SOCIAL VALUES:

The 3S-BOT (intellectual property of team Tri-Ancestillians) contributes in very vital and important sectors like exploration-research-defence by it's surveillance functionality.This functionality makes important scientific research or investigation easy as well as can protect/save people from many criminal activities.It contributes to personal or communal security that detects a variety of threats, which can trigger an alarm that protects us from unprecedented harm.The 3S-BOT can be used as a personal helping arm, an automated lamp and also as a camera man that provides significant improvements to our daily life. So our bot not only impacts social values and society, but also strengthens the defence for national security as well as improves the quality of our personal life.

CORE FUNCTIONALITY:

SECURITY :

- Scanning particular Area and Detection for objects - Ultrasonic sensor | PIR Motion Sensor
- Scanning particular Area and Detection for sounds - Sound sensor
- Alarm - Buzzer| LEDs
- Capture multimedia information - Camera | Sound sensor
- Environmental Threats Detection - Flame Sensor | Smoke Sensor | Gas Sensor | Temp Sensor

SURVEILLANCE :

- Exploring to not reachable area to humans - Advanced Car mechanism (wheel, motor)
- Collecting samples (no human touch) - Robot arm (servo motors, PVC)
- Gathering intelligence for criminal Activities - Camera | sound sensor

SERVICE:

- Helping hand can carry objects - Robot arm (servo motors, PVC)
- Automated LAMP - LDR sensor | LEDs
- RC LAMP - Bluetooth Module | LEDs
- Photography help - Camera, Bluetooth
- Distance maintaining to deliver objects - Robot arm (servo motors, PVC)

STRUCTURE :

A well uplifted(5-6in) from ground 4 wheeled PVC body , PVC arm, Remote Controlled (Via Bluetooth) robot.

TECHNICAL REQUIREMENTS:

Softwares:

- Arduino IDE
- Languages:
    - C/C++

Hardwares:

- Microcontroller
- Electronic Sensors
- Electronic Modules
- Motors
- Basic Components
- PVC
- Tools

Goals Completed:

SECURITY ASPECT GOALS:

1. Detects Fire/Flame in our houses and activates alarm, alerting users.
2. Detects LPG-Hydrogen leakages in kitchen, Smokes on our households and activates alarm.
3. Detects unwanted sound near our home during night time (after 10PM) and alerts us.
4. Detects unwanted Motion near our home during night time (after 10PM) and alerts us.
5. Detects theft activity by motion sensing or sound sensing.

SURVEILLANCE ASPECT GOALS:

6. Detects Fire/Flame in Cave/area exploration and signals us the presence of fire.
7. Detects LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations in any area and signals us the presence of gasses.
8. Searches for motions or sound in any area.
9. Detects the accurate temperature and humidity of any area.
10. Detects the presence of light in any area.

SERVICE ASPECT GOALS:

11. Shows us the temperature and humidity of our house.
12. Auto turns on Lamp when electricity is out or in darker areas.
13. Is able to carry objects in small amounts and deliver maintaining distance in covid situations

REQUIRED COMPONENTS:

SL. No.	COMPONENTS
1	Arduino Mega 2560
2	12-bit 16-Channel Servo Motor Shield
3	L298n DC Motor Shield
4	SG90 Servo Motor
5	MG996R Servo motor
6	Wheel
7	6-12v DC Motor
8	Bluetooth Module HC-05
9	PIR Motion Sensor
10	Flame Sensor
11	Gas-Smoke Sensor
12	Remote
13	LDR Module
14	Temp-Moisture Sensor LM35
15	16x2 LCD Screen
16	LEDs (different color)
17	3.7v Li-ion Battery
18	Sound sensor
19	Camera
20	Wires
21	Breadboard
22	IR Sensor
23	VeroBoard
24	Hc-SR04 Ultrasonic Sensor
25	PVC board
26	PVC Pipe
27	Buzzer
28	Switches
29	Resistors,Capacitors,Diodes etc

WORKING PROCEDURE:

working procedure [must include block diagrams or proteus model of how your project works]

The basic components to take the inputs are

- Sensors
- Camera
- Modules

The basic components that shows the output are

- LCD Display
- LED Lights
- Buzzer

The medium of connection of the controlling device and our 3S-BOT will be through :

- Bluetooth

Our system will perform the following action

-The system will consume energy from a lithium-ion rechargeable battery. At the same time the battery will provide the sufficient power to run the input sensors, motors and other components.

