



## *Abstract*

A smart card reader is a device that can read a card with some sort of bar coding or magnetic strip in it. This card readers connect to a laptop computer through a USB data cable and, with the appropriate software installed on the computer. This project develop an application which is programmed using c language to integrate both application and smart card reader, the developed application can be used for college student. The proposed system will help student to have an access to many university services automaticity without any connection with human, for example these servers such as show their tables , borrow books , show their results ,add their subjects and more of services which will be done easily by card reader. This project use Arduino Uno with some parts as SG90 Micro servo motor 9g, jumper cables and RFID RC522 module.

## ACKNOWLEDGEMENTS

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Dr. Mafawez Alharbi , for giving me good guidelines for the project throughout numerous consultations. Deepest gratitude to all those who have directly and indirectly guided me in writing this project.

In the end I want to thank my family because they are the reason for my presence in this place.

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# Chapter 1

## 1.1 Introduction

In 1968 German inventor's patent combination of plastic cards with microchips, after in 1968, German inventor Jurgen Dethloff along with Helmet Grotrupp filed a patent for using plastic as a carrier for microchips, and then 1970, Dr. Kunitaka Arimura of Japan filed the first and only patent on the smart card concept. In, 1974 Roland Moreno of France files the original patent for the IC card, later dubbed the "smart card." In 1977, three commercial manufacturers, Bull CP8, SGS Thomson, and Schlumberger began developing the IC card product.

A campus card is known as a student card or student ID card. It is an identity document proving the student's status and you can use it to get some Features of it. A smart card reader is a device that can read a card with some sort of bar coding or magnetic strip in it. ... These card readers connect to a laptop or computer through a USB data cable and, with the appropriate software installed on the computer, you can begin using the card reader on your system. So we will develop an application which is programmed using c to integrate together (application and smart card reader) the application is for college student which help to make processes like : show their tables , borrow books , show their results ,add their subjects and more of services which will be done easily by card reader .

## 1.2 Problem Statement

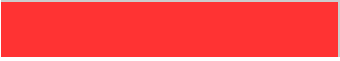





The card that students use now is not smart, and does not give students the right to access the library or the parking and it is not activated beneficially for the student or the university, it is used only in entering the exams.



## 1.3 Research Goals:

We want to help the university represented by students and faculty to make the use of university services easy and to reach several points namely:



- Enter and leave the Library.
- Enter your examinations room.
- Access the 24 hour PC Access your hall.
- Access to features faster.
- Keep up with the technical.
- Facilitate services for students.

## 1.4 Questionnaire summary:

Q1 / What is your opinion about the project?			
1	Accept		75.6%
2	Reject		20%
3	I'm not sure		4.4%
<p>Comment : The majority accept the idea , 75.6% accept the idea , 20% reject it and 4.4 not at all , so this means the idea of the project is successful .</p>			
2 / Is the idea of the project useful for the student?			Response Percent
1	I'm not sure		6.7%
2	No		13..3%
3	Yes		80%
<p>Comment : The majority think it useful , 80% think the idea is useful for the student and university , 13.3% think the idea is not useful and 6.7% between that . So that means the Most think the idea is useful.</p>			

3 / Is the project idea scalable?			Response Percent
1	I'm not sure		42.5%
2	Yes		47.5%
3	No		0.00%

Comment : The majority think it can development , 47.5% think we can develop the idea , nobody think the idea cannot scalable , 42.5% between that .

4/ Is the idea of the project expensive?			Response Percent
1	1. Yes		50.00%
2	2. No		50.00%

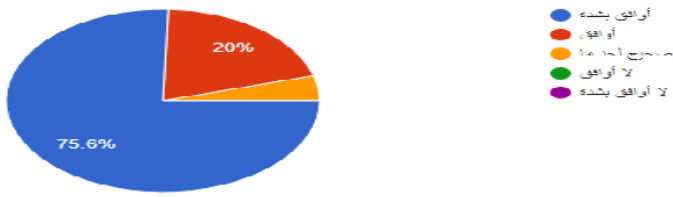
Comment : the idea is expensive partly . the percent is between supporter and opposer .

5 / is it in saudia Arabia?			Response Percent
1	1. Yes		38.1%
2	2. No		61.9%

Comment : The majority think it is a new in saudia Arabia , 61.9% believe it is not applicable, while 38.1% believe the idea is applied.



