CS637 Course project

RFID Project

RADIO FREQUENCY IDENTIFICATION

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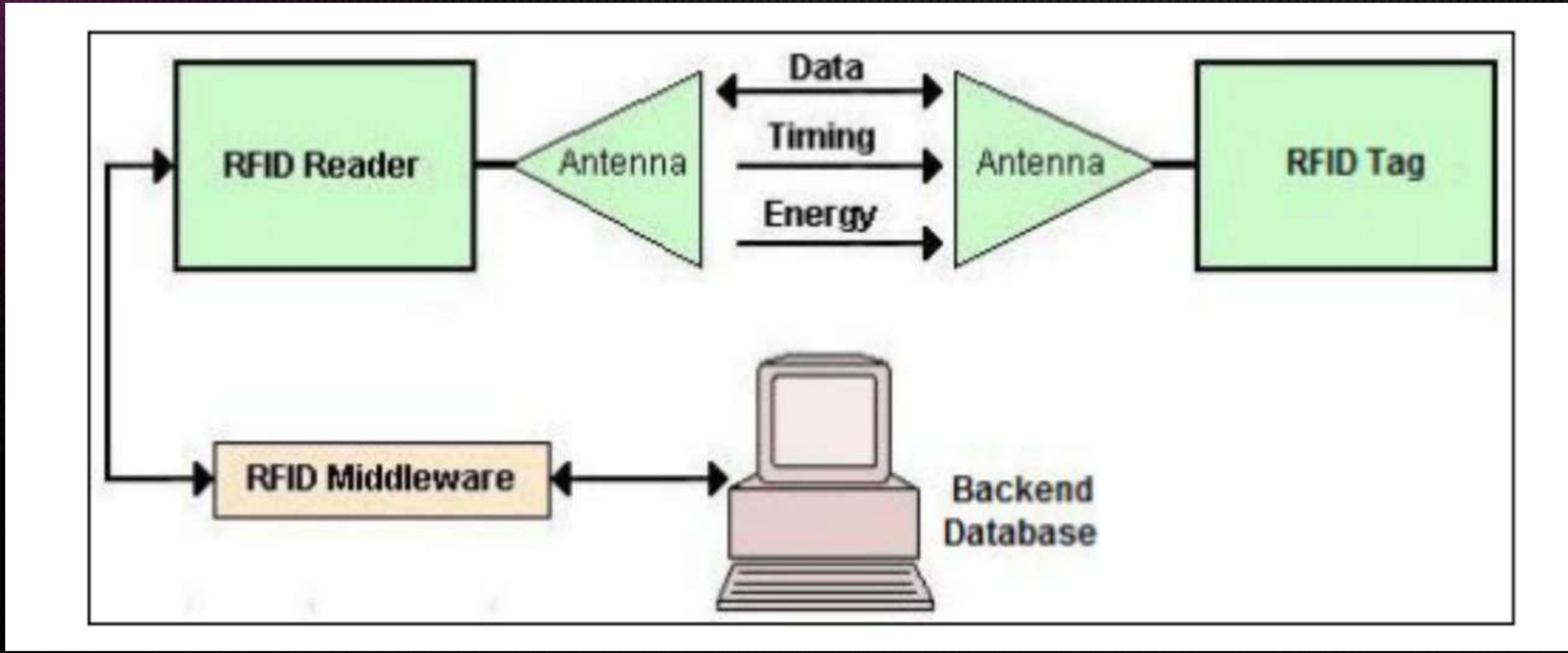
Components of an RFID system

An RFID system consists of various components that are connected to one another by a dedicated communication path. The individual components are integrated into the system to implement the benefits of RFID solution.



Tags

An object that is attached to any product and uses a unique sequence of characters to define it. It comprises of a chip and the antenna.

Antenna

It is responsible for the transmission of information between the reader and tag using radio waves..

Reader

A scanning device that uses the antenna to realise the tags that are in its vicinity. It transmits signals at a certain frequencies.

Middleware

A communication interface to interpret and process data being fed by the readers into information. It takes into account all relevant ports of communication and a software application to represent this information..

Backend database

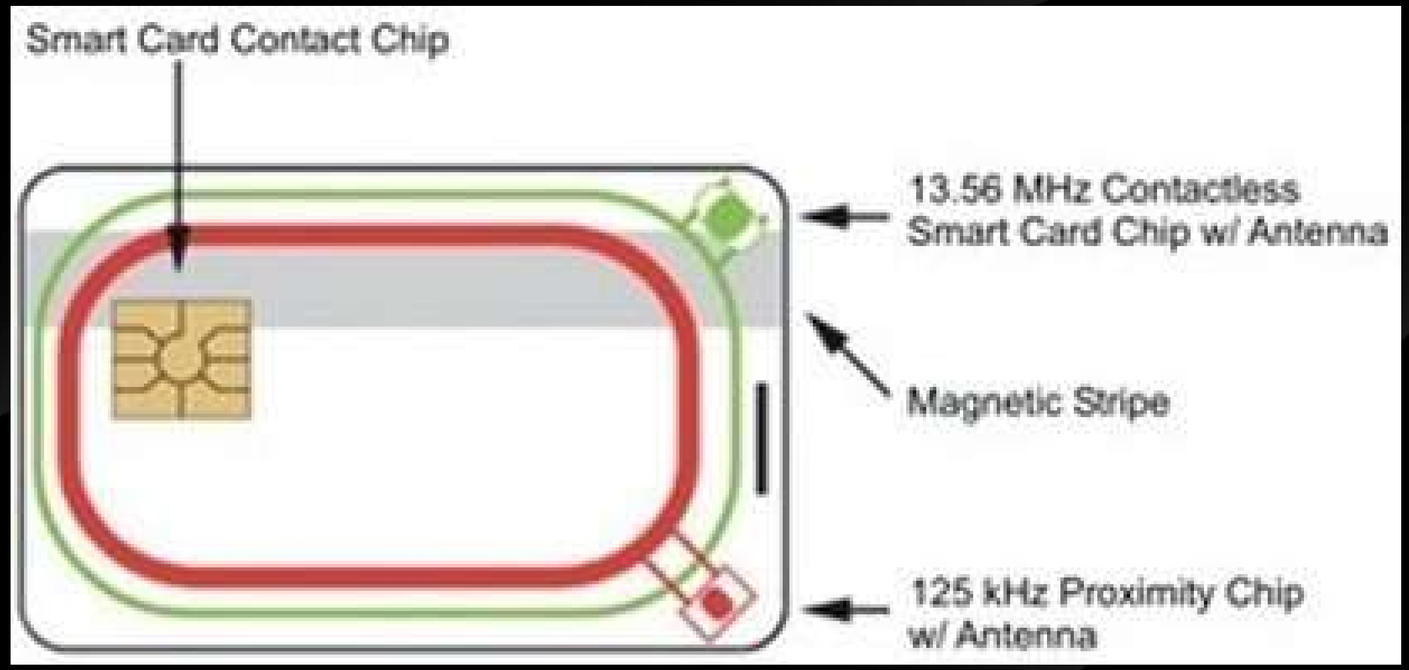
A repository of information, which is designed specific to the application. The database stores records of data specific to individual tags