-The 3S-Bot will receive input from the environment via it's Sensors, Camera and LDR Module.

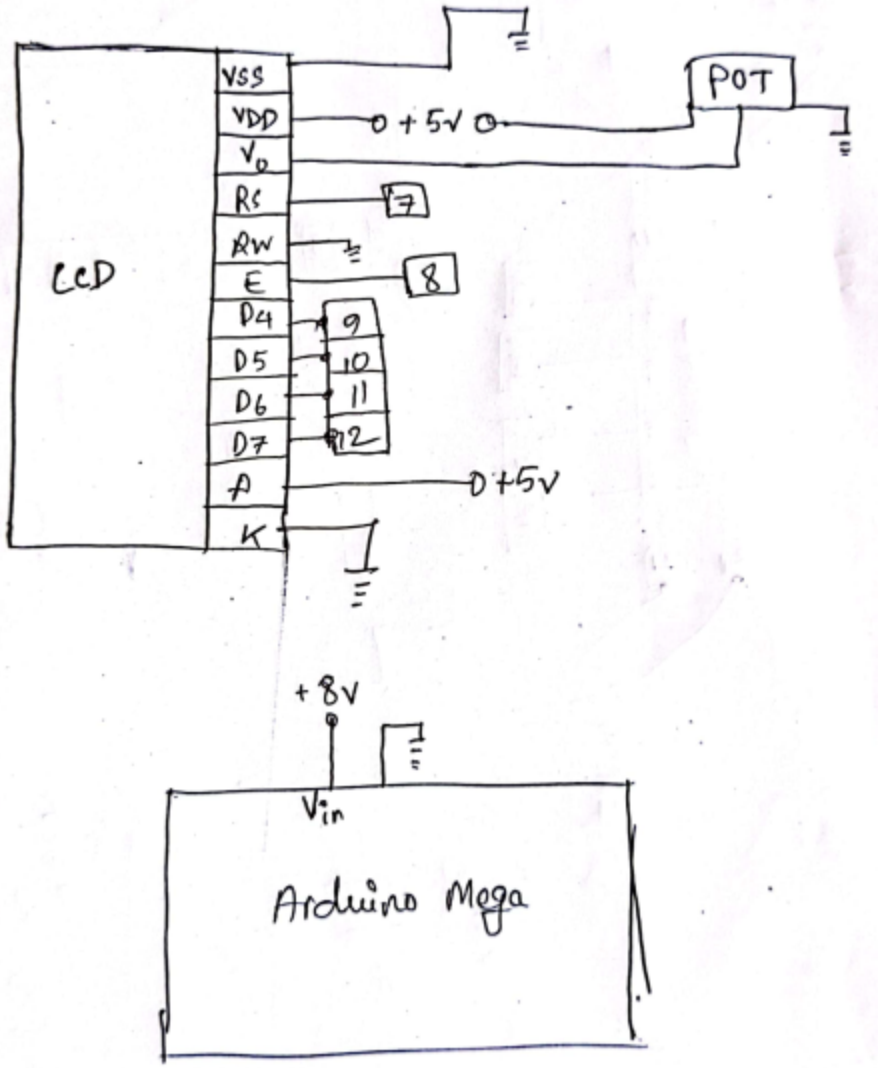
-The 3S-Bot will be controlled by a mobile application via Bluetooth connection system.

