AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

CSE211: Introduction to Embedded Systems

Project Document

Presented to:
Dr: Sherif Hammad
Eng: Mohamed Tarek

Presented by:

Eslam Mostafa Mohamed

Table of Contents

System layout....1
List of components....3
Circuit wiring....6
Discussion of the developed mobile app....8
Flow charts of the main flow of the program....11
Problems faced and how we managed to solve them....14

List of figures

Figure 1-circuit components ....
Figure 2- circuit components ....
Figure 3- TIVA C ....
Figure4- ARDUINO ....
Figure5-ULTRASONICSENSOR....
Figure6-MAGNETICSENSOR ....
Figure7-GAS SENSOR ....
Figure8-BLUETOOTHEMODULE ....
Figure 9- laser receiver module ....
Figure10-LCD 2X16 ....
Figure11-BUZZER ....
Figure12- LEDS ....
Figure 13- circuit wiring ....
Figure14-BLUETOTHAPP ....
Figure15-BLUETOOTHAPP ....
Figure16-BLUTOOTHAPP ....
Figure 17- BLUTOOTH APP ....
Figure18-FIRSTFLOWCHART ....
Figure19-SECONDFLOWCHART ....
Figure20-THIRDFLOWCHART ....

System layout

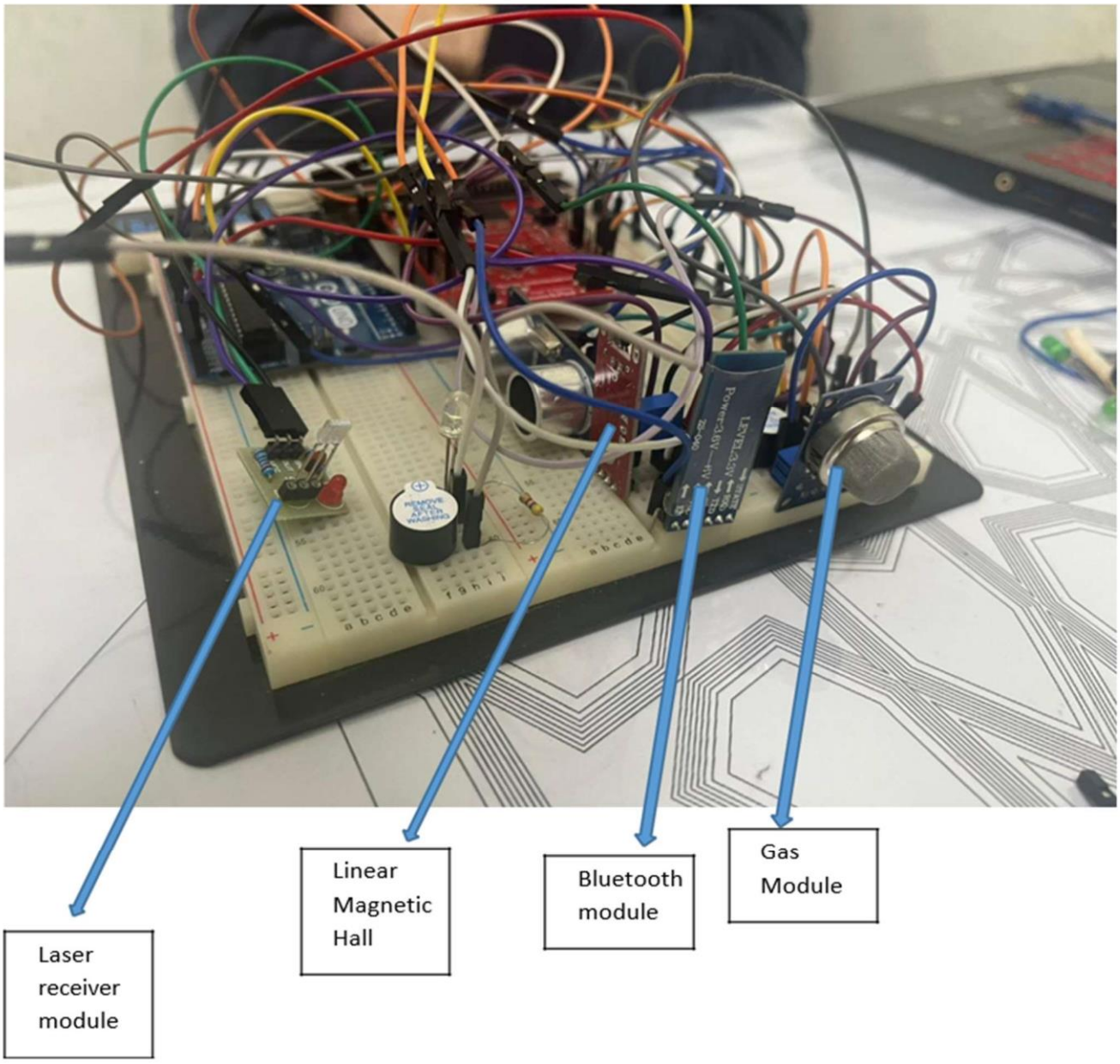


FIGURE 1-CIRCUIT COMPONENTS

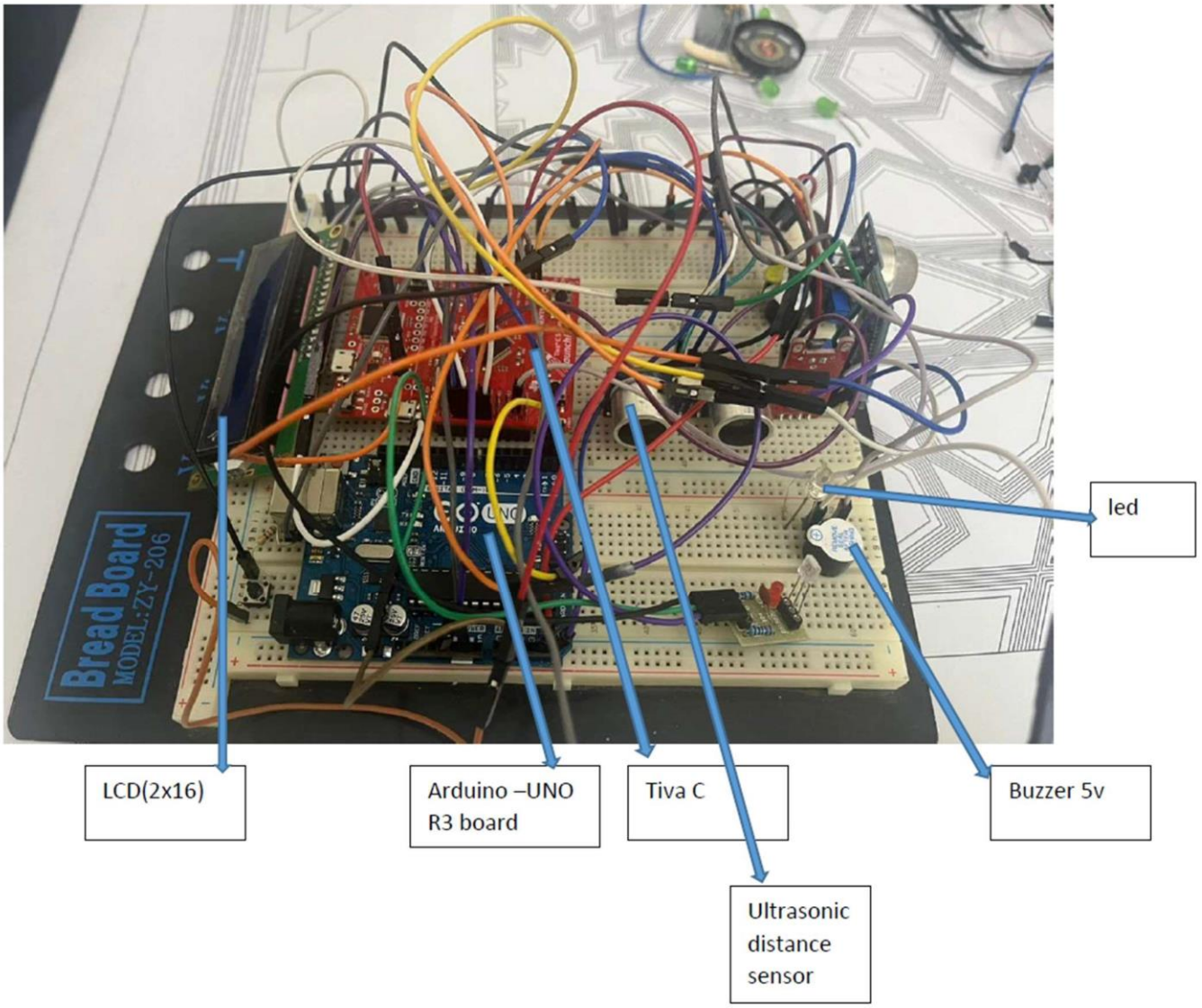
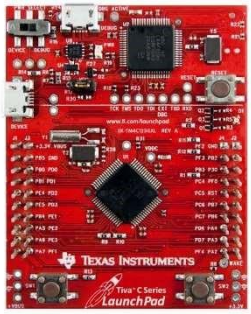
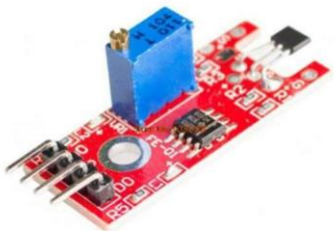
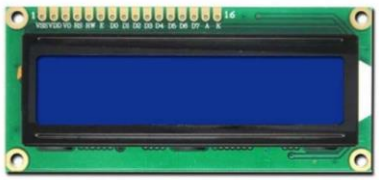