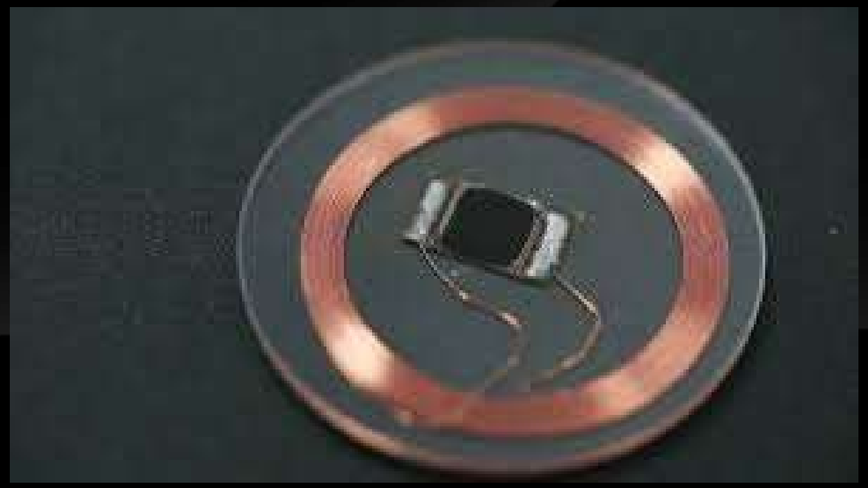
How does RFID works?

- When the tag is brought close to the reader, the reader generates an electromagnetic field. This causes electrons to move through the tag’s antenna and subsequently powers the chip.

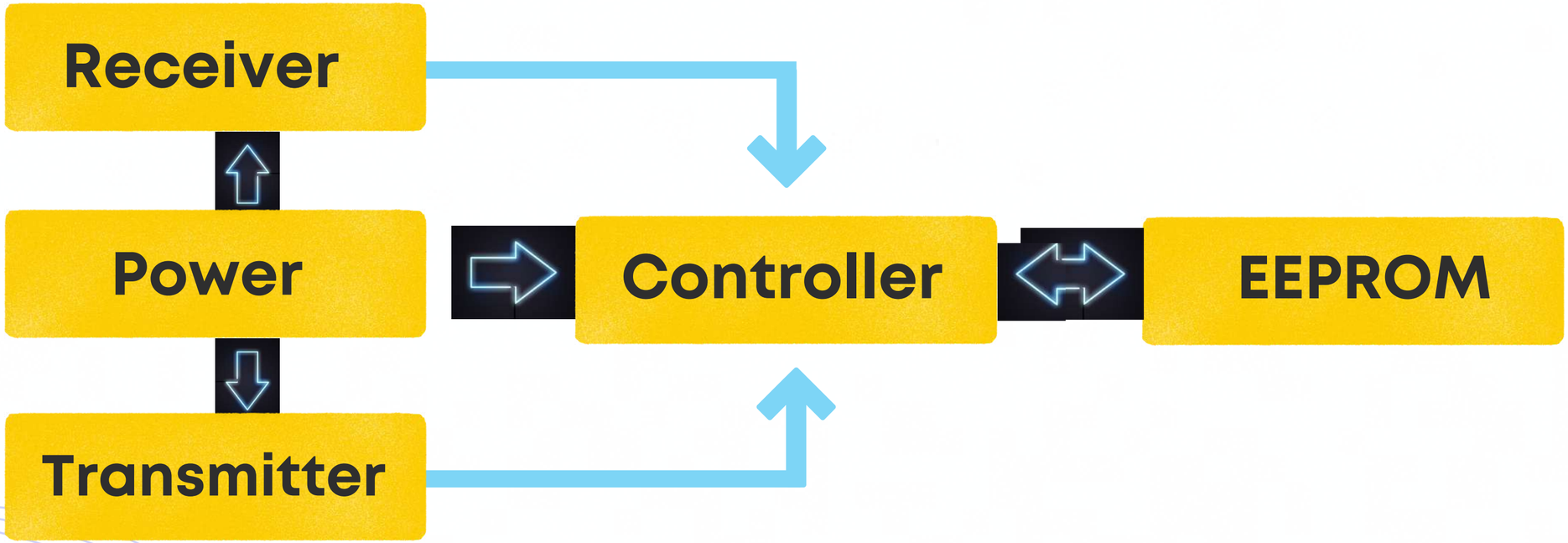
- The chip then responds by sending its stored information back to the reader in the form of another radio signal. This is called a backscatter. The reader detects and interprets this backscatter and sends the data to a computer or microcontroller.