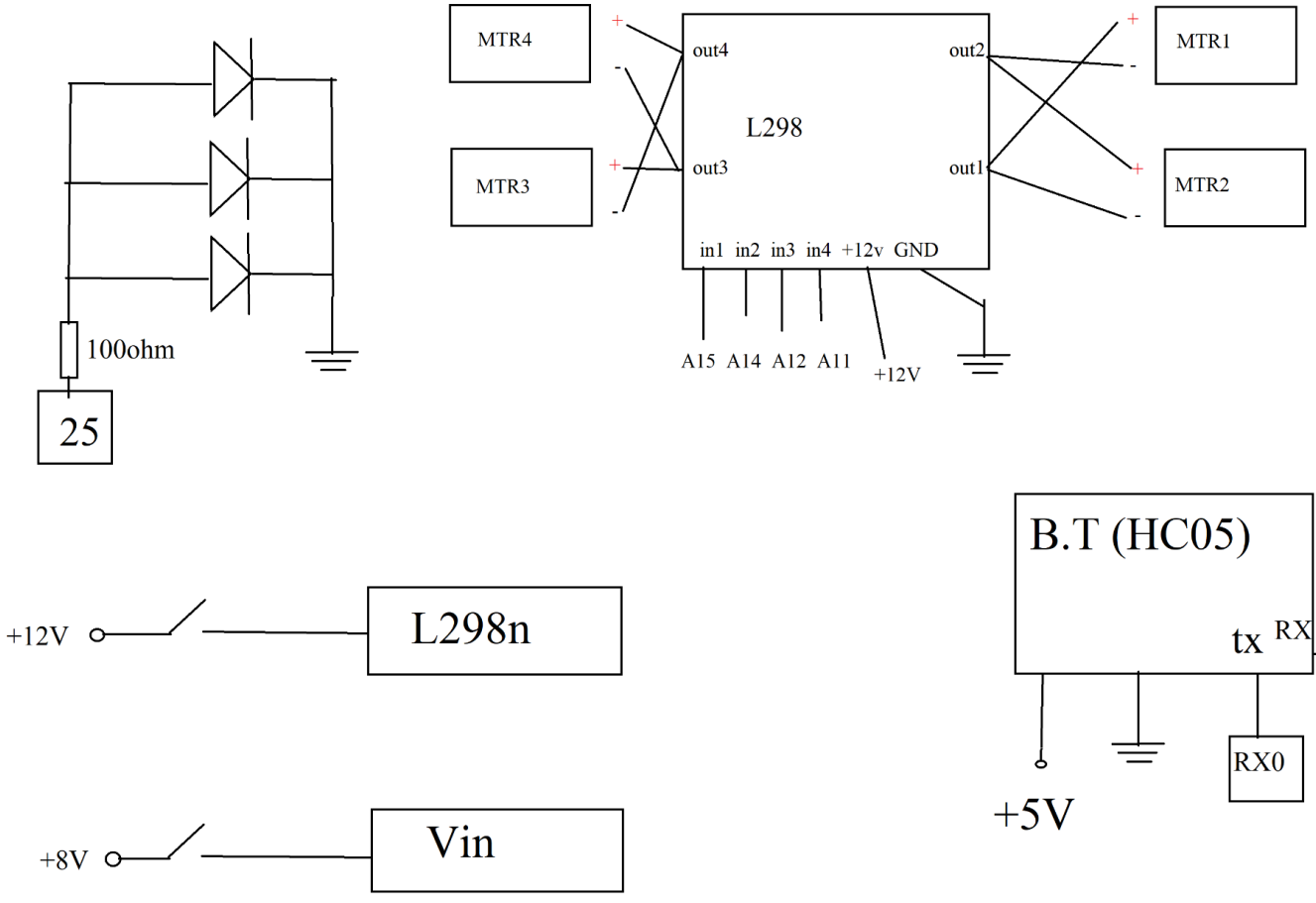
-For the different purposes 3S-Bot will perform different types of services.

