Technical University of Cluj-Napoca
Faculty of Electronics, Telecommunications and Information Technology
2025

MICROPROCESSORS

Security access reader for entering building using microcontrollers

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Introduction

In this project we have a security access reader for entering buildings using microcontrollers constructed with a single-board Arduino Uno and a RFID technology for user identification.In addition a code for the Arduino is used for user registration,access restriction and access monitoring by recording data logs into database.

An access reader enhance security by preventing unauthorized entry while offering convenience through automated access control.They are cost-effective,easily customizable,and can be integrated with IoT and smart home systems.. Additionally,they improve time management and enable real-time monitoring, making them ideal for workplaces, residential complexes, and high-security areas. With their ability to store entry logs and trigger alarms during security breaches, microcontroller-based access readers are an essential component of modern security systems.

Theoretical background

A security access reader is an electronic system designed to control entry to restricted areas by verifying user credentials. Using an Arduino microcontroller and an LCD display, this system ensures secure and efficient access control.

The Arduino Uno is a microcontroller board that acts as the brain of the system,handling input from authentication devices,processing the data and triggering the necessary responses.It has 14 digital input/output pins,6 analog inputs,a 16 MHz ceramic resonator,a USB connection,a power jack, for battery or AC-to-DC adapter for independent use. The power of the microcontroller can be provided via USB when it is connected to a computer for software configuration with Arduino Software (IDE) provided by manufacturer.

RFID (Radio-frequency identification) is an electronic communication technique used to identify objects.In our case the RFID reader is used for recognizing the tag IDs of contactless cards.

The Liquid Crystal Displays (LCD) acts as the user interface for displaying system messages and feedback.It’s function is to guide us through the process by firsty displaying a “Scan RFID ID ” message and after verifying credentials show messages such as “Authorized” and “Access denied ”.

Implementation

Step 1.Installing the software and libraries

Arduino-Software can be installed from the official Arduino site.While we wait for the application to install we will download the Arduino RFID library that we will need in order to code the microcontroller.