Inside RFID tag and Card

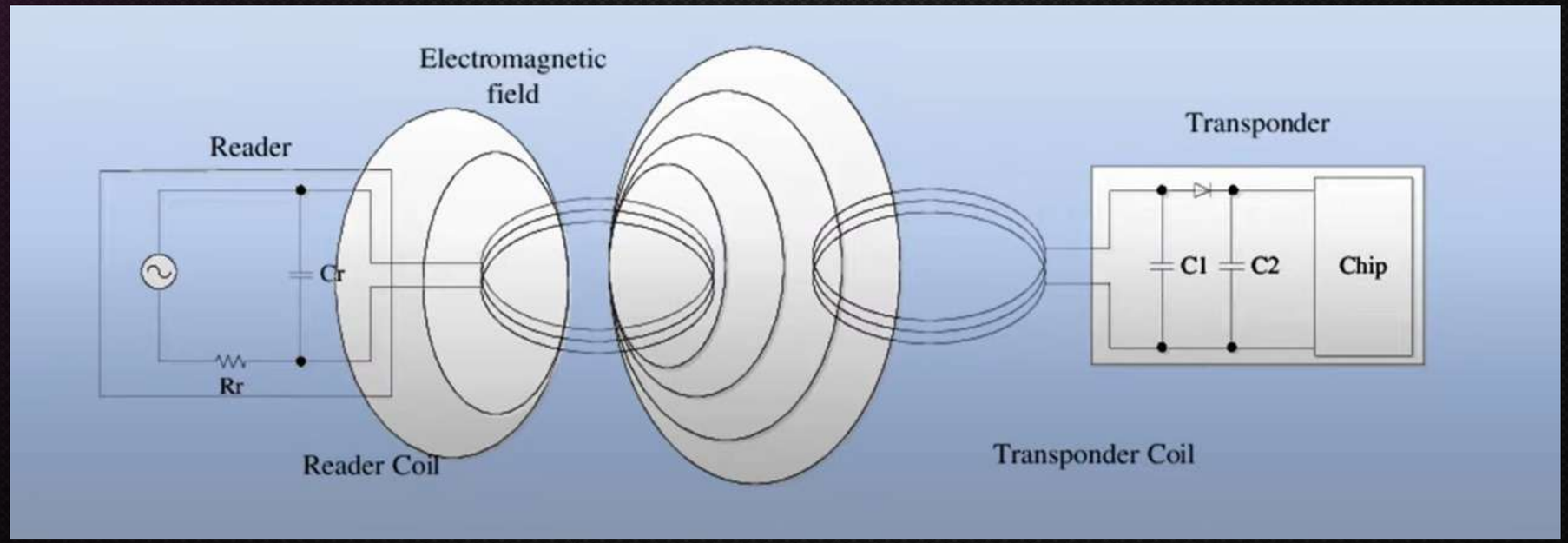




RFID CHIP



Basic Tag Operation Principle



Why only RFID?

- Contactless
- Quick
- Simultaneous read of multiple items
- Individual item data and tracking
- No requirement of power source on tag so easy and long term usage

RFID Applications

- Retail and Distribution
- Keyless Entry
- Pharmaceuticals
- Contactless Payment
- Livestock Tagging
- Pet Identification

RFID Frequencies

RFID frequency bands[23][24]

Band	Regulations	Range	Data speed	ISO/IEC 18000 section	Remarks	Approximate tag cost in volume (2006)
LF: 120–150 kHz	Unregulated	10 cm (4 in)	Low	Part 2	Animal identification, factory data collection	US$1
HF: 13.56 MHz	ISM band worldwide	0.1–1 m (4 in – 3 ft 3 in)	Low to moderate	Part 3	Smart cards (ISO/IEC 15693, ISO/IEC 14443 A, B), ISO-non-compliant memory cards (Mifare Classic, iCLASS, Legic, FeliCa ...), ISO-compatible microprocessor cards (Desfire EV1, Seos)	US$0.05 to US$5
UHF: 433 MHz	Short range devices	1–100 m (3–300 ft)	Moderate	Part 7	Defense applications, Underground Miner Tracking with active tags	US$5
UHF: 865–868 MHz (Europe) 902–928 MHz (North America)	ISM band	1–12 m (3–40 ft)	Moderate to high	Part 6	EAN, various standards; used by railroads[25]	US$0.04 to US$1.00 (passive tags)
microwave: 2450–5800 MHz	ISM band	1–2 m (3–7 ft)	High	Part 4	802.11 WLAN, Bluetooth standards	US$25 (active tags)
microwave: 3.1–10 GHz	Ultra wide band	up to 200 m (700 ft)	High	Not defined	Requires semi-active or active tags	US$5 projected
mm-wave: 24.125 GHz [26][27][28]	ISM band worldwide	10–200 m (30–700 ft)	High	Not defined	Requires semi-passive tags. Uses retrodirective backscatter approaches to achieve extended ranges	US$10 projected

Aim

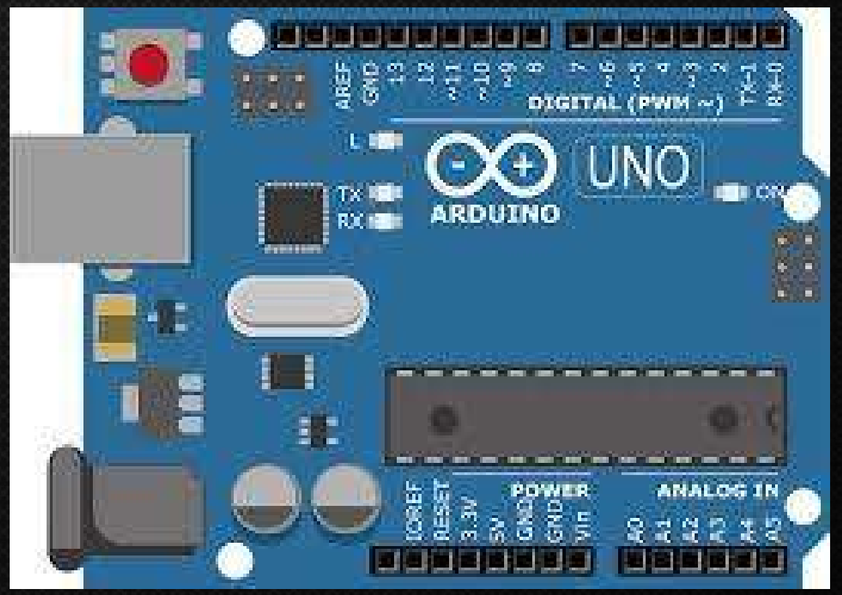
Using an RFID tag system to make a entry exit management system, to make this smooth and efficient a tag with low maintainence and easy to handle.