ما هو رأيك في المشروع ؟  
رؤى 45



هل فكرة المشروع مفيدة للطلاب ؟  
رؤى 45

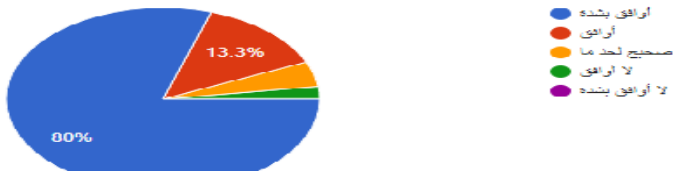
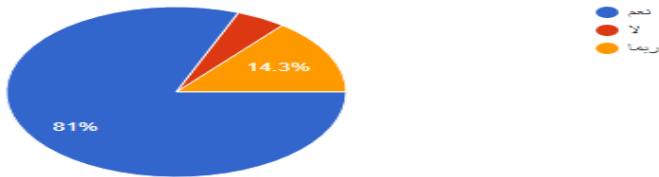


Figure 1A questionnaire part 1

هل ترى أن الفكرة قابلة للتطوير ؟  
رؤى 42



هل ترى أن الفكرة مكلفة ؟  
رؤى 40

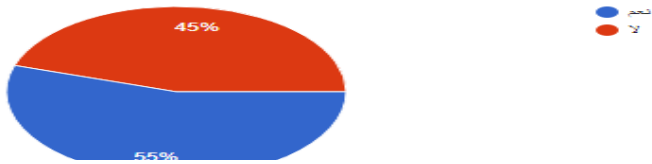
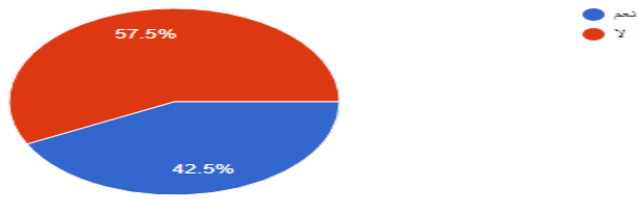


Figure 2 questionnaire part 2

هل توجد تخبرات هادمة لأساس الفكرة ؟  
ردا 40



هل ترى بأن الفكرة مناسبة لتقديمها كمشروع تخرج ؟  
ردا 44

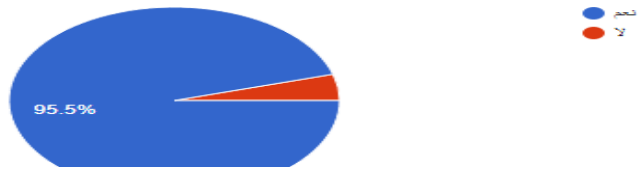
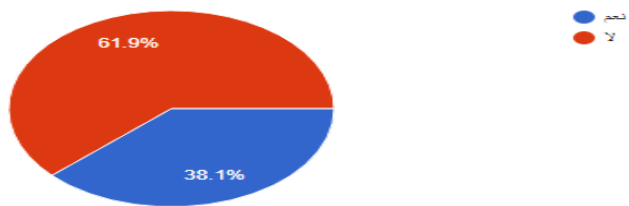


Figure 3 questionnaire part 3

هل فكرة المشروع موجودة فعلا في إحدى جامعات المملكة ؟  
ردا 42



ما رأيك في مسمى الفكرة ؟ (CSC)  
ردا 45

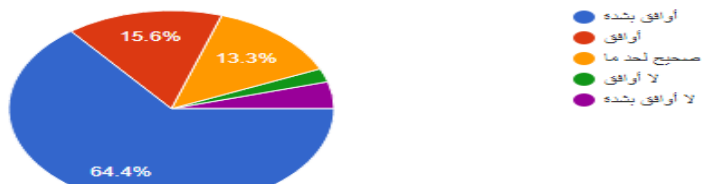


Figure 4 questionnaire part 4

## Chapter 2

### 2.1. Research methodology:

#### 2.1.1. Agile methodology:

In software application development, Agile is a methodology that anticipates the need for flexibility and applies a level of pragmatism into the delivery of the finished product. Agile requires a cultural shift in many companies because it focuses on the clean delivery of individual pieces or parts of the software and not on the entire application.

Agile has replaced Waterfall as the development methodology of choice in most companies.

#### 2.1.2. Twelve principles of the Agile Manifesto

In 2001, 17 software development professionals gathered to discuss concepts around the idea of lightweight software development and ended up creating the Agile Manifesto. The Manifesto outlines the core values of Agile, and although there has been debate about whether the Manifesto has outlived its usefulness, it continues at the core of the Agile movement.