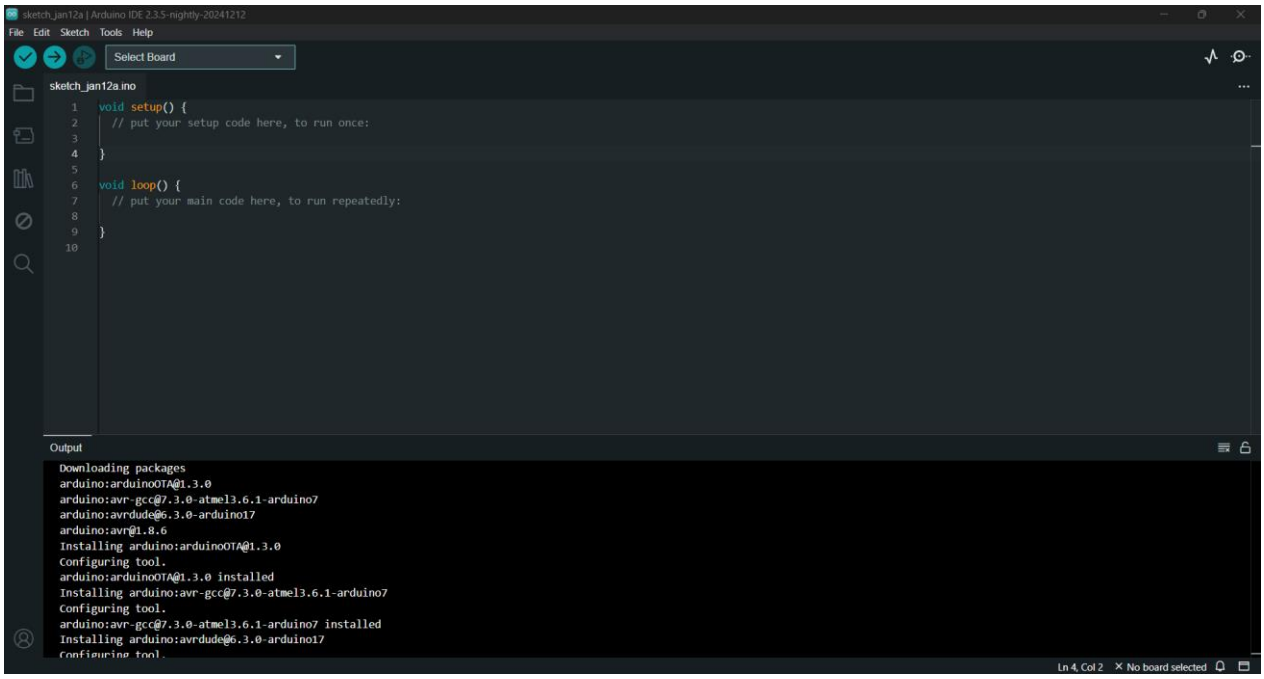

Fig. 1 Successful installation of the Arduino and the libraries

Step 2.Wiring and assembling the Arduino microcontroller with the RFDI sensor and the LCD

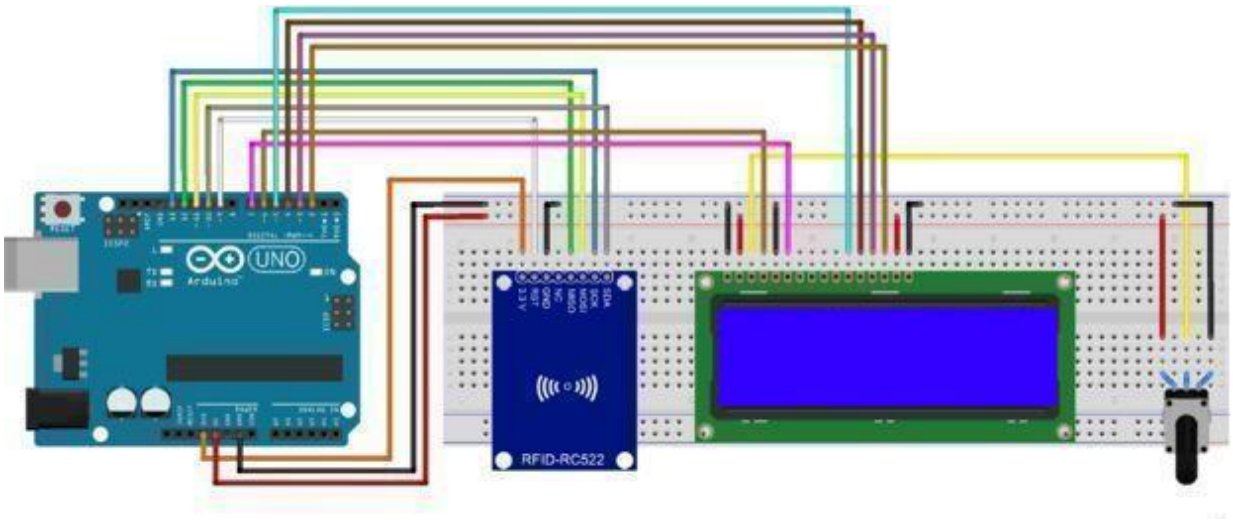

Fig. 2 Image for assembling the access reader

In this step we will connect the RFDI sensor and the LCD to the Arduino microcontroller based on the image from Fig 2.