Components used

RFID Reader/Writer

The RC522 RFID reader module which is used to read and write RFID tags.

Arduino



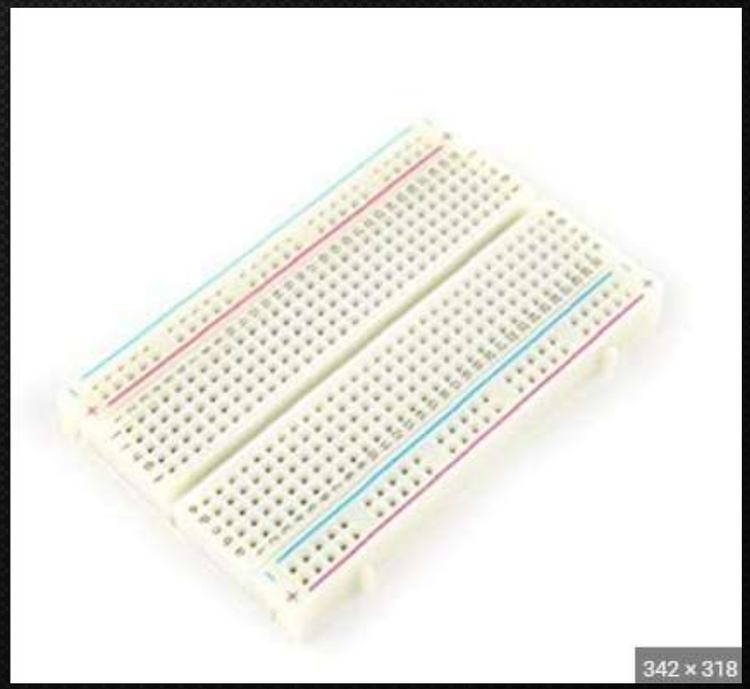
Arduino here is used to do the processing work here and communicate data received from RFID reader to a local host.

Components used

RFID tag

RFID stores data of a student and can be edited .

RFID tag

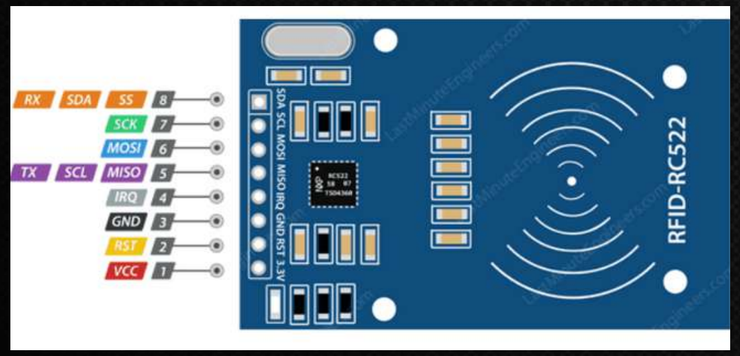


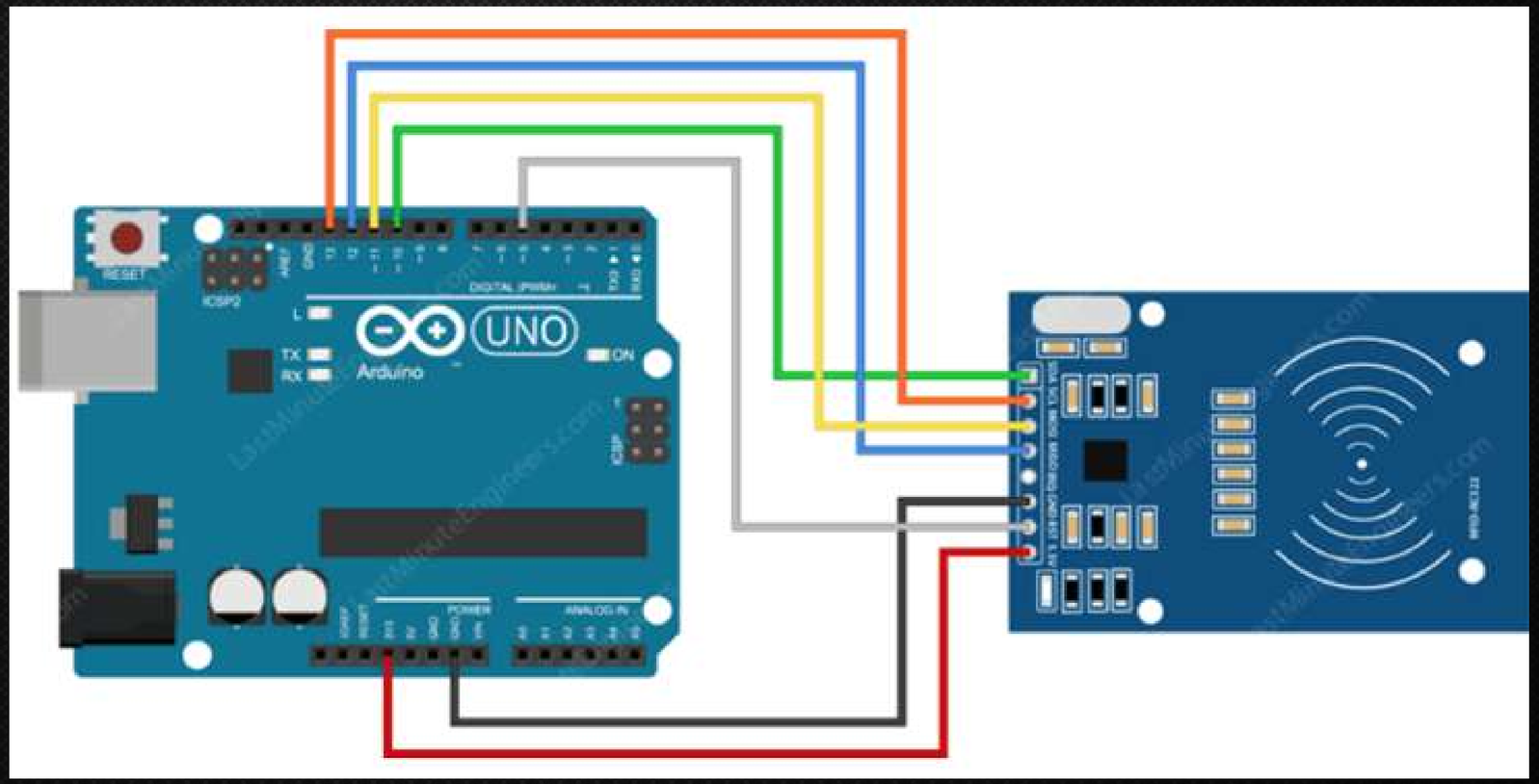
A bridgeboard is used to make connections to our model.