Included in the Manifesto are concepts that were revolutionary at the time, including the emphasis on people and communication, rather than on processes and tools. Other key parts of the Manifesto include working directly with and satisfying customers, breaking all work down into small chunks, meeting daily to ensure work is on track and being open to changes even at the very end of the process.

#### 2.1.3. Types of Agile methodologies

In any Agile environment, it is likely there are several Agile methodologies being used. One of the oldest of these is extreme programming, which is based on the idea that for successful development to happen quickly, testing must be done regularly. In many cases, the tests must be written even before the code.



Another Agile methodology that is widely used is Scrum. Scrum brings everyone on the team, including the business stakeholders, together to agree on features. Then, specific goals are set for a 30-day sprint, at which point the agreed-upon software is delivered.

Some Agile proponents emphasize Lean development, or Lean Programming, which strips software development down to the basics. Feature-driven, test-driven or behaviour-driven can also be used in an agile environment, depending on the needs of the organization.

#### 2.1.4. Advantages of Agile:

Much has been compared over the years with Agile versus Waterfall approaches.

In the Waterfall era of software development, coders worked alone, with little to no input before handing the software to testers and then on to production.

Bugs complications and feature changes either weren't handled well, or were dealt with so late in the process that projects were seriously delayed or even scrapped.

The idea behind Agile model, in which everyone -- including the business side -- stayed involved and informed in the development process, represented a profound change in both the culture and a company's ability to get better software to market more quickly.

Collaboration and communication became as important as technology, and because the Agile Manifesto is open to interpretation, Agile has been adapted and modified to fit organizations of all sizes and types. The Agile cultural shift also paved the way for the latest software development evolution, Davos.

# Chapter 3: requirement and designed

## 3.1 System Requirements:

This section present the system requirement which is the functional requirements that include:

- The system must keep the student's basic information and permissions on the central server.
- The system should allow students to create new accounts.
- The system must maintain full student records.
- The system should allow students to view all records stored in the system.
- Data requirements: Contact information for the student.

## 3.2 Use case diagram:

The use cases of the proposed system are two, first one is for student and the second is for the admin.

Student use case have many functions. Students can benefit from the card by entering many locations such as enter to the library, enter to final exams, enter to parking and enter to the labs. Student use case is shown in figure 5.

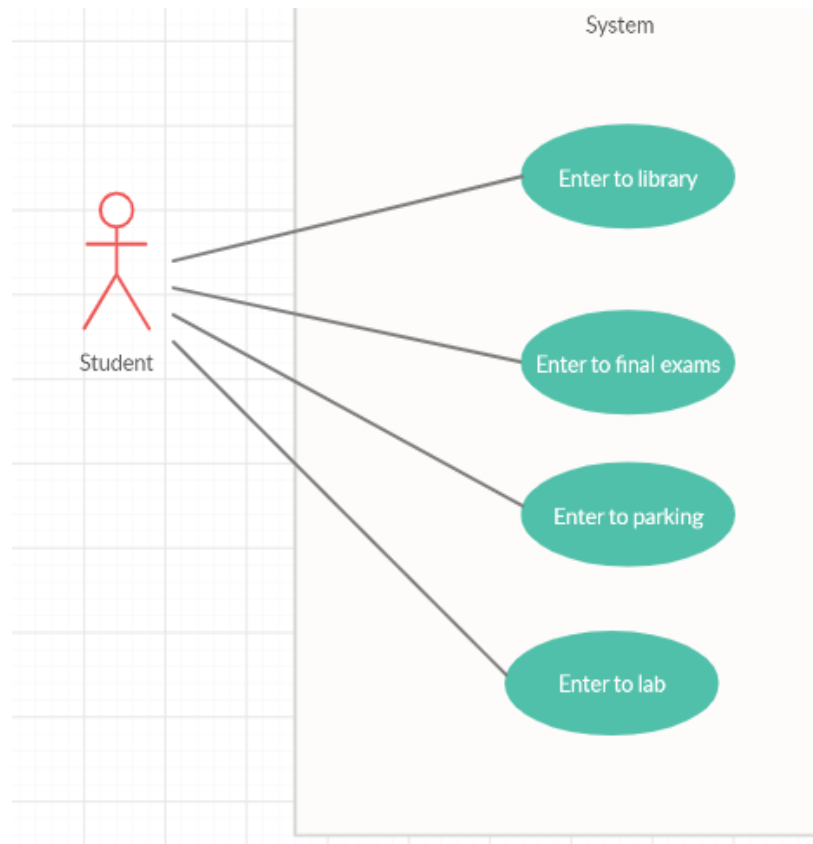
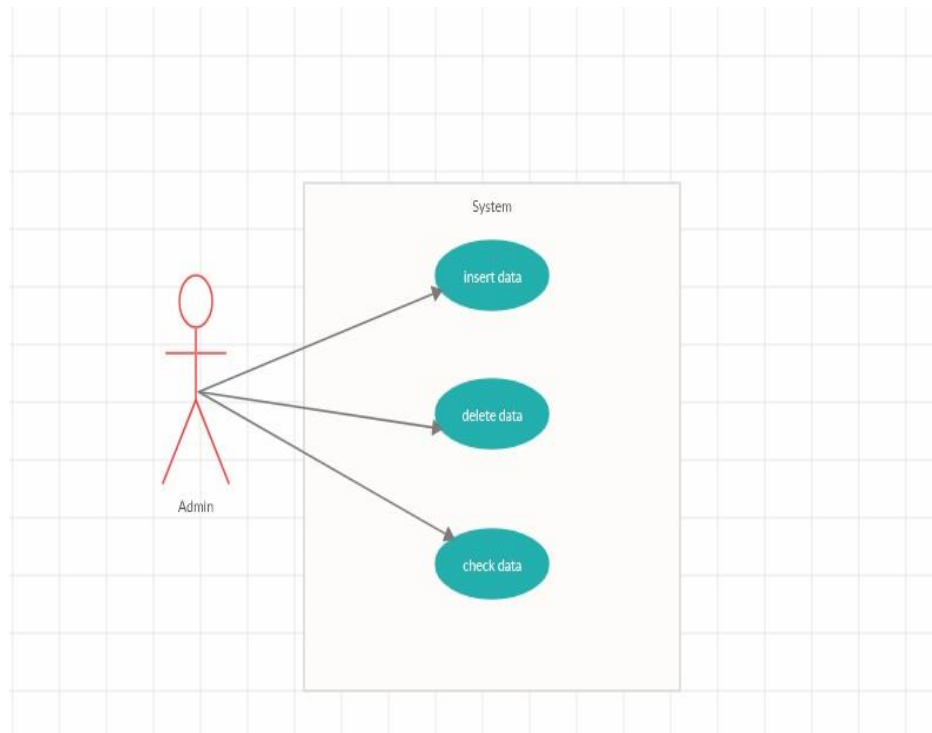