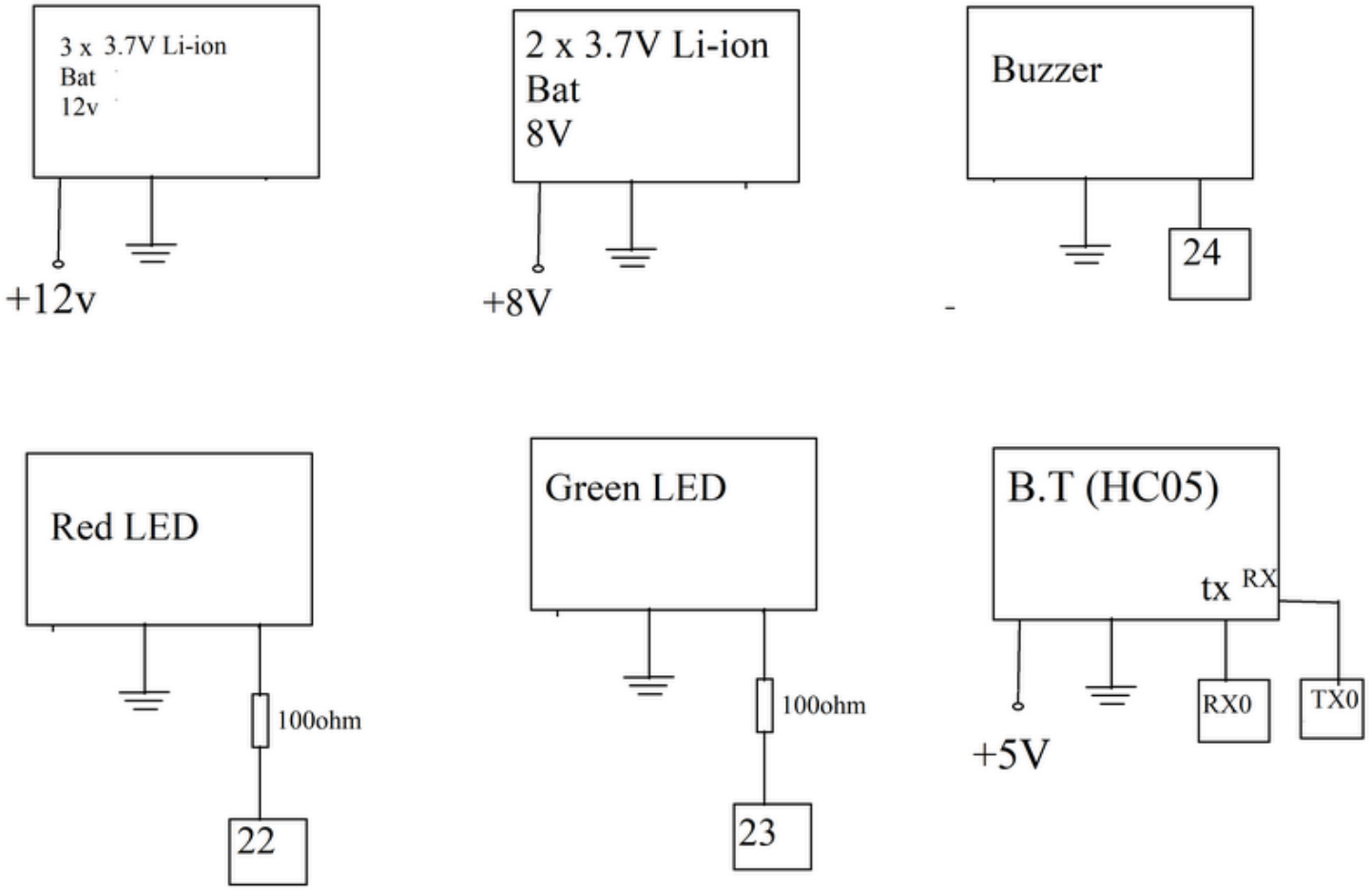
- -For Security, Environmental Threats Detection.
- -For Surveillance, Exploring areas not reachable to humans.
- -For Service, Helping hand can carry objects.

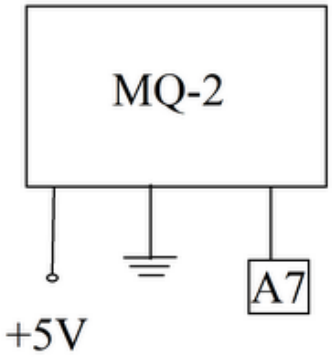
The core mechanism of our system is we will take inputs though the sensors from various activities of the environment of a particular zone. This input data will be processed in the Arduino microcontroller. That is the arduino will be coded to manipulate the input data. Then after such operations done in arduino we will output the results in forms of LCD Display , or LED lights, or Buzzer emitting sounds.