FIGURE 2- CIRCUIT COMPONENTS

List of components

#	Component Name	Photo	Usage
1	Tiva (TM4C123GH6PM) Microcontroller	 FIGURE 3- TIVA C	Receive detected signals from sensors Send detected signals to Arduino
2	Arduino - UNO R3 Board	FIGURE 4 - ARDUINO	Receive detected signals from Tiva Send signal to lcd to display
3	Ultrasonic Distance Sensor (HC-SR04)	FIGURE 5- ULTRASONIC SENSOR	Detect barriers Measure distance

4	Linear Magnetic Hall Switch Sensor Module (KY-024)	 FIGURE 6- MAGNETIC SENSOR	Detect Magnet
5	Gas Sensor Module (MQ-2)	 FIGURE 7- GAS SENSOR	Detect gas
6	Bluetooth Module (HC-05)	 FIGURE 8- BLUETOOTHE MODULE	Receive data from Tiva Send data to mobile app
7	LASER Receiver Module	 FIGURE 9- LASER RECEIVER MODULE	Detect light and send signal to Arduino

8	LCD (2×16)	 FIGURE 10- LCD 2X16	Display any message that an intrusion happened
9	Buzzer 5V	 FIGURE 11- BUZZER	Make a sound when detecting gas or a magnet
10	Led	 FIGURE 12- LEDS	Light up when detecting any intrusion