Figure 5 student (Use-case diagram)

### 3.3 Admin Use case

- The admin user can control the data and information of the student by deleting the data, adding it, or viewing it and checking it. The admin use case is shown in figure 6.



**Figure 6 Admin (Use-case diagram)**

### 3.4 System Sequence Diagrams:

Sequence diagram presents how the system work in order as it is presented in figure 7. The student will enter the card into the device, the device will send the data to the database to verify the validity of the data, then the database will respond to the student, either by accepting the data and allowing him to enter, or rejecting the data and requesting the re-entry of another card.

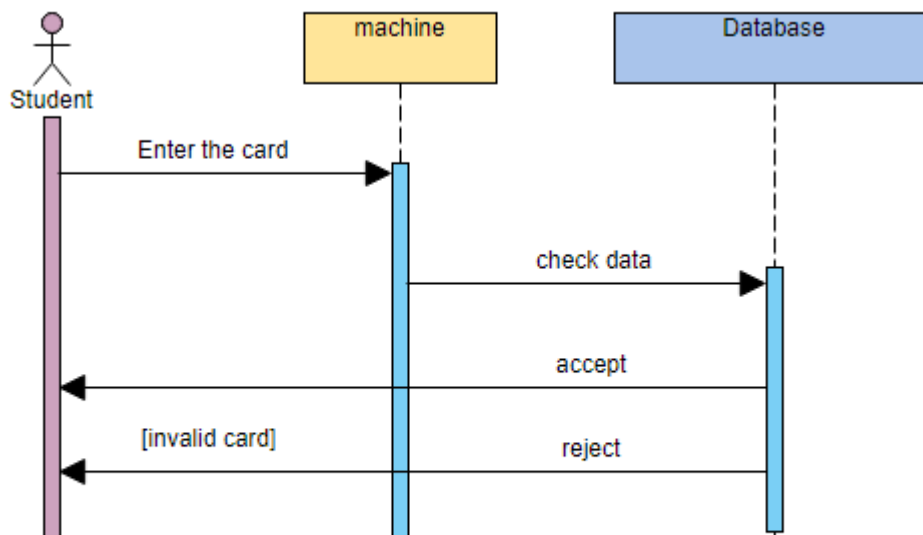


Figure 7 Sequence diagram

## Chapter 4: Implementation

### 4.1 Arduino :

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.



