PROJECT PROPOSAL ON

"Automatic Toll Collection System according to Weight"

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Course Title: Peripherals and Interfacing Laboratory

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Objectives:

 • To recover the costs associated with constructing and maintaining specific roads and bridges.

 • To enhance the efficiency of toll collection processes.

• To encourage the use of other forms of transportation, such carpooling, biking, or public transportation.

• To maintain toll collection according with transports weight.

• To explore other forms of transportation, easing traffic and advancing environmentally friendly transportation options.

 • To guarantee justice and a distributed cost of transportation. Any tax structure can be created to guarantee justice and a distributed cost of transportation.

Problem Statement:

 • Without a toll tax system, appropriate revenue maintainingroads, bridges, and other transportation infrastructure may not be available.

 • Having manual toll tax system, there are lack of fairness and quity according with weight of different vehicles.

 • Insufficient funding for infrastructure.

Significance of Project:

- To improve efficiency
- To enhance user experience
- To reduce operational cost
- Data collection and analysis
- To implement fairness collection toll according with weight

Scope of Project:

- A working man who is getting trouble during collecting toll manually.

- Imposing same toll for every vehicle which is not right.

- Transaction Processing for Tolls

Introduction:

In this project, we will introduce you to the Automatic **Toll Collection System**

according with Weight designed using **RFID Module** and **Arduino**.

Nowadays there is a huge rush in toll plazas for paying the **toll tax**.

Therefore, in order to reduce traffic and save time, an **automatic toll**

collector can be used. The aim of the project is to automatically identify

the **RFID tag** in a vehicle and to display the particular amount the user has

to pay in order to pass the toll. If the user pays the amount, he can pass

the **gate** else he will be blocked.

This project is a demo of a **Smart Toll Tax Collection System**. Consider

there are n numbers of vehicles at Toll Plaza. When these vehicles cross

the **IR Sensor**, the gate will be closed. At the same time, the **LCD** will

display to put the Card to the reader for scanning. Then you can put your

card on **RFID** and pay your bill. When the bill is successfully paid, then you

can go towards the 2nd Gate. When a vehicle crosses the 2nd IR Sensor, the

gate will be opened and you can go.Any vehicle will pay toll according with

its weight which is measured by **loadcell**

and the weight is multiplied by the tk of fixed amount.Here, we use **keypad**

for recharging tk if the card is out of balance.

Components:

1.Arduino Uno: The operating voltage is 5V .The recommended input voltage will range from 7v to 12V.The input voltage ranges from 6v to 20V.Digital input/output pins are 14 .Analog input pins are 6 .DC Current for each input/output pin is 40 mA.DC Current for 3.3V Pin is 50 mA .Flash Memory is 32 KB SRAM is 2 KB .EEPROM is 1 KB CLK Speed is 16 MHz.Quantity 1.
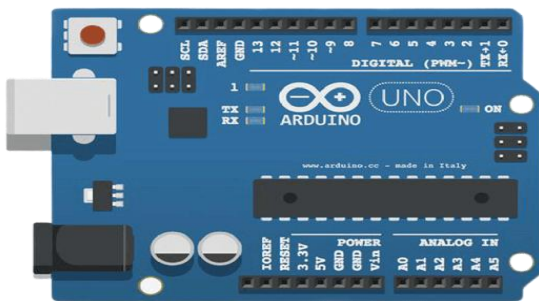

Fig-1.1:Arduino Uno

2.RC522 RFID Reader: The **RC522** reads cards with a 13.56MHz frequency.Quantity 1.

Fig-1.2:Rc522 rfid reader
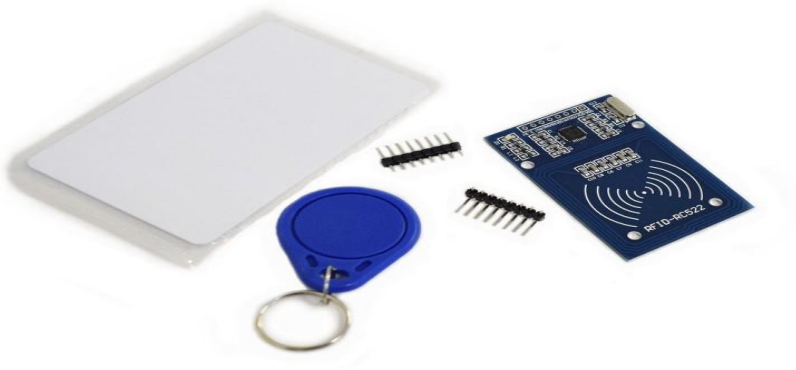
3.RFID Card: Quantity 2.