Step 3.Code for RFID READING

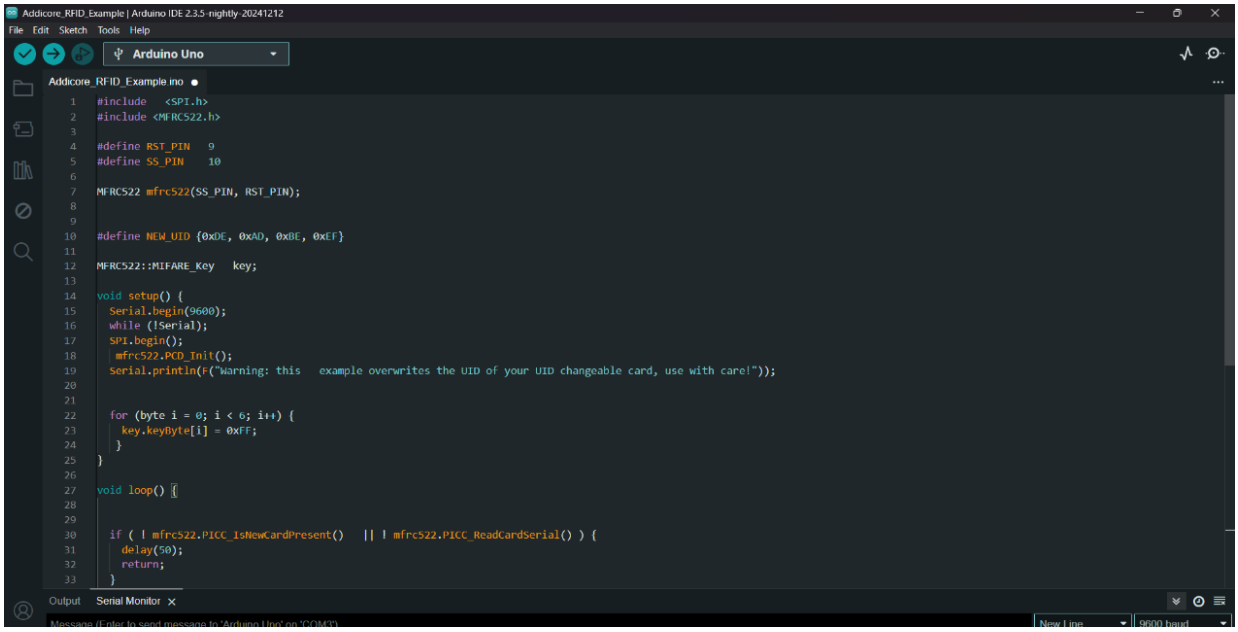

Fig. 3 Code for reading the RFDI sensor

For this step we will connect the Arduino microcontroller to the PC and run the program.After the code was verified,we will scan the keycard on the sensor,so that we can get the Card UID(for my kecard I got the UID: 97 4C 3B 33) which we will use to register access to.

