Ahsanullah University of Science & Technology

Department of Computer Science & Engineering

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CSE 3216

Microcontroller Based System Design Lab

Project Final Report

Project Name: Public Bus Automation

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Objective

A very large population of our country travels by public bus every day. The travel experience is not pleasant for both passengers and bus staff. We often see passengers complain that bus staff charge extra fares, take a huge number of standby passengers, do not want to take half the fare for students, etc. On the other hand, the bus staffs complain that passengers give them less fare forcefully, and some people who are not students take advantage of half fare by providing a false identity.

The objective of this project is to

- Provide an automated door system
- Make an automatic system which will charge accurate fares
- Discount half fare for the students
- Live tracking to the bus
- Minimize passenger as well as bus stuff' sufferings

Social Values

Our project will have a great impact on society. According to the Sustainable Urban Transportation Index, in the Greater Dhaka Metropolitan Area, more than 10 million people use local buses every day. Traffic jams make their journey difficult. In addition to that, quarreling and fighting with bus staffs over fares and other issues makes the journey more unpleasant. These tiring journeys also make an impact on their mental health and personal lives. Proper implementation of our project will make the job of bus staffs easier and passengers won't have to fight over fares anymore. As population is increasing day by day, their need of transports plays a vital role in life. Our goal is to meet their need as much as possible by this system.

Required Components

The following parts and tools are required for building this project:

- Arduino Mega 2560 R3
- MFRC-522 RFID Module
- RFID Tag (125KHz)
- GPS Module GY-NEO-6M V2
- SIM800L GSM/GPRS Module
- IR Infrared Obstacle Avoidance Sensor Module
- LCD2004 20X4 LCD Display
- Gear Motor
- Buzzer
- I2C LCD Adapter Module

Working Procedure

When entering the bus, the passenger has to put his/her RFID card or keyring to the MFRC-522 RFID Module. Each card or keyring contains a unique UID. This UID will be read and checked with the saved values. If the UID matches with any registered UID and if the card has non-negative balance on it, then the bus gate will open. After entering the bus, the door will be closed. After the maximum number of people entered the bus, the gate won't open from outside.

The GPS module will continuously monitor and calculate how much distance the bus traveled. To leave the bus, the passenger will have to put his RFID card or keyring to the RFID module inside the bus. The system will calculate the distance the passenger traveled after entering the bus. The fare will be calculated according to the distance traveled. Students and police will get a discount according to the law.

The distance travelled by the bus can also be measured by calculating the revolution of the bus wheel. We know a vehicle travelled its circumference in a full revolution of its wheel. Revolution can be measured by various methods. We used IR sensor module to determine when a specific portion of bus wheel comes near the IR sensor. That portion is covered with reflective material. So, when that specific portion comes near the IR sensor, the sensor can detect the reflective part and count this as a full revolution of wheel.

We used a switch to change the mode from GPS to wheel revolution in order to measure distance. When GPS won't get any signals, a transition from GPS mode to revolution wheel mode can be achieved by pressing the switch.

A buzzer is set to tone every time a card or tag is present at the RFID reader.

Circuit Diagram [1]