RFID Reader/Writer

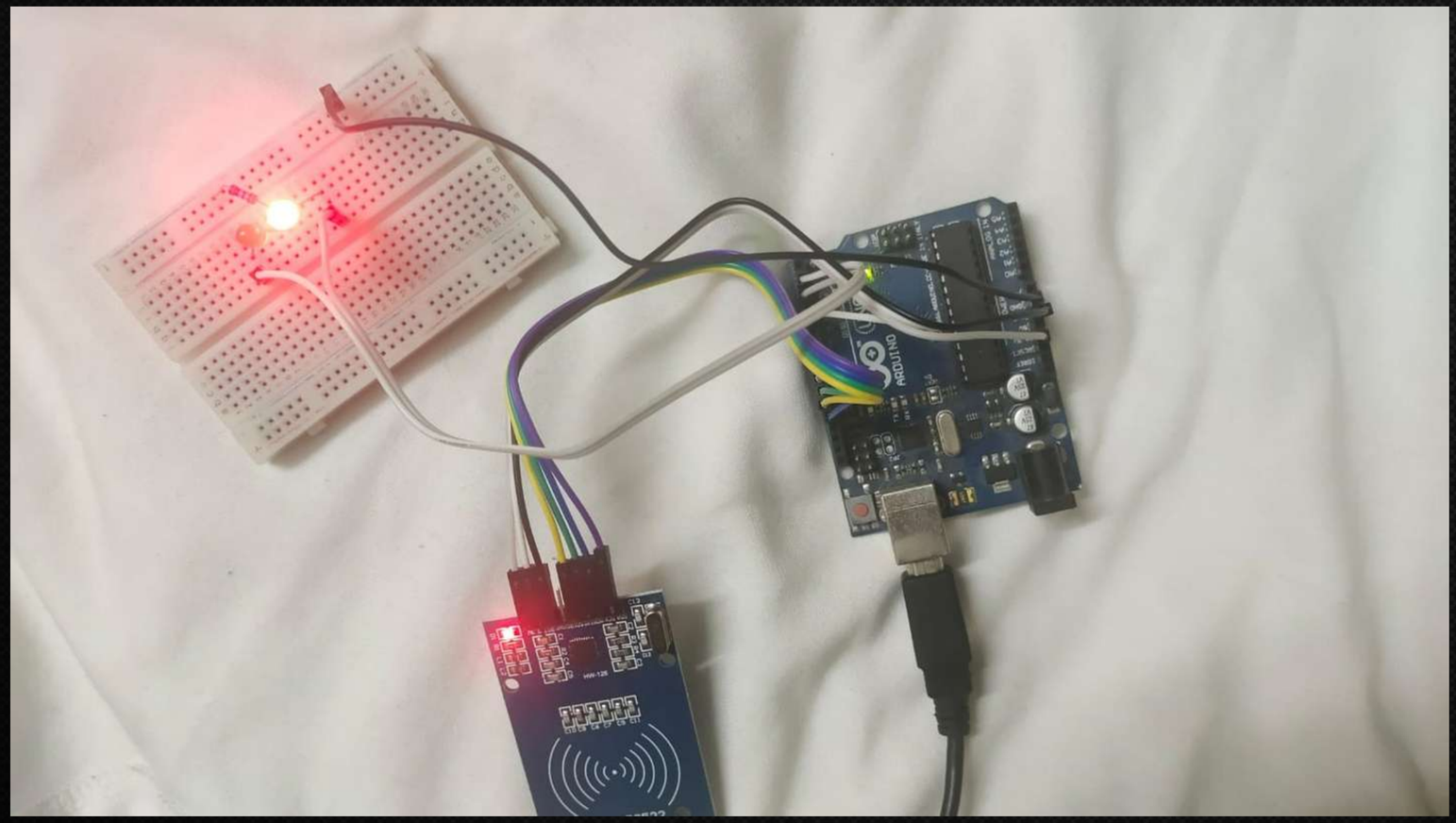
The RC522 RFID reader module is designed to create a 13.56MHz electromagnetic field and communicate with RFID tags
The reader can communicate with a microcontroller over a 4-pin SPI with a maximum data rate of 10 Mbps. It also supports communication over I2C and UART protocols.
The RC522 RFID module can be programmed to generate an interrupt.