Fig-1.3:Rfid card

4.I2C LCD Display: 16 character x 2 line Blue LCD.I2C interface.Adjustable backlight intensity and contrast.5V operation.Quantity 1.

Fig-1.4:LCD Display

5.IR Sensor Module: 5VDC Operating voltage. I/O pins are 5V and 3.3V compliant. Range: Up to 20cm. 20mA supply current.Quantity 2.
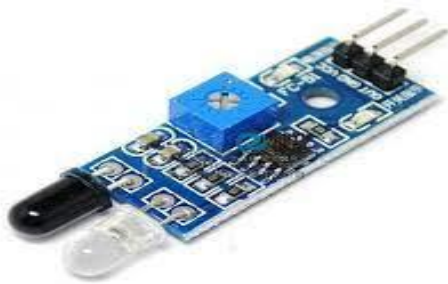

Fig-1.5:IR Sensor

6.Servo Motor: The servo motor is compact and lightweight and outputs high power. Rated Output Power: 200 W (1/4 HP) Motor Frame Size: 60

.

Fig-1.6:Servo Motor

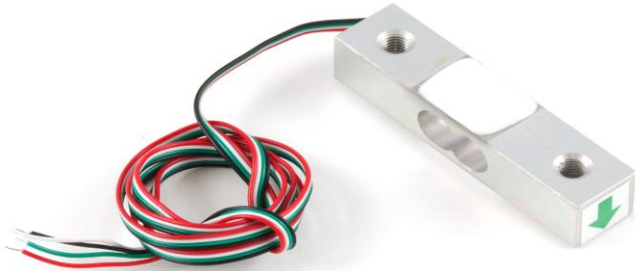**7.Load Cell:**1 kg load cell.Quantity 1.

Fig-1.7:Load cell

8.4*4 Matrix Keypad: The **keypad** is used as an input device to read the key pressed by the user and to process it. **4x4 keypad** consists of **4** rows and **4** columns.Quantity 1.

Fig-1.8:Keypad

9.Breadboard & Connecting wires: As Required.

Project Description:

In this project, we are going to use Arduino Uno as our microcontroller, two IR sensor to detect the vehicles before and after giving toll. One servo motor would be used in this project for the stand up and down. Lcd display for showing amount and what will be done.Rfid card and reader module for paying toll and a loadcell for measuring weight of the vehicle.Keypad for recharging tk.
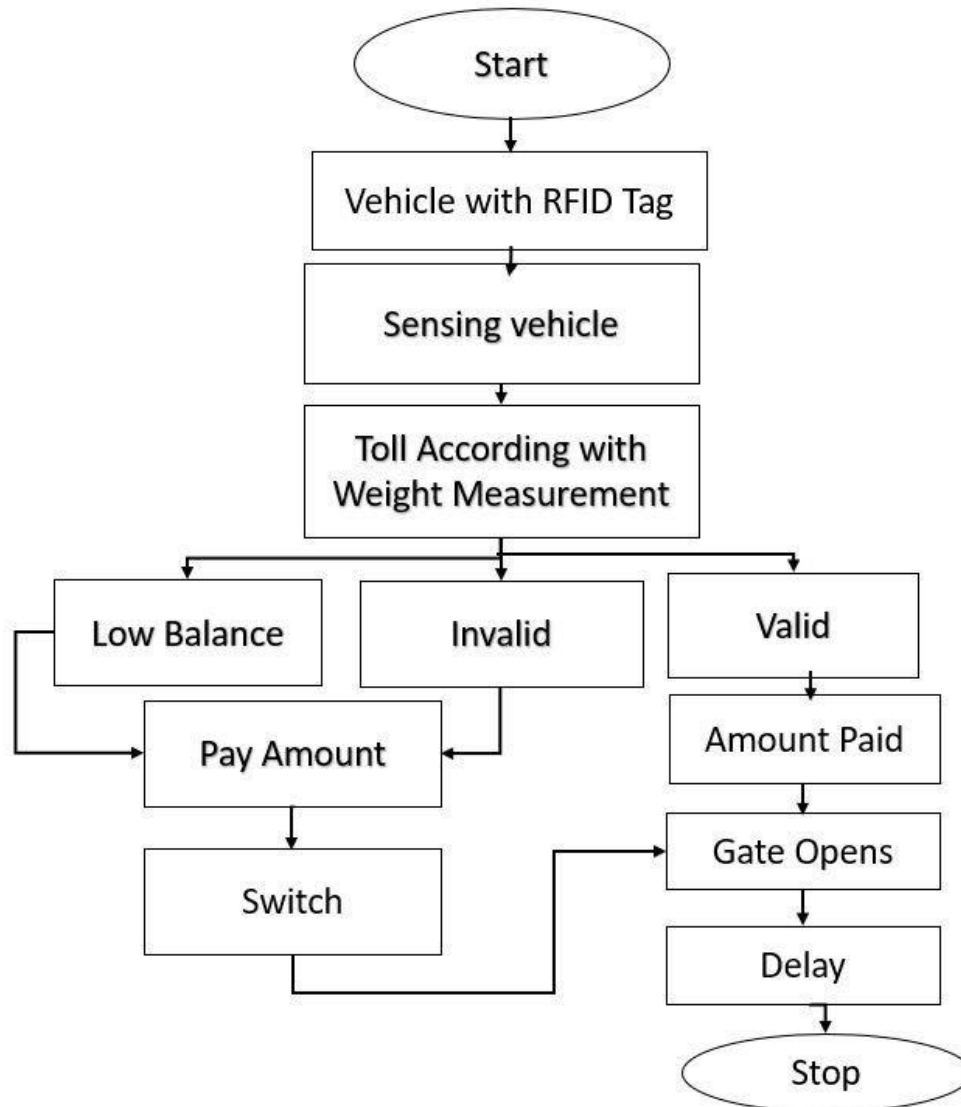
```
                    ┌─────────┐
                   (   Start   )
                    └─────────┘
                         │
                         ▼
              ┌───────────────────────┐
              │  Vehicle with RFID Tag │
              └───────────────────────┘
                         │
                         ▼
              ┌───────────────────────┐
              │    Sensing vehicle     │
              └───────────────────────┘
                         │
                         ▼
              ┌───────────────────────┐
              │   Toll According with  │
              │   Weight Measurement   │
              └───────────────────────┘
          ┌──────────────┼──────────────┐
          ▼              ▼              ▼
   ┌────────────┐ ┌────────────┐ ┌────────────┐
   │ Low Balance│ │  Invalid   │ │   Valid    │
   └────────────┘ └────────────┘ └────────────┘
          │              │              │
          ▼              ▼              ▼
       ┌─────────────────────┐  ┌────────────┐
       │    Pay Amount        │  │ Amount Paid│
       └─────────────────────┘  └────────────┘
               │                       │
               ▼                       ▼
       ┌─────────────────────┐  ┌────────────┐
       │    Switch            │─▶│ Gate Opens │
       └─────────────────────┘  └────────────┘
                                       │
                                       ▼
                                ┌────────────┐
                                │   Delay    │
                                └────────────┘
                                       │
                                       ▼
                                 (   Stop    )
```