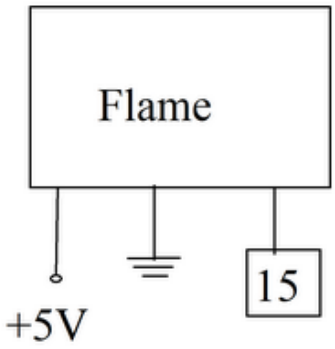
Circuit Diagram:

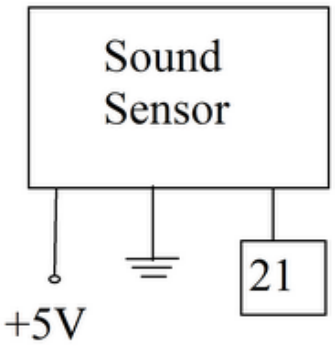

LCD
VSS
VDD
V_0
RS
RW
E
D4
D5
D6
D7
A
K
+5V
POT
7
8
9
10
11
12
+5V
+8V
V_{in}
Arduino Mega

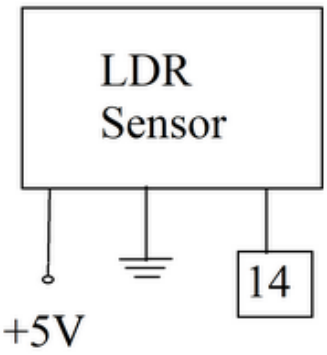

MTR4
MTR3
MTR1
MTR2
L298
out4
out3
out2
out1
in1 in2 in3 in4 +12v GND
A15 A14 A12 A11
+12V
100ohm
25
+12V
L298n
+8V
Vin
B.T (HC05)
tx
RX
RX0
TX0
+5V

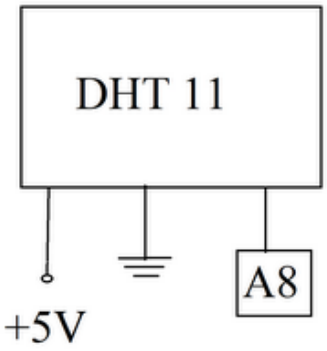

3 x 3.7V Li-ion
Bat
12v
+12v
2 x 3.7V Li-ion
Bat
8V
+8V
Buzzer
24
-
Red LED
100ohm
22
Green LED
100ohm
23
B.T (HC05)
tx
RX
RX0
TX0
+5V

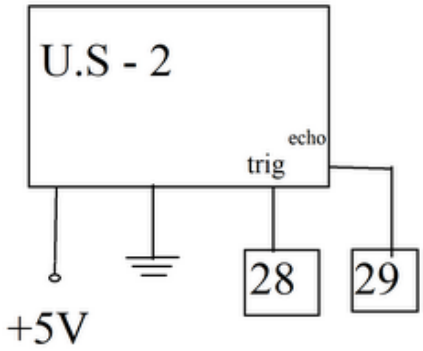












Budget Comparison:

Previously Estimated Budget

SL. No.	COMPONENTS	QTY	UNIT PRICE	TOTAL(bdt)
1	Arduino Mega 2560	1	1200/-	1200
2	12-bit 16-Channel Servo Motor Shield	1	362/-	362
3	L298n DC Motor Shield	1	175/-	175
4	SG90 Servo Motor	4	200/-	800

5	MG996R Servo motor	2	490/-	980
6	Wheel	4	59/-	236
7	6-12v DC Motor	4	75/-	300
8	Bluetooth Module HC-05	1	343/-	343
9	PIR Motion Sensor	1	110/-	110
10	Flame Sensor	1	70/-	70
11	Gas-Smoke Sensor	1	170/-	170
12	Remote	1	80/-	80
13	LDR Module	1	108/-	108
14	Temp-Moisture Sensor LM35	1	125/-	125
15	16x2 LCD Screen	1	230/-	230
16	LEDs (different color)	15	4.33/-	65
17	3.7v Li-ion Battery	7	300/-	2100
18	Sound sensor	1	90/-	90
19	Camera	1	1000/-	1000
20	Wires	20+	2.5/-	50
21	Breadboard	1	125/-	125
22	IR Sensor	1	70/-	70
23	VeroBoard	2	50/-	100
24	Hc-SR04 Ultrasonic Sensor	3	109/-	327
25	PVC board	2	100/-	200
26	PVC Pipe	1	20/-	20
27	Buzzer	1	16/-	16
28	Switches	7	6/-	42
29	Resistors,Capacitors,Diodes etc	25+	2.5/-	63
			total	**9557**

From the table we can estimate the budget for -
Arduino mega - 1200/-
Different motors and its components - 2635/-
Variety of Sensors & Modules - 2413/-
Others - 3309/-
Total Estimated Cost - 9557/-