Circuit wiring

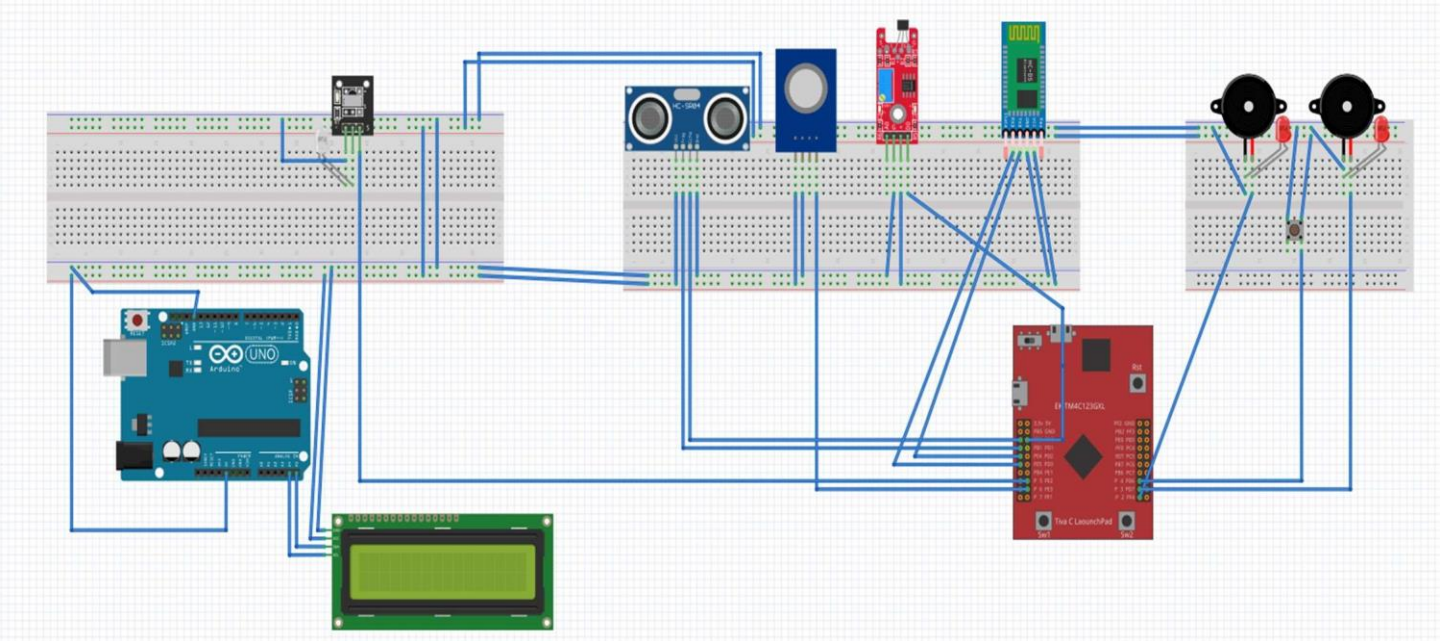


FIGURE 13- CIRCUIT WIRING

Arduino:

VCC Pin >>> VCC pin in breadboard

GND pin >>> GND Pin breadboard

A4 pin >>> SCL Pin (LCD)
A5 Pin >>> SDA pin (LCD)

LCD:

VCC Pin

GND Pin

Tiva C board:

SW1: Start pushbutton SW2:

Stop Pushbutton

Ultrasonic sensor:

VCC pin GND pin Trig >>> PinB1 in Tiva C Echo >>> PinB0 in Tiva C

Gas sensor:

VCC pin GND pin Analog output >>> PinE3 in Tiva C

Magnetic sensor:

VCC pin GND pin Digital output >>> PinD0 in Tiva C

Bluetooth module:

VCC pin GND pin RXD >>> PinE4 in Tiva C TXD >>> PinE5 in Tiva C

Laser receiver module:

GND Pin Signal >>> Pin E2 in Tiva C

Left Buzzer:
GND Pin Speaker >>> PinA2 in Tiva C

Right Buzzer: GND
Pin

Speaker >>> PA3 in Tiva C

Mute pushbutton:

VCC pin GND pin VCC >>> PinA4

Discussion of the developed mobile app

1) Application overview

Terminal for serial devices connected with Bluetooth Classic / LE

'Serial Bluetooth Terminal' is a line-oriented terminal / console app for microcontrollers, Arduinos and other devices with a serial / UART interface connected with a Bluetooth to serial converter to your android device.

This app supports different Bluetooth devices:

- Bluetooth Classic (implementing standard Bluetooth SPP profile)
- HC-05, HC-06, ...
- Raspberry Pi 3

