CAR PARKING MANAGEMENT (PROTOTYPE)

Documentation of the project : Car Parking Management

Project Overview

This project is a real-world simulation of a parking system which uses RFID system to log data and uses IR sensors to detect which slots are empty to keep the car and also the program helps to run this simulation infinitely once powered on.

This prototype can be further extended to real world using the RFID and the parking slot management system.

The Code of the project is on GitHub - https://github.com/Subhankar2000 and developed by Subhankar Karmakar , email id : subhu990@gmail.com
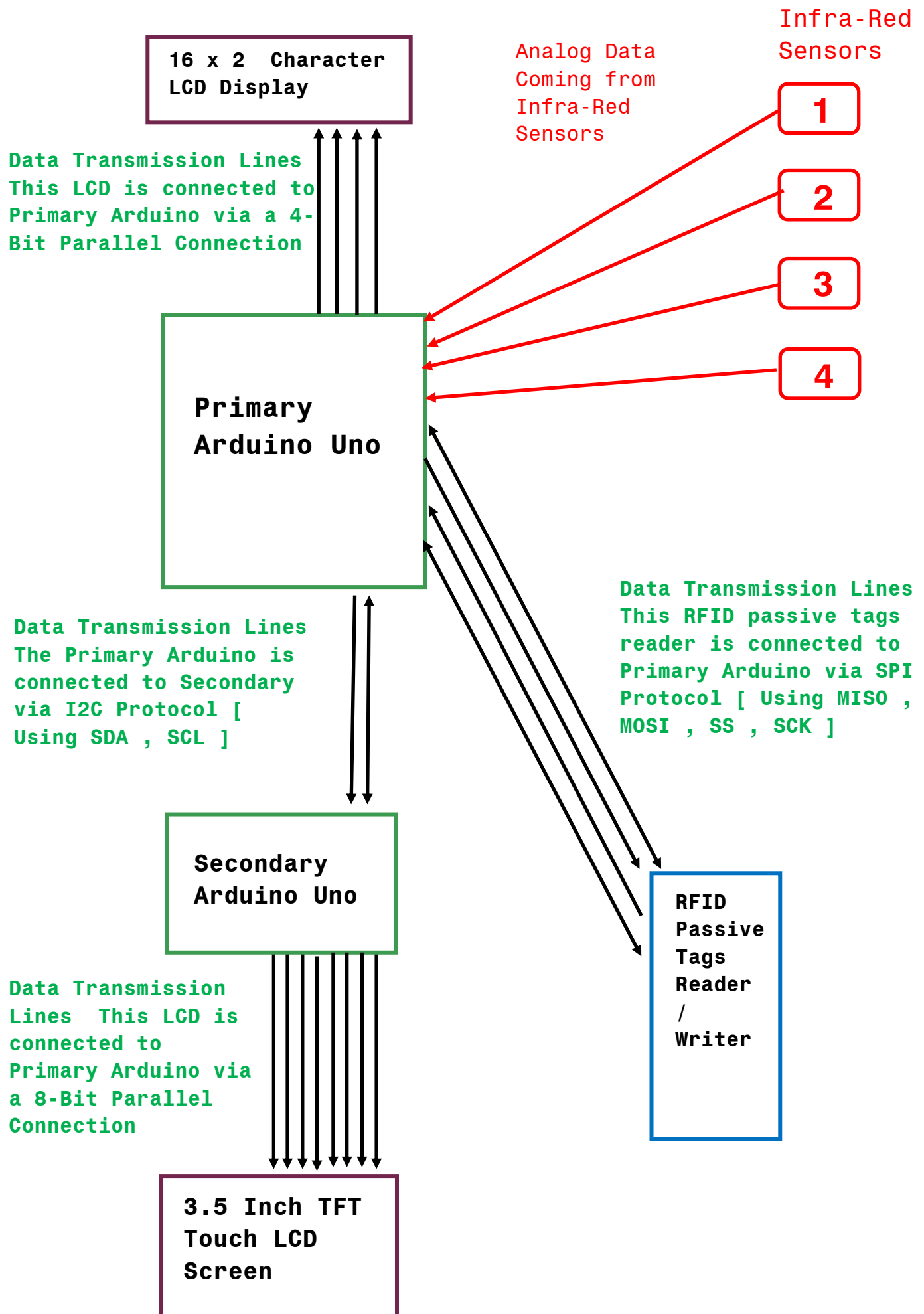

This prototype including the code has been developed entirely by :

Subhankar Karmakar [1ˢᵗ Year , Session 2017-21 , Electronics and Communication Department , Asansol Engineering College]

Topics :

1. Circuit Block Diagram
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4. Applications of this prototype in real world
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1.Circuit Block Diagram

16 x 2 Character LCD Display

Analog Data Coming from Infra-Red Sensors

Infra-Red Sensors

1

2

3

4

Data Transmission Lines This LCD is connected to Primary Arduino via a 4-Bit Parallel Connection

Primary Arduino Uno

Data Transmission Lines This RFID passive tags reader is connected to Primary Arduino via SPI Protocol [Using MISO , MOSI , SS , SCK]

Data Transmission Lines The Primary Arduino is connected to Secondary via I2C Protocol [Using SDA , SCL]

Secondary Arduino Uno

RFID Passive Tags Reader / Writer

Data Transmission Lines This LCD is connected to Primary Arduino via a 8-Bit Parallel Connection

3.5 Inch TFT Touch LCD Screen

2. Description of Circuit Block Diagram

There are two Arduino Uno in this Project / Prototype , one which is labelled primary and other is labelled secondary , the primary Arduino is connected to the RFID reader and writer module and the 16x2 Character LCD Display and the Secondary Arduino Uno.