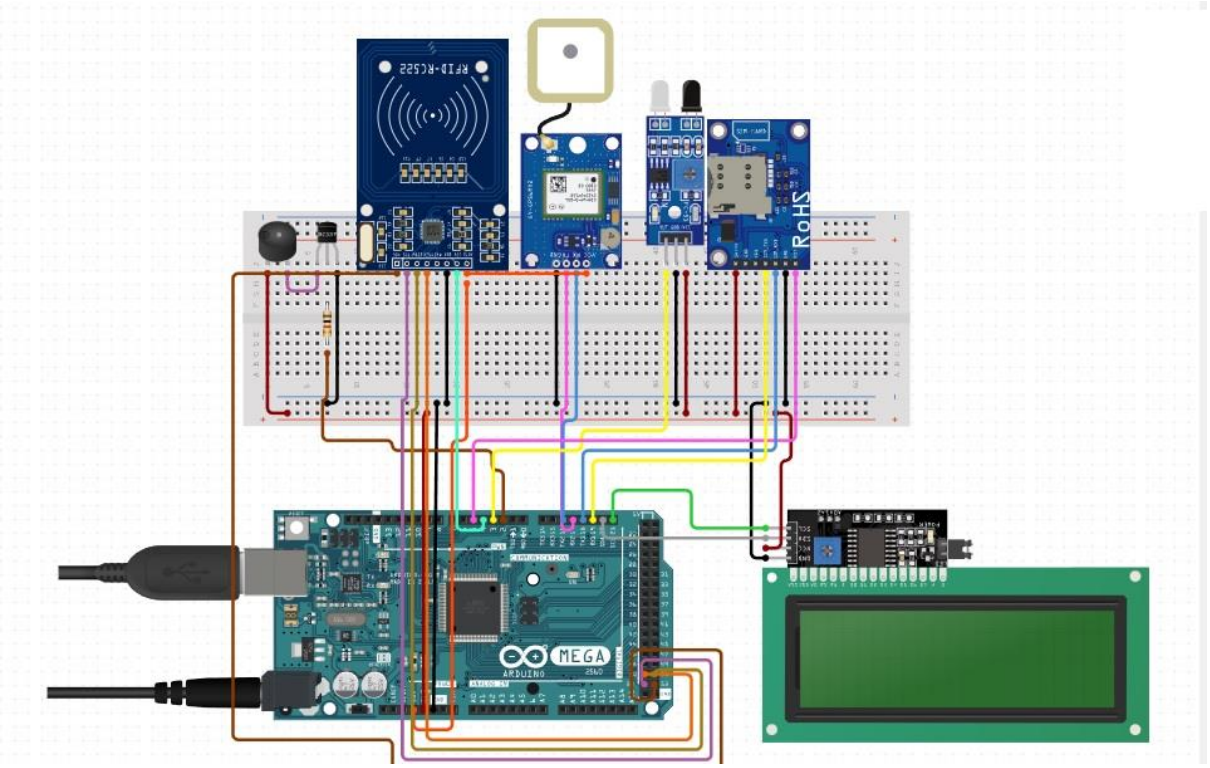


Figure 1: Circuit diagram of Public Bus Automation

Block Diagram

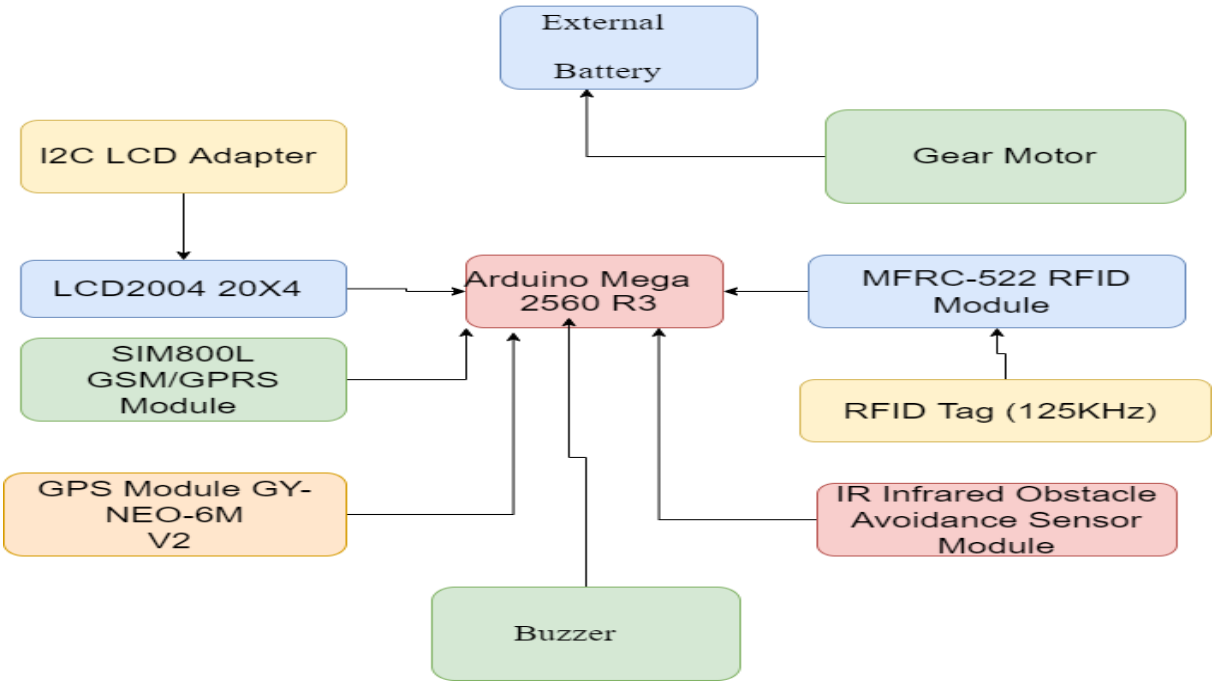


Figure 2: Block diagram of Public Bus Automation

Project Images

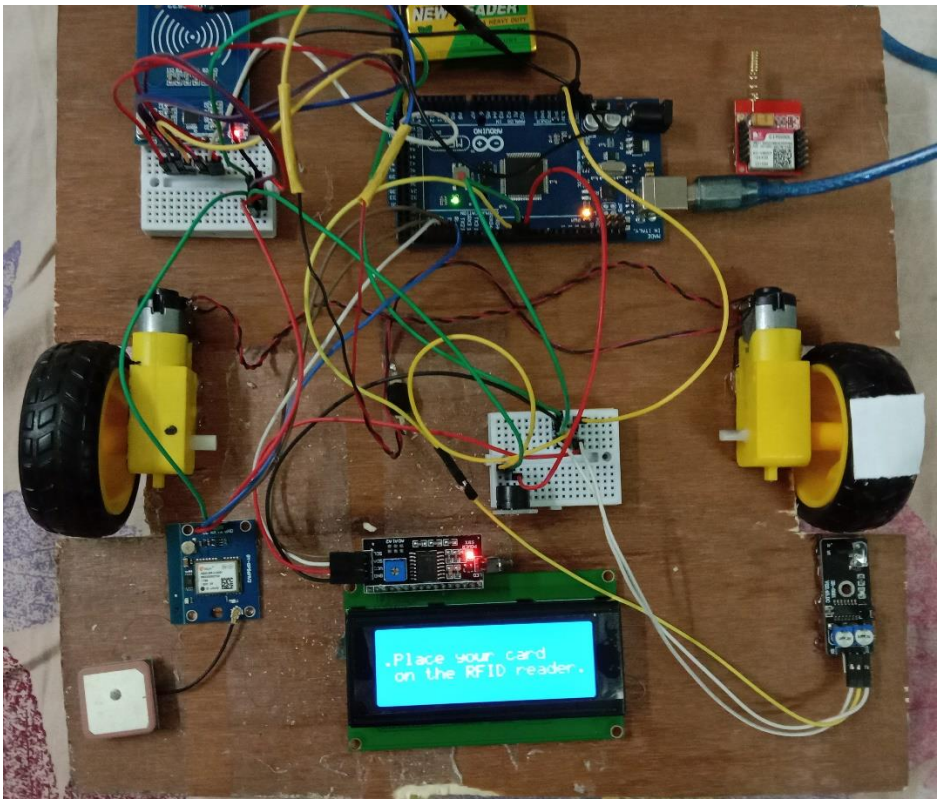


Figure 3: A working demo of Public Bus Automation

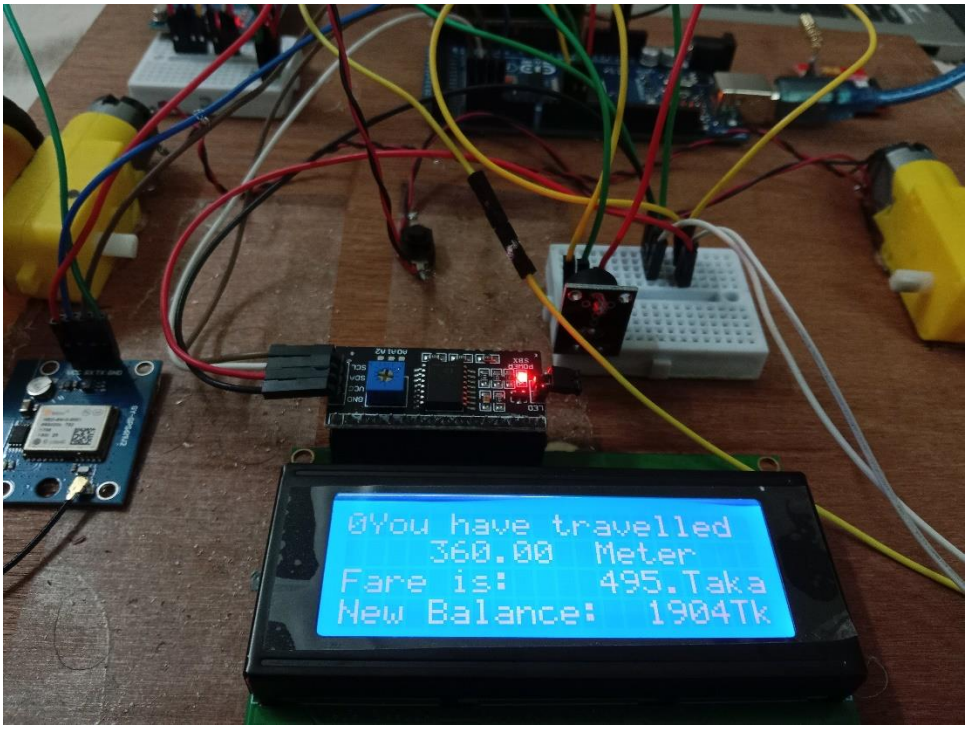


Figure 4: Calculated fare of a passenger after journey is completed

Budget Comparison

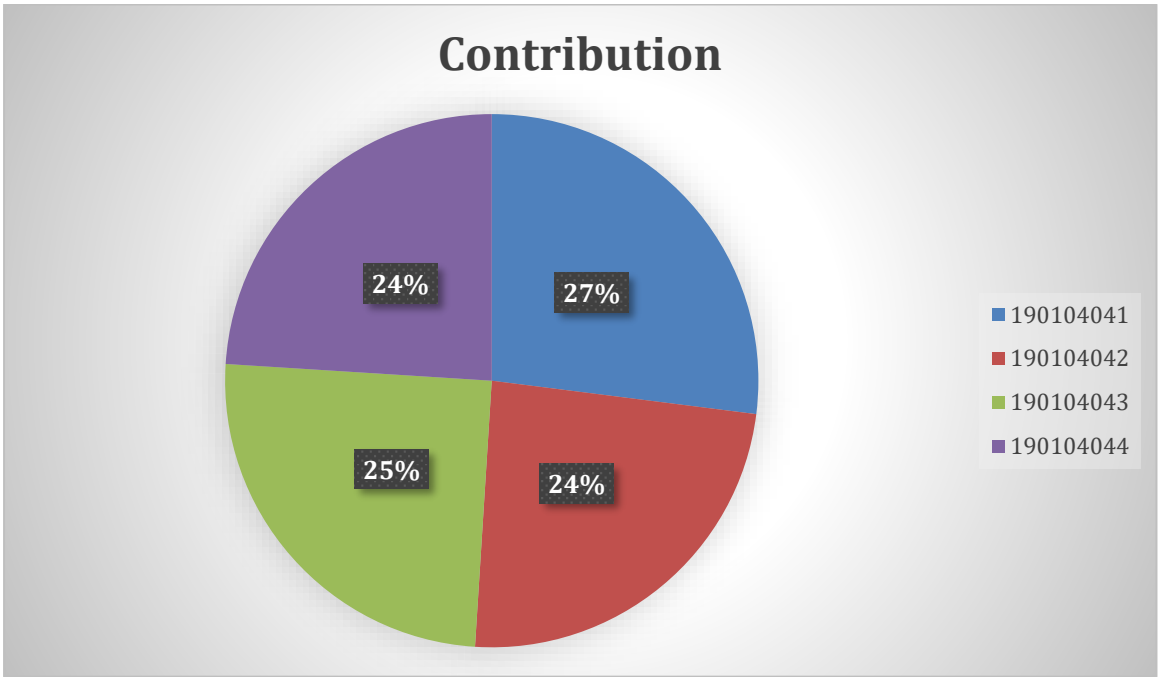
Initial Estimation: [2]

Equipment	Quantity	Budget (Tk)
Arduino Mega 2560 R3	1	2000
Arduino Uno R3	1	1140
MFRC-522 RFID Module	3	600
RFID Tag (125KHz)	5	125
GPS Module GY-NEO-6M V2	1	845
SIM800L GSM/GPRS Module	1	450
IR Receiver	3	15
IR Transmitter	3	20
PIR Motion Sensor Module	1	117
LCD2004 20X4 LCD Display	1	550