Connections and Pinouts



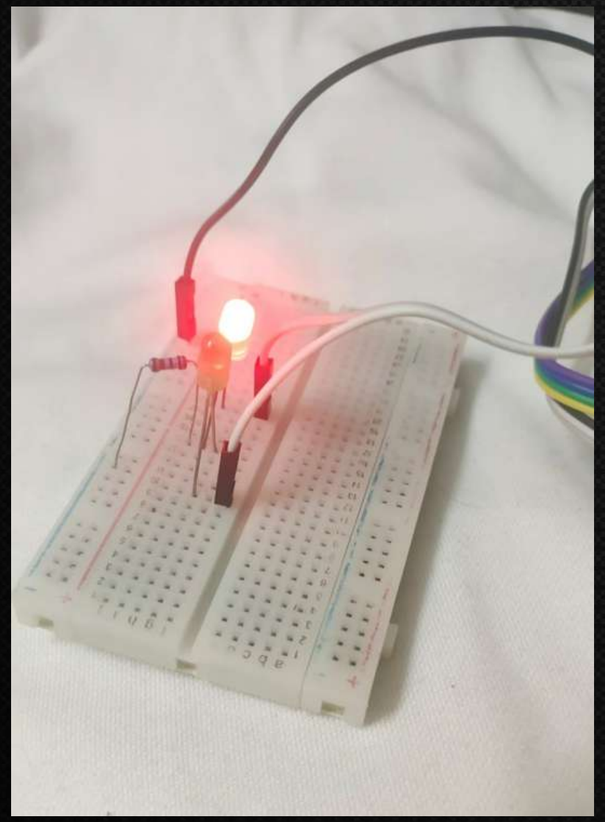


Working Model

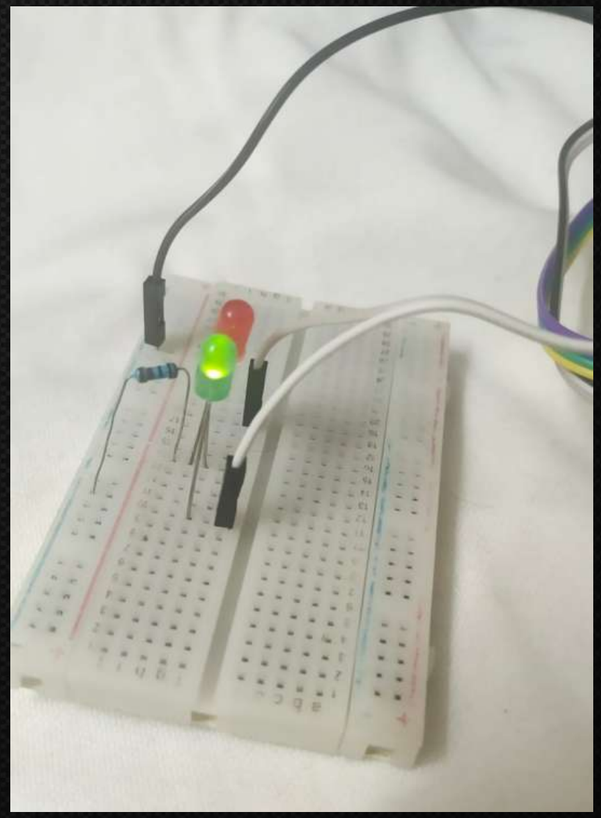


An Arduino connected to an RFID reader, and a bridgeboard, which whole is connected to a Laptop.

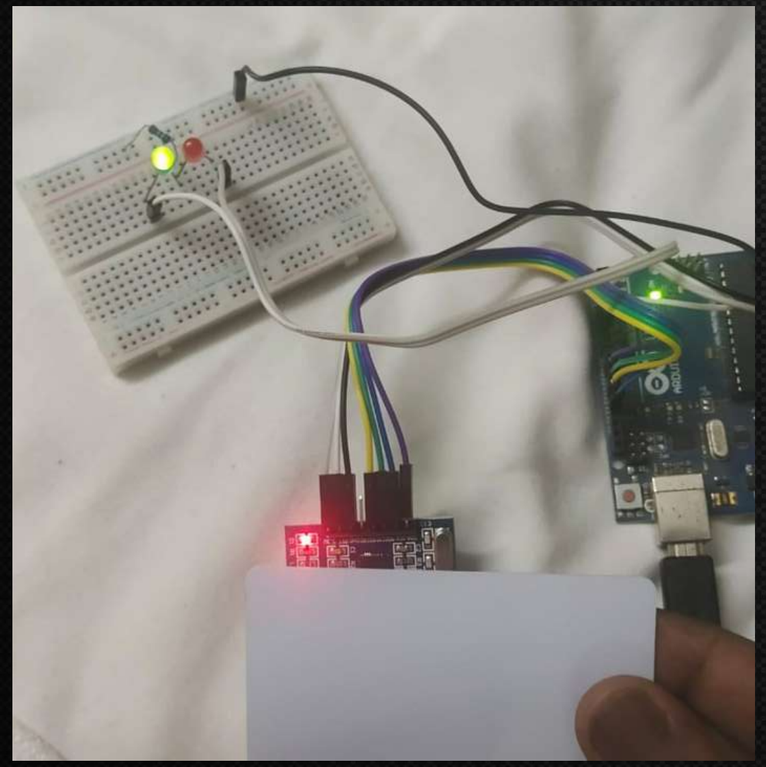
Bridgeboard



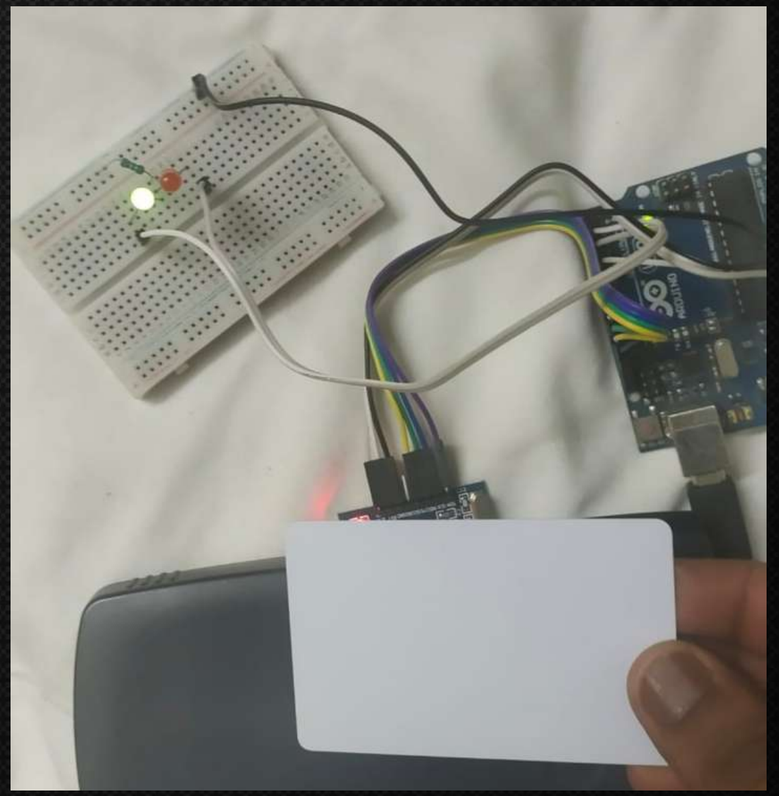
As a RFID tag/card is read by RFID reader successfully the Bridgeboard turns to green light.