In the above Block Diagram , the power Sources are not shown for the sake of simplicity of the diagram and here all the devices (screen , Arduino , Infra-Red Sensors) use standard 5V power supplied from a 7805 Voltage Regulator but the RFID Module uses 3.3V power Supply from Arduino Uno.

The RFID Module as Shown in the Diagram is connected via SPI protocol to Primary Arduino Uno through the standard 4 pin SPI connection [MISO , MOSI , SCK , SS]

and it scans any passive 13.56 Mhz RFID card and transmits information to the Primary Arduino.

The 16x2 Character LCD Display is also connected to the Primary Arduino via a standard Character LCD connection and gets the necessary details from Primary Arduino such as the Name and the User ID to print on the screen.

The Infra-Red sensors sends the signal HIGH / LOW to Primary Arduino.

After the primary Arduino gets all information , it sends a group of data encoded in an array to the secondary Arduino via I2C protocol and the Secondary Arduino on receiving the information and decoding it , displays it to the main 3.5 inch TFT Display which is directly connected to the secondary Arduino.

3.Description of Program Flow

The RFID reader will at first scan the RFID tags and then send the processed UID to primary Arduino Uno via the SPI Protocol , then the Primary Arduino will compare with its mini database and show the UID and Name of the Card Holder in the 16x2 Character LCD display , simultaneously the Primary Arduino will also take inputs from the Infra-Red Sensors to Tell which slots are empty and which are not , after this first stage of the information gathering by Primary Arduino , the Primary Arduino will send an Array of data , where each element of this array will be indicating a specific state and information for Card Holder and Slot information which one is empty and which one is occupied . This Array of data will be sent from Primary Arduino to Secondary Arduino via the I2C bus and the Secondary Arduino on getting the Array via I2C will start decoding the array elements and process it one by one to generate commands

for the 3.5 Inch TFT Touch Display and there
fore we will get an extended Display of

large size and this display will show all the
necessary details such as the Name of the
Person in full , the User ID , the slots
empty and the status of the car parked or
not , that is , has the person kept his car
before or not , if he has kept the car , he
will be greeted with an welcome screen and
if he is coming for the first time , then
the user will be greeted with the slots
empty screen. This flow goes on and on and
the logics of the IR and the data flow is
written in the form of Arduino Program.

There are two programs for two separate
Arduino's and each of them performs their
own functions , such as the primary Arduino
is concerned with the Input from RFID ,
displaying on the Character LCD Screen and
taking Inputs from IRs and sending Data to
the Secondary Arduino and the Secondary

Arduino on the other hand is only programmed to receive the data , decode and display it on the big 3.5" TFT Touch Screen.

The two programs run independently of each other and only sync during the data transfer, The system (comprised of both the Arduino's) once booted up , can run infinite times and simulate the Car Parking Management via RFID and the Slot Selection.

4. Applications of this prototype in real world

This prototype is a real world simulation of a parking management managed by RFID reader / writer and a placement tracking system that is which slot is empty to keep the car and which is not. So, this model can help to manage car parking in any Corporate Office Building , where a dedicated Building is there to park the cars and there people can easily park cars and manage the logging of data via RFID tags and also near Super Market places , where there is a parking lot dedicated for the shoppers coming there and park the cars. This Prototype can be extended to use to make payment by smart cards and also can be extended to connect various parking lots via this system and over network , So on the basis of this , this can be applied and used in tourist places where new people come and go and use their regular cards to log data , make payment and the slot managing algorithm can

help to look which slot is full and hence notify the parking is full.

So , in a nutshell this system via RFID can be applied to normal parking lots , where we can log the data of the customer and can have the payment at once without any problems and if there is no RFID tag with the customer , the RFID tag writing process can help to issue the card in the name of the person with great accuracy and speed.

And the Parking space management via IR sensors as shown in the project can be extended via Ultrasonic sensors to determine which slot is full , which is empty and which is privileged , so a user / new user can easily park the car at his convenient place and also can get the notification if the whole parking lot is full or not.

5.Cost of the Prototype

This project is created using :

- 2 x Arduino UNO   : ₹ 1100
- Character LCD 16x2 (JHD162A)   : ₹ 170
- 3.5" TFT Touch LCD (ILI9481)   : ₹ 550
- 43 x Jumpers   : ₹ 215
- 4 x Infra-Red Sensors   : ₹ 300
- RFID Reader (RFID-RC522)   : ₹ 230
- 4 x RFID passive tags (MIFARE 1KB) : ₹ 60

Total : ₹ 2625

The above costs can vary from place to place

6.Photos of the Prototype

Google Drive Link –

https://drive.google.com/drive/folders/1xvesUAO
wpgKvd3xcqGLtZhSKC2Tk9vzL

7.Code for the Prototype

GitHub Link –

https://github.com/Subhankar2000/Car-Parking-
Management