Servo Motor SG90	2	400
Total		**6,262**

Final Expenditure: [2]

Equipment	Quantity	Budget (Tk)
Arduino Mega 2560 R3	1	1800
MFRC-522 RFID Module	1	200
GPS Module GY-NEO-6M V2	1	845
SIM800L GSM/GPRS Module	1	450
IR Infrared Obstacle Avoidance Sensor Module	1	100
LCD2004 20X4 LCD Display	1	550
Gear Motor	2	170
RC Car Wheel	2	140
Buzzer Module	1	45
I2C LCD Adapter Module	1	170
Mini breadboard	2	90
Jumper wires	40	95
Total		**4,655**

Contribution of Team-Members



Challenges of the Project:

1. The Sim-Kit is not getting connected.
2. GPS module cannot send signals properly if there are obstacles between it and the satellite.
3. Unable to connect database with Arduino
4. Automatic mode switching from GPS to wheel revolution was not possible

Conclusion

The Arduino-based project "Public Bus Automation" employs numerous sorts of sensors to respond to various events and automate various tasks on a Bus. As a result, it decreases the workload of the bus employees and improves the travel experience for both passengers and bus staff. It also reduces the possibility of human mistakes. Net income will rise as a result of this arrangement. As a result, the Arduino-based project "Public Bus Automation" will make the job of bus drivers easier, and passengers will no longer have to bargain over rates.

Reference

1. Circuit Diagram, https://www.circuito.io/app?components=9442,11061,316349,417987,761981,811437,956215,975601, Created and accessed September 6, 2022
2. All prices collected from https://store.roboticsbd.com/, Last accessed September 6, 2022