Final Expenditure

Current Estimated Budget

SL. No.	COMPONENTS	QTY	UNIT PRICE	TOTAL(bdt)
1	Arduino Mega 2560	1	1200/-	1200
2	12-bit 16-Channel Servo Motor Shield	1	362/-	362
3	L298n DC Motor Shield	2	175/-	350
4	SG90 Servo Motor	1	200/-	200
5	MG996R Servo motor	1	490/-	490
6	Wheel	4	59/-	236
7	6-12v DC Motor	4	75/-	300
8	Bluetooth Module HC-05	1	343/-	343
9	PIR Motion Sensor	1	110/-	110
10	Flame Sensor	1	70/-	70
11	MQ-Gas-Smoke Sensor	1	170/-	170
12	Remote	1	80/-	80
13	LDR Module	1	108/-	108
14	DHT11-used instead of Temp-Moisture Sensor LM35	1	170/-	170
15	16x2 LCD Screen	1	230/-	230
16	POT 10k	1	35/-	35/-
17	LEDs (different color)	15	4.33/-	65
18	3.7v Li-ion Battery	7	300/-	2100
19	Battery holder 3s,2s	1+1	50+100	150
20	Sound sensor	1	90/-	90
21	Camera	1	1000/-	1000
22	Wires	70	2.5/-	175
23	Breadboard	1	125/-	125
24	IR Sensor	1	70/-	70
25	VeroBoard/soldering	1	250/-	250
26	Hc-SR04 Ultrasonic Sensor	3	109/-	327
27	PVC board	2	100/-	200
28	PVC Pipe	1	20/-	20
29	Buzzer	1	24/-	24
30	Switches	2	25/-	50
31	Resistors,Capacitors,Diodes etc	25+	2.5/-	63

32	Hot glue	3	20/-	60
33	Hot glue gun	1	345/-	345
34	tapes	3	15-	45
35	180mm red-black wire-SELL ABLE	3 meter	15/-	45
36	Multimeter	1	1100/-	110
37	Zip tie	25	3/-	75
			total	**10,191**

From the table we can estimate the budget for -
Arduino mega - 1200/-
Different motors and its components - 2635/-
Variety of Sensors & Modules - 3047/-
Others - 3309/-
Total Estimated Cost - 10,191/-

Contribution of Team Members:

1.Sadman Alvee(180204074):

- Collected all the physical components.
- LDR sensor configuration & lamp light soldering and connecting to Arduino.
- LCD display connection using pot and coding.
- Temperature sensor configuration and coding.
- Designing the physical structure.
- Tried to include the arm of the robot.

2. Arman Sakif(180204054):

- The sound sensor circuit configuration and coding.
- The flame sensor circuit configuration and coding.
- LED output for alarm.
- gas sensor circuit configuration.
- Tried to include the camera of the bot.

3. Minhajul Islam(170104001):

- The motor connection soldering.
- The motor driver connection with Arduino and coding.
- Connection of the switches of two separate voltage sources.
- Bluetooth connection.

4. Rahat Ashik(180204073):

- The ultrasonic sensor circuit configuration and coding.
- Buzzer of alarm system configuration and coding.
- Power supply of the whole bot.
- gas sensor coding in Arduino.

We worked together while building the whole structure of the bot. And making updates and debuggings were done together as a team.

Challenges of The Project:

- Connection of the motor shield was difficult due to high voltages.
- Arm couldn't be included because the servo couldn't take the load of the pvc made arm and the proper mechanics of the arm required a shaft but we used screws and bolts.
- We couldn't include the camera because the downloaded software wasn't working properly.

CONCLUSION:

The 3 core features Security-Surveillance-Service of 3S-BOT brings huge improvements and new possibilities to our personal, social and even national lifestyle. The Security feature makes a person feel more safe and helps to be more productive and focused. The Surveillance feature makes a huge impact on our social life by improving police-military defense activities, exploring areas which are not easy for humans and gathering samples which can be hazardous if done by humans. Last but not least the service feature makes life much easier and productive during the pandemic where movements of objects can be done remotely. So it can be said that 3S-Bot not only impacts not only social values but also improves our national lifestyle which plays a big role towards the development of a country.