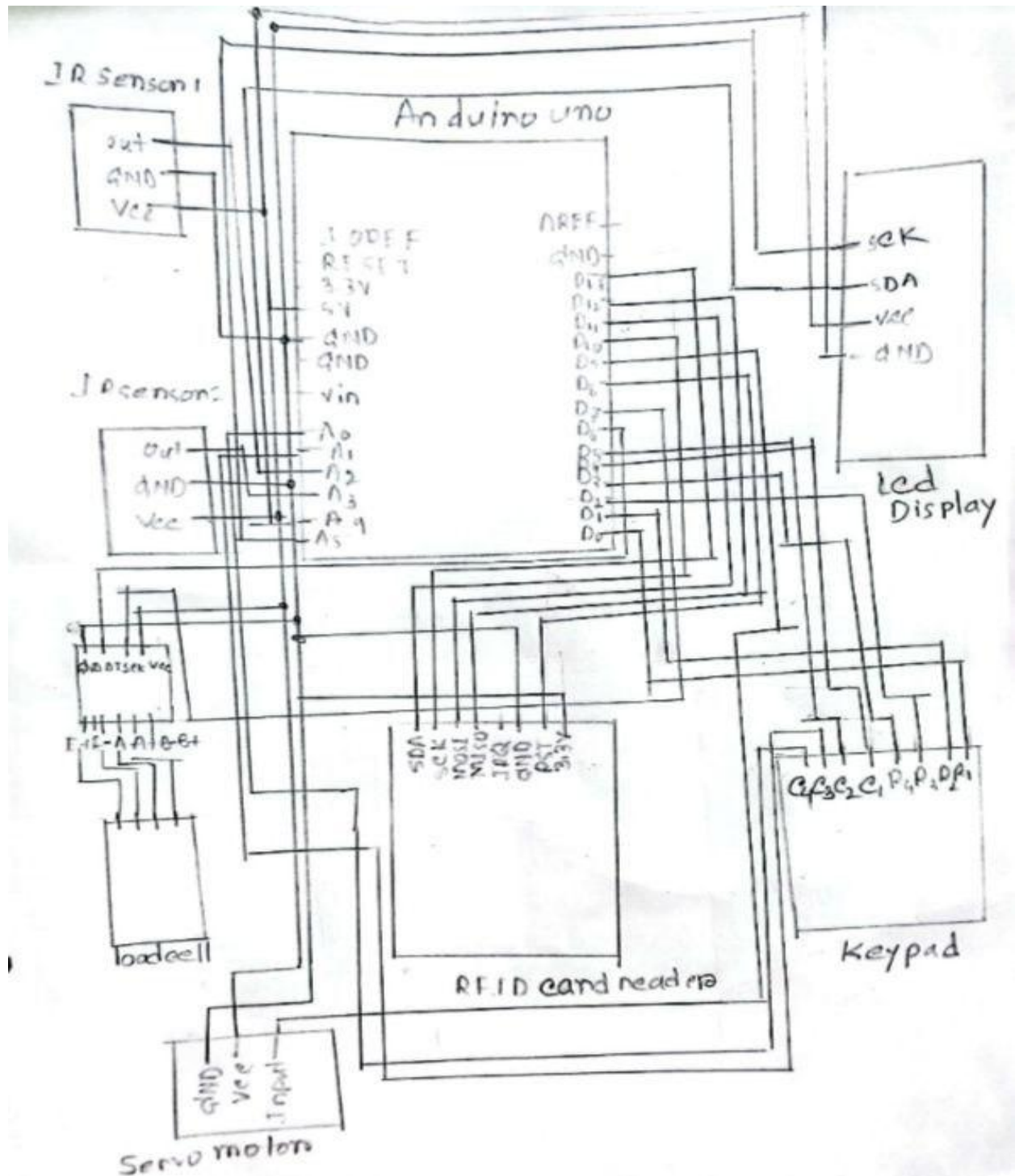Fig 1.9: Flow chart of Project

Circuit Diagram:

Fig 1.2: Circuit Diagram

Pseudo Code:

//Include required libraries

//Declare and initialize variables and objects

//Pin configuration

```
void setup ()
{
        //Initialize Display
        //Setup pin modes
        //Attach servo
        //Initialize RFID
}
void loop()
{
        //Initiate Load cell
        //Sense if car has entered and redirect to weight function
        //Function calling
        sens1!=true{
        //welcome
        Set value k to1
        }
        k = true{
        wight()
        rfid()
        }
```

```cpp
}
//Function to measure weight
void weight()
{
        //Setting toll according to weight
}
//Function for the down of servo
void servoDown()
{
        delay(5);
}
//Function for the servo up
void servoUp()
{
        delay(5);
}
 //Function for paying toll
rfid()
{
        //Pay money if has sufficient balance
        //For insufficient call recharge function
        recharge()
}
//Function for recharging
reCharge()
```

```
{
        //Recharge balance if doesn't have enough balance
}
//Function for recharging mode on
KeyPad()
{
        //Recharging mode on
}
//Back in loop  and sense if car is here.. free path and let go
```