2) Technical Details

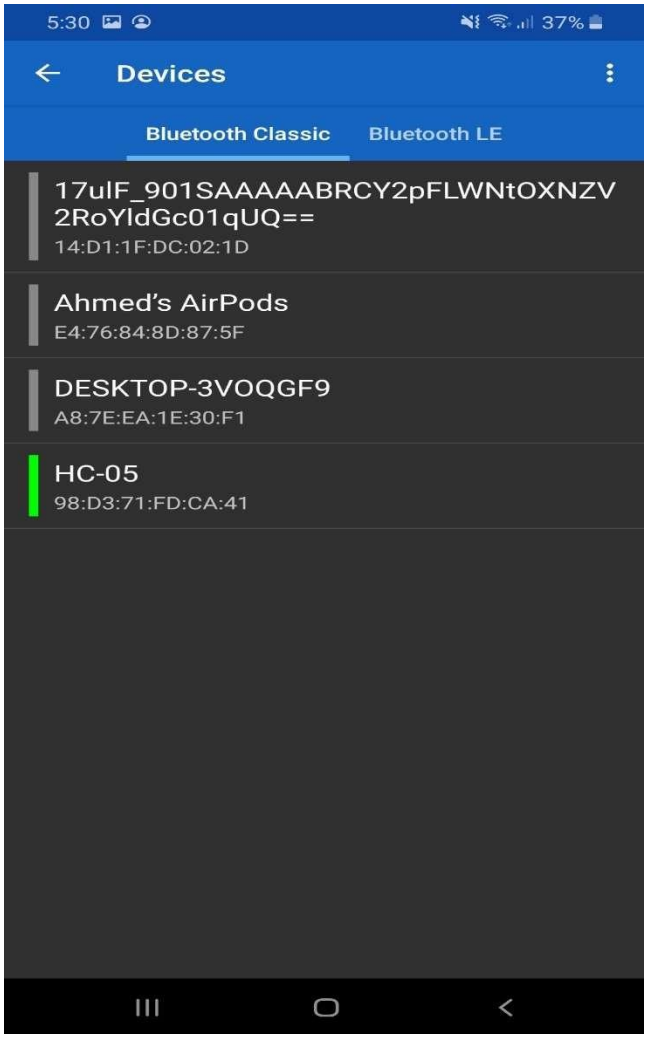
Latest update: 25 Nov 2023 Used

version: 1.47

Required OS: Android 4.3 or up developed by: Java source code link:

https://github.com/kai-morich/SimpleBluetoothTerminal/tree/master

3) Application screen shots


5:30
37%
Devices
Bluetooth Classic
Bluetooth LE
17ulF_901SAAAAABRCY2pFLWNtOXNZV2RoYldGc01qUQ==
14:D1:1F:DC:02:1D
Ahmed's AirPods
E4:76:84:8D:87:5F
DESKTOP-3VOQGF9
A8:7E:EA:1E:30:F1
HC-05
98:D3:71:FD:CA:41