Reading of a RFID Tag/card



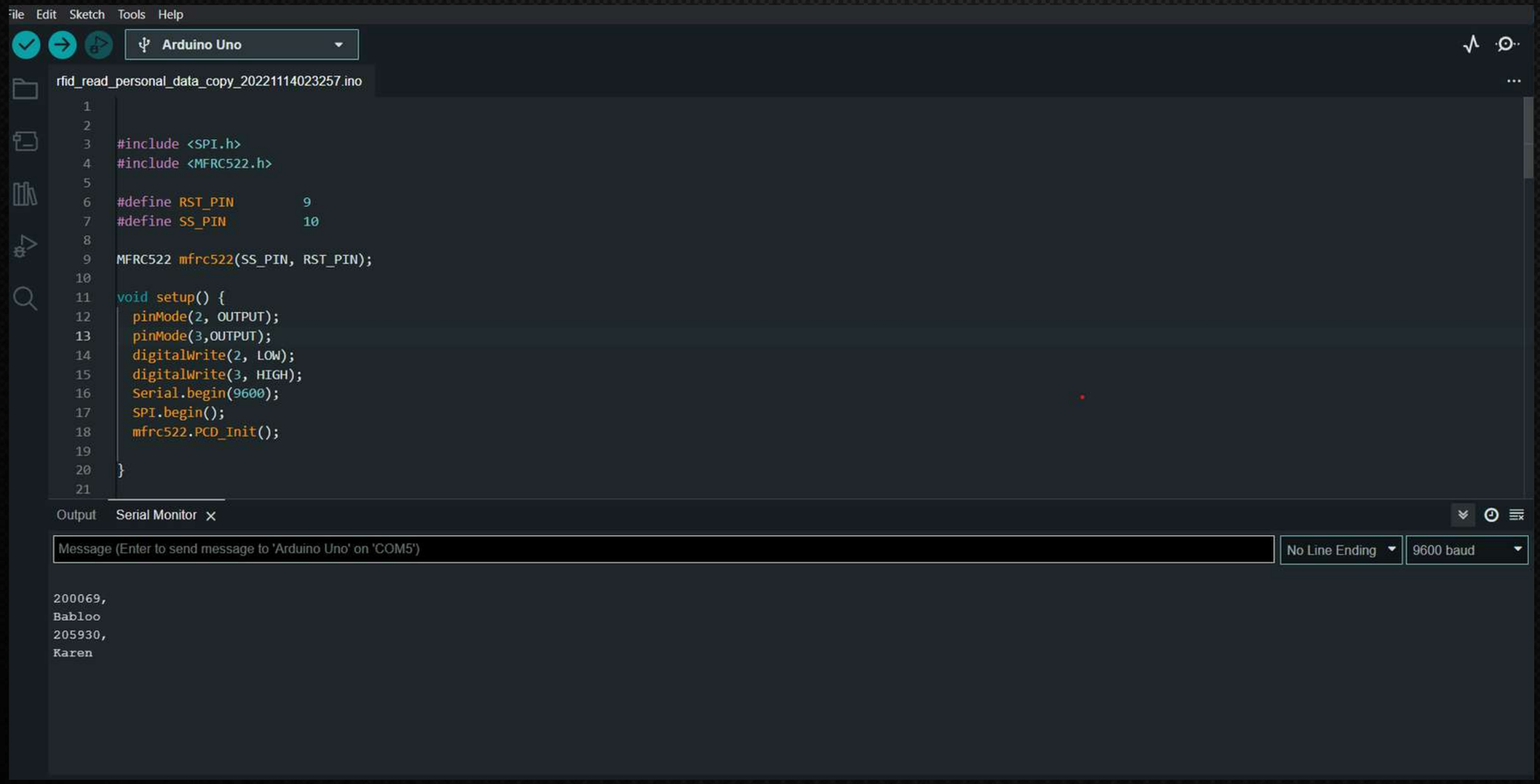
An RFID card is read by the reader at a distance of few centimeters.