Design Of The Project :
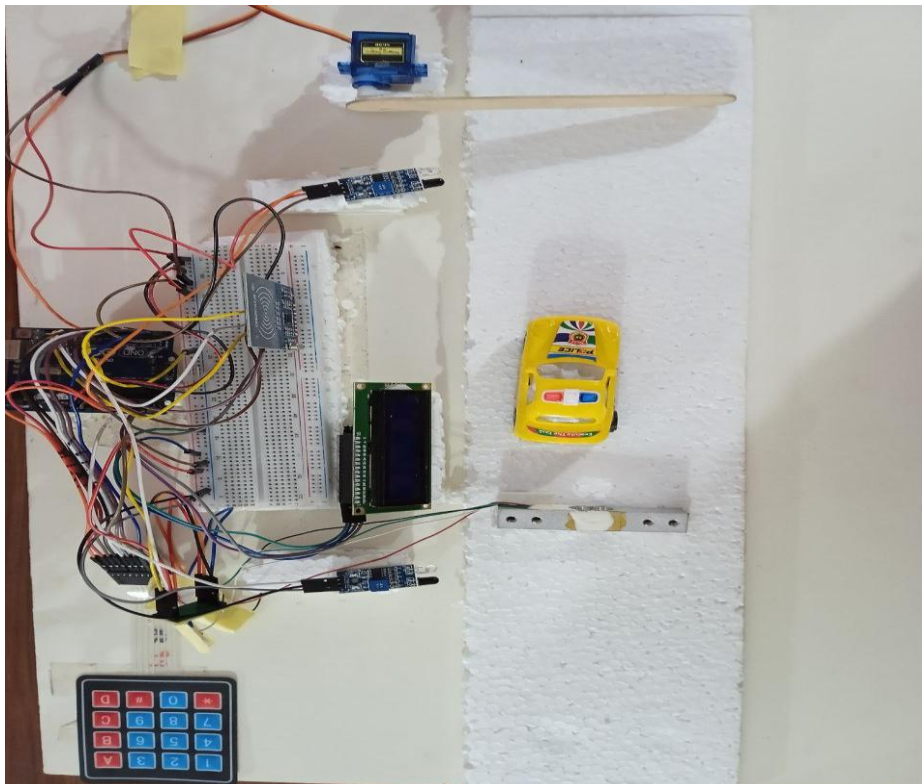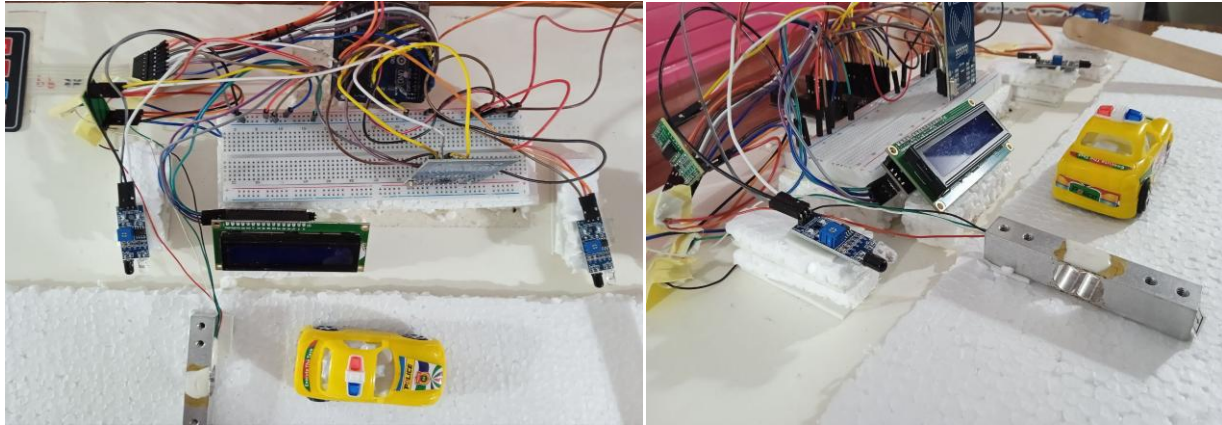
Discussion :

From this project, we have known practically about the application automatic toll tax system using Arduino uno, RC522 RFID Reader module, RC522 RFID Card, LCD Display, IR Sensor Module, Servo Motor, Loadcell, 4x4 Keypad module. We have gone through trials and errors and successfully solved the errors on our own with the help of internet. We have face problems for long time while using keypad. We faced problem when insufficient balance is shown in lcd and recharge through keypad for paying. When a vehicle goes over the loadcell for measuring toll which the driver will pay, there is some component error in loadcell. Here, We used two IR sensor ,first IR sensor is used for detecting a vehicle and it will help the servo motor to close the stand .when toll is paid successfully and the second IR sensor detect the vehicle it will help the servo motor to up the stand and vehicle can go.

Conclusion:

In conclusion, the Atomatic Toll Collection System according to weight Peripheral project aims to enhance the automatic toll collection system by introducing a text messaging feature that provides real-time notifications and updates to users. By integrating a text messaging gateway along with weight and enabling user registration and account management, this project enhances convenience, communication, and user experience within the toll system.

The Toll Tax System Peripheral project serves as a valuable addition to the automatic toll collection system, improving communication, and user engagement.

It paves the way for further advancements in toll systems, contributing to more efficient and user-friendly transportation infrastructure.

Refferences:

- . https://www.arduino.cc
- https://www.youtube.com/watch?v=jHO8y9CAwkE&t=932s
- https://www.youtube.com/watch?v=pWiS-oW3Snc&t=16s
- https://www.youtube.com/watch?v=C_pWNQ6H9EE
- https://www.youtube.com/watch?v=OGxPCTKB2sY&t=871s