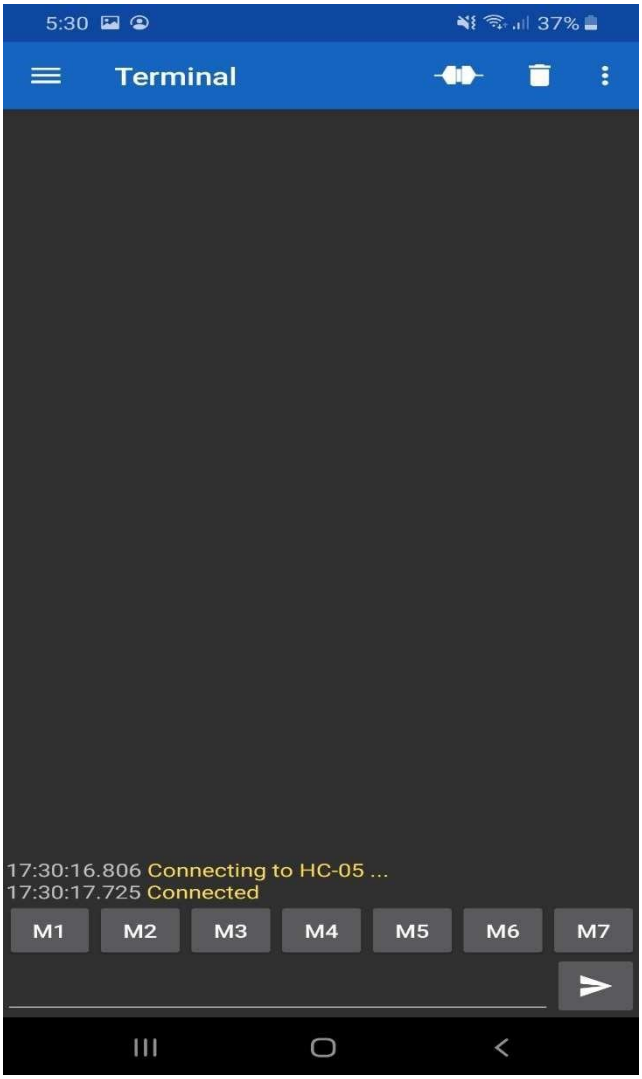


FIGURE 14- BLUETOTH APP

FIGURE 15- BLUETOOTH APP

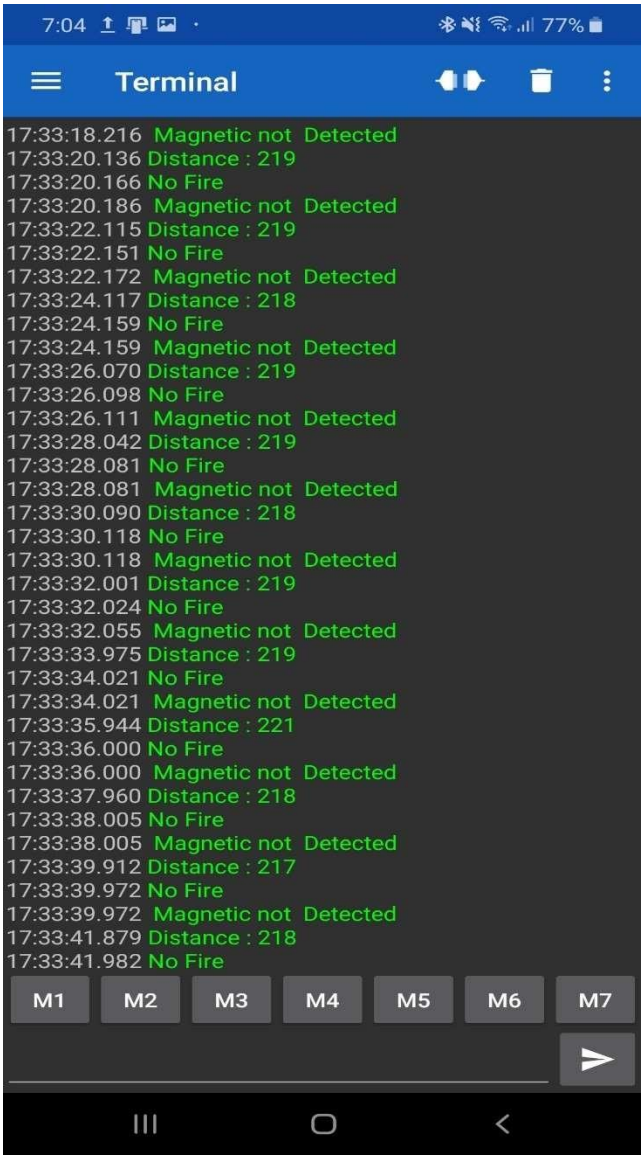


FIGURE 16- BLUTOOTH APP

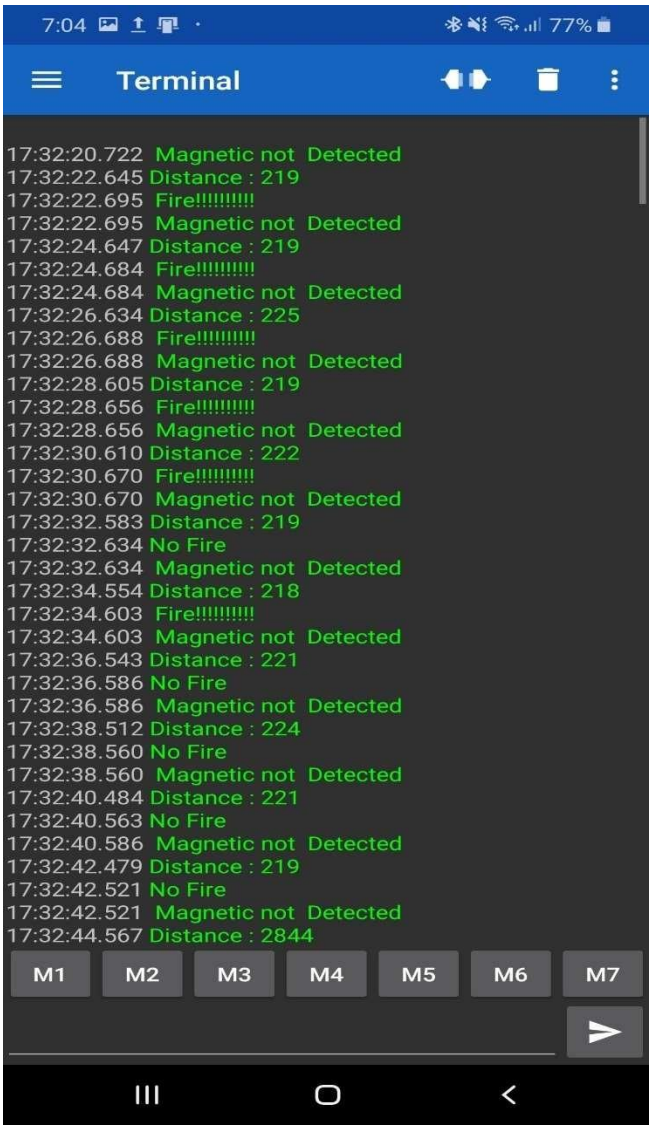


FIGURE 17- BLUTOOTH APP

Flow charts of the main flow of the program

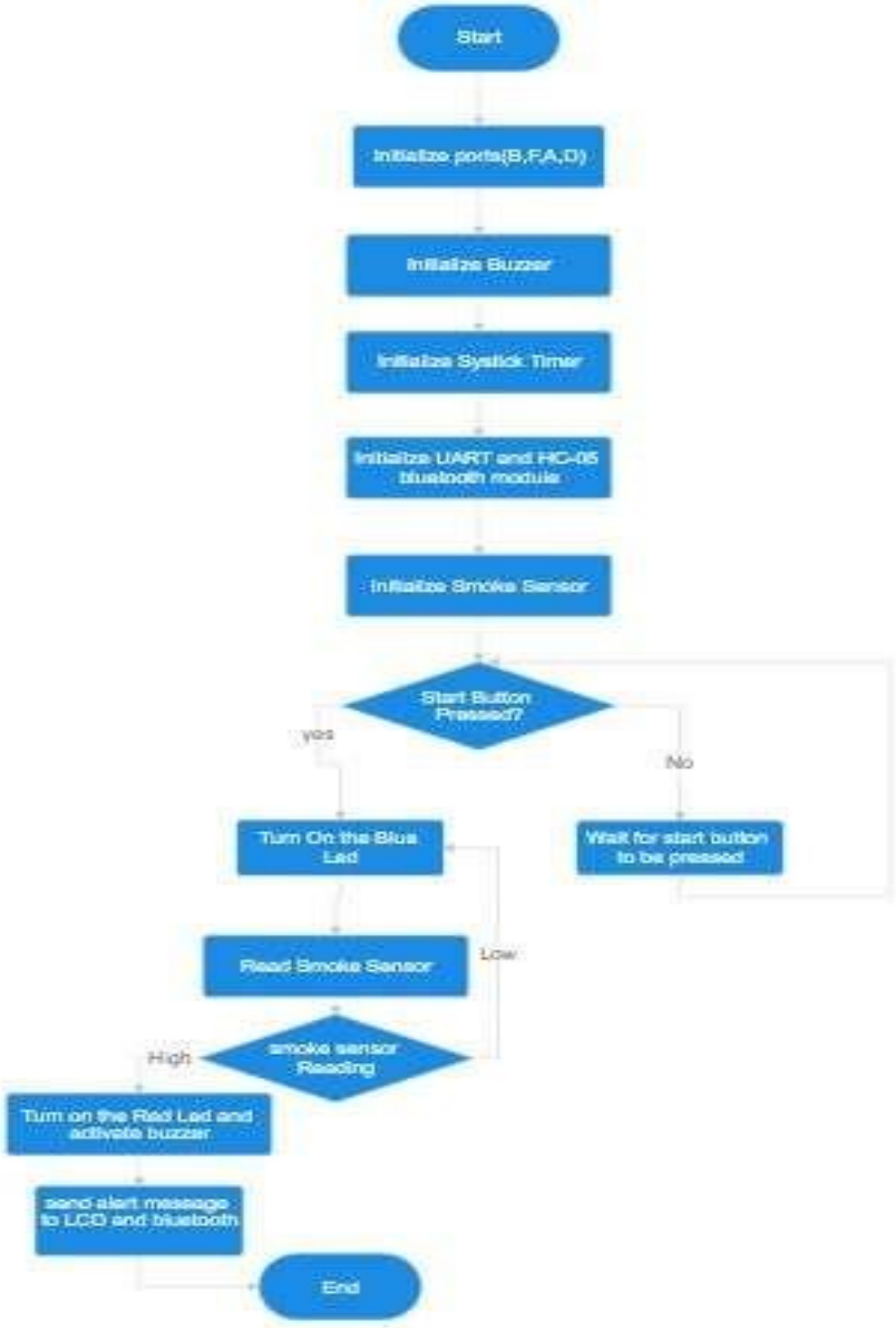


FIGURE 18- FIRST FLOWCHART

FIGURE 19- SECOND FLOWCHART

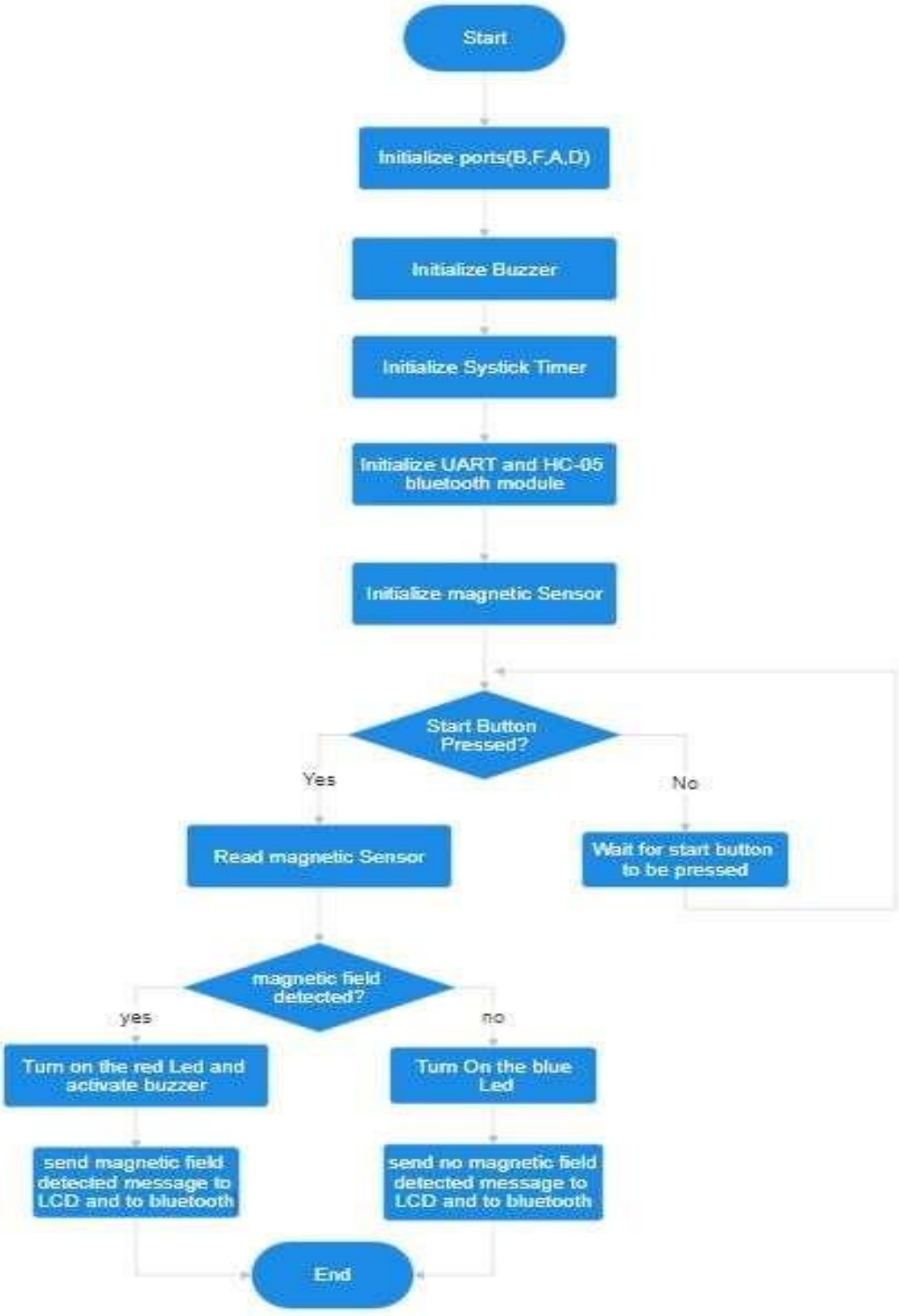


FIGURE 20- THIRD FLOWCHART

Problems faced and how we managed to solve them

1) Display all sensors results on LCD

Solution: LCD is 2x16 so we made first line (16 bits) to display ultrasonic result And second line to display magnetic result and fume together each sensor in (8 bits)

2) Delay while detecting with the smoke sensor (MQ-2)

Solution: We decrease the adc_value in the code and adjust the potentiometer to increase sensitivity.

3) Mobile app to display results on it

Solution: use Android OS to be easy to link via Bluetooth module and use Serial Bluetooth Terminal application

4) Interference from Ambient Light in laser receiver module

Solution: Implement adaptive modulation and signal processing techniques to mitigate interference from ambient light. Use light sensors to dynamically adjust the transmission parameters based on the ambient light conditions.