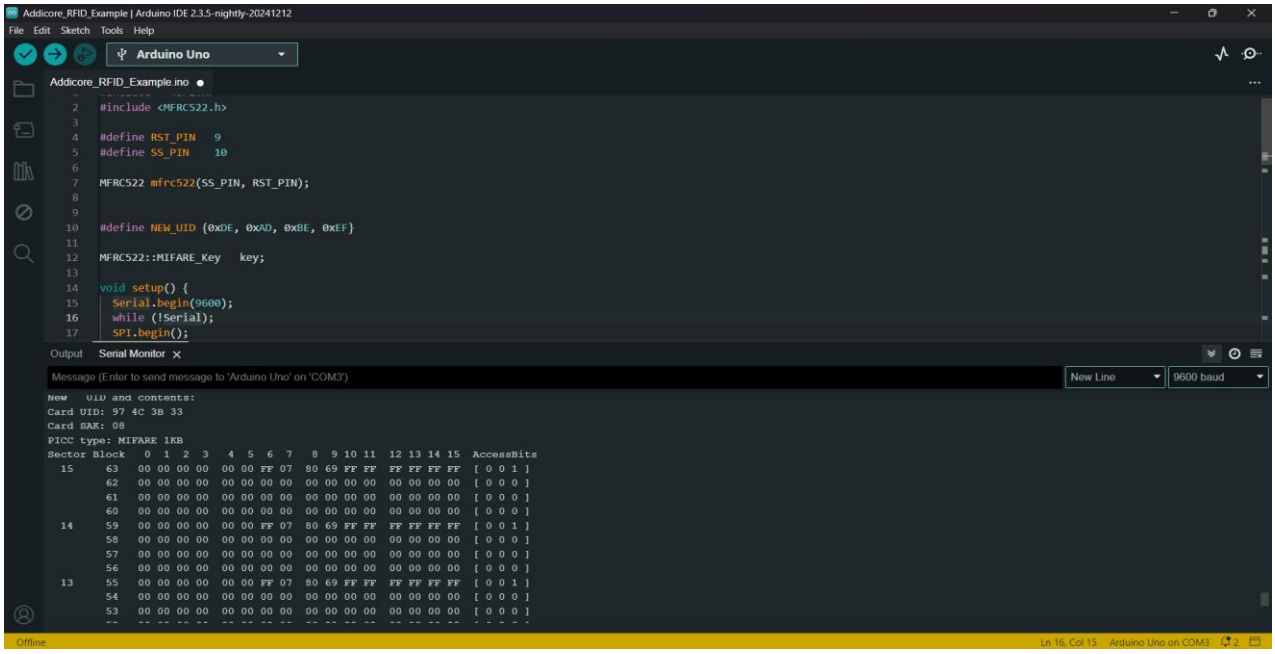

Fig. 4 Imagine after run and scanning the keycard

Step 4.Code for RFID reader write with LCD

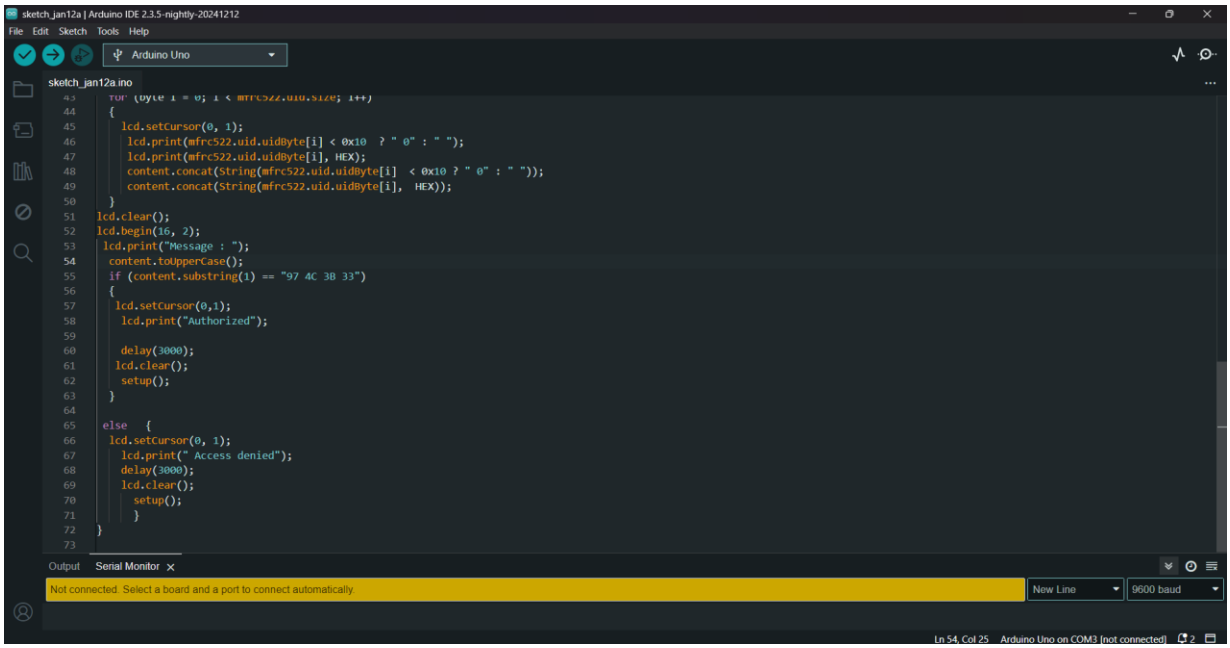

Fig 5. Imagine with code for RFID reader

We will place our UID that we obtain from scanning the keycard into our code,so that the keycard will be registered in the program and granting it authorization.

Conclusion

In conclusion the project does it thing,as we will see in the video attached to the project.Problems that I encountered are that sometimes the LCD will glitch and the message will freeze because some wires will disconnect when moved,no longer being able to scan the keycard and allowing access,better cable management must be done in order to avoid this problem for the future.

A next step to my project will be to implement a key that will let me register keycards from the sensor and not the program only,and attach it to a structure to test it’s lockdown capabilitie.

Bibliography

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5. RFID Reader With LCD 1602 | Arduino Project Hub