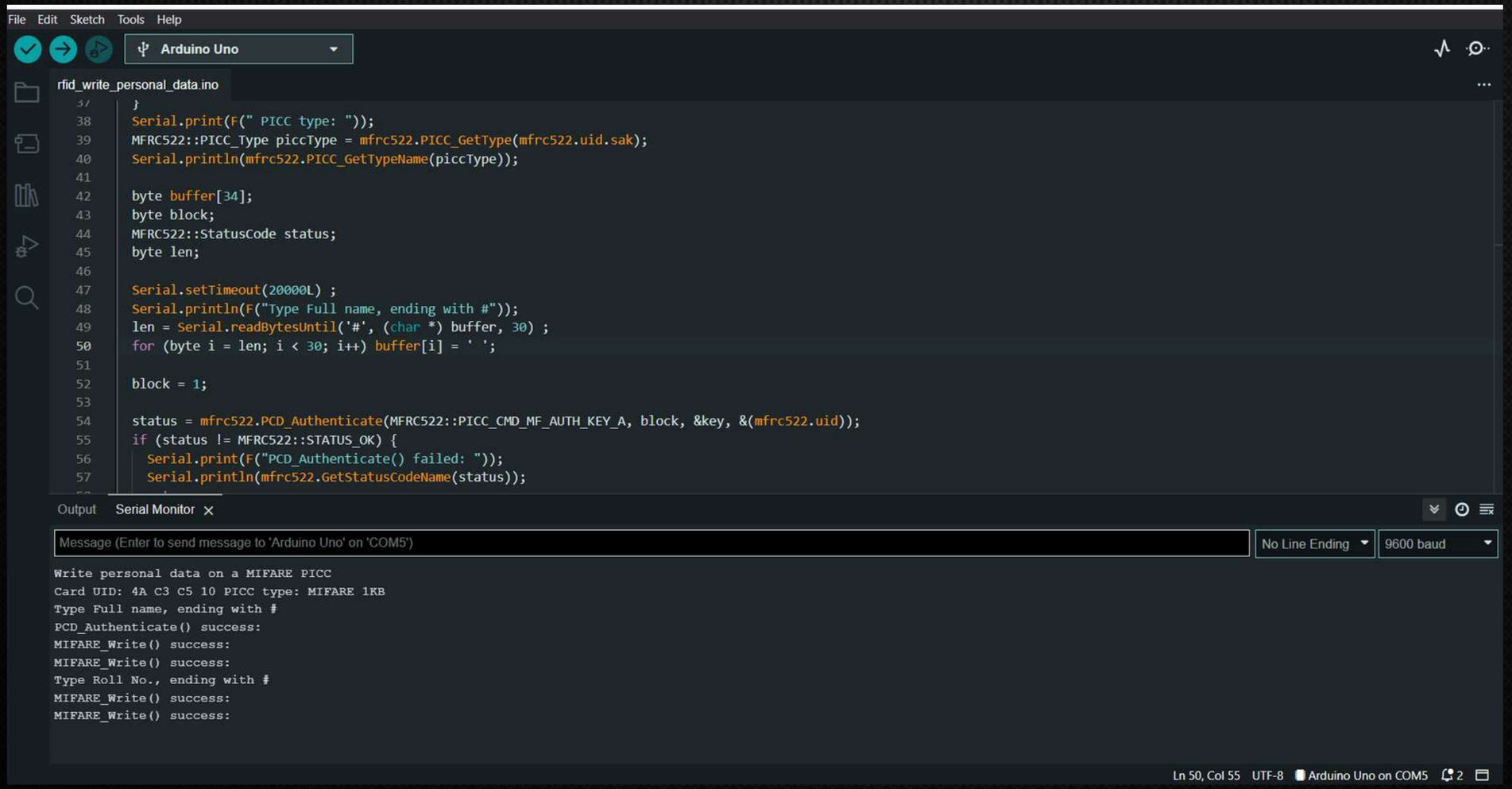
An RFID card ican also be read by the reader in presence of obstruction between them in this case a calculator.

Terminal Window

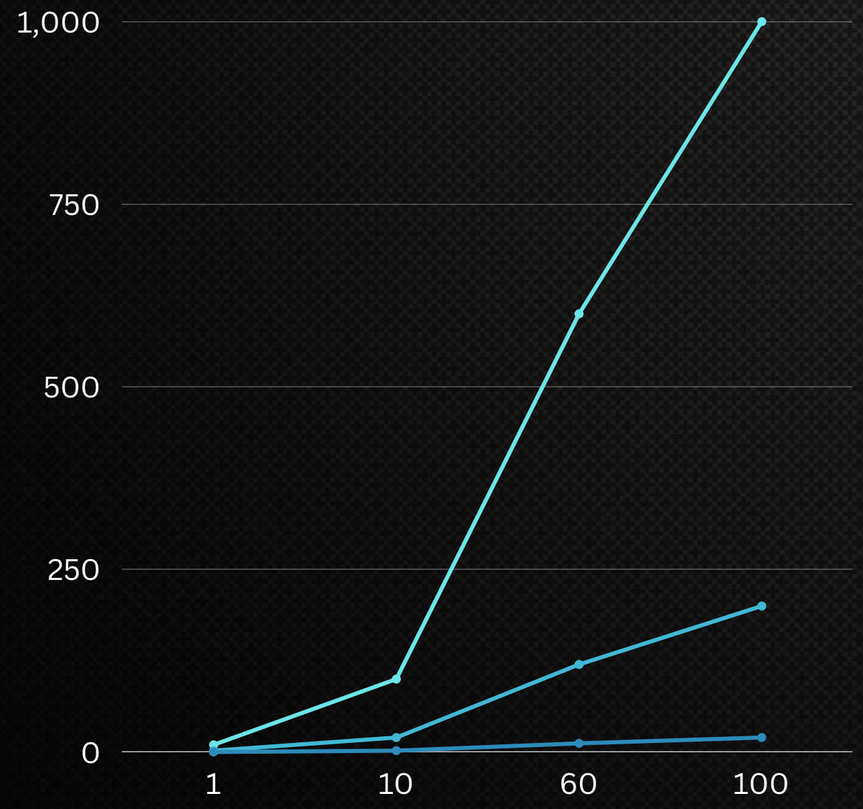
Reading an RFID card



Writing on a RFID card



Observations



Method	Total number of students			
	1	10	60	100
Manual Entry	10 sec	100 sec	600 sec	1000 sec
Bar Code	2 sec	20 sec	120 sec	200 sec
RFID technology	0.2 sec	2 sec	12 sec	20 sec

Working idea

To make an exit/entry from campus we do use a permission at portal. I am now working on to check the received information from a database with students requested for entry/exit, and checking a student's card if they have been permitted.

Thank You

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Implementations

1. Made a working model, and implemented it to store data from the tag.
2. We can write information on a card/tag through the same setup.
3. Storing this data on a CSV file.
4. In process of making a automated system for permission based entry/exit system.

Implementations

100% Project contribution
Harsh Agrawal(200407)