## 4.2 Hardware system

Arduino system consists of many subsystem, this section will present some parts that we will use it in the project. Below we present each hardware and description of this parts.

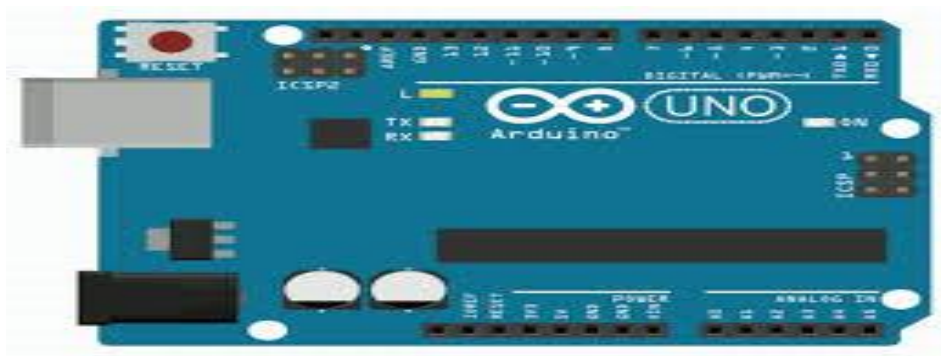
- **SG90 Micro servo motor 9g.**



**Figure 8** SG90 Micro servo motor 9g

- This device will act as the portal that will open when reading correct data from the card.

- **Arduino Uno R3 (you can also use the other version of Arduino)**



**Figure 9** Arduino Uno R3 (you can also use the other version of Arduino)

- This device communicates with the RFID device via wire via specific ports so that this device performs the role of the database by accepting or rejecting card data.

- **Jumper cables**



**Figure 10 Jumper cables**

- The link between the Arduino device and RFID .

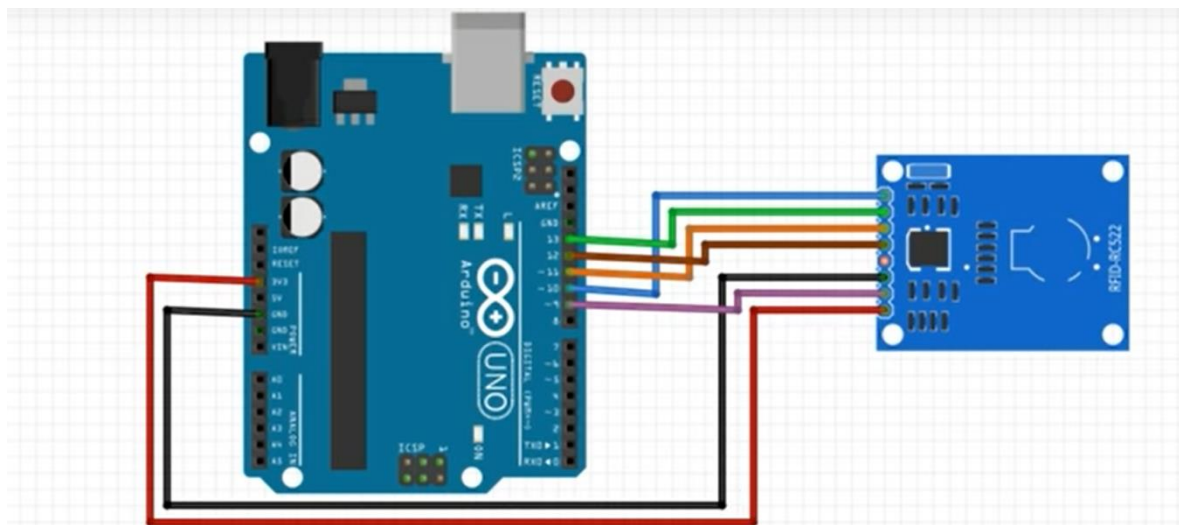
- **RFID RC522 module**



**Figure 11 RFID RC522 module**

- The student card and RFID device that will read the card.

#### 4.3 The Circuit: -



**Figure 12 the connection between Arduino and RFID**

- Explanatory explanation of how to connect the Arduino and RFID devices via wires.

## schematics

RFID PINOUT	ARDUINO PIN
RST PIN	9
SDA PIN	10
MOSI PIN	11
MISO PIN	12
SCK PIN	13
GND PIN	GND
3.3V PIN	3.3V

**Figure 13 the connection between Arduino and RFID**

- Explanatory explanation of how to connect the Arduino and RFID devices via wires.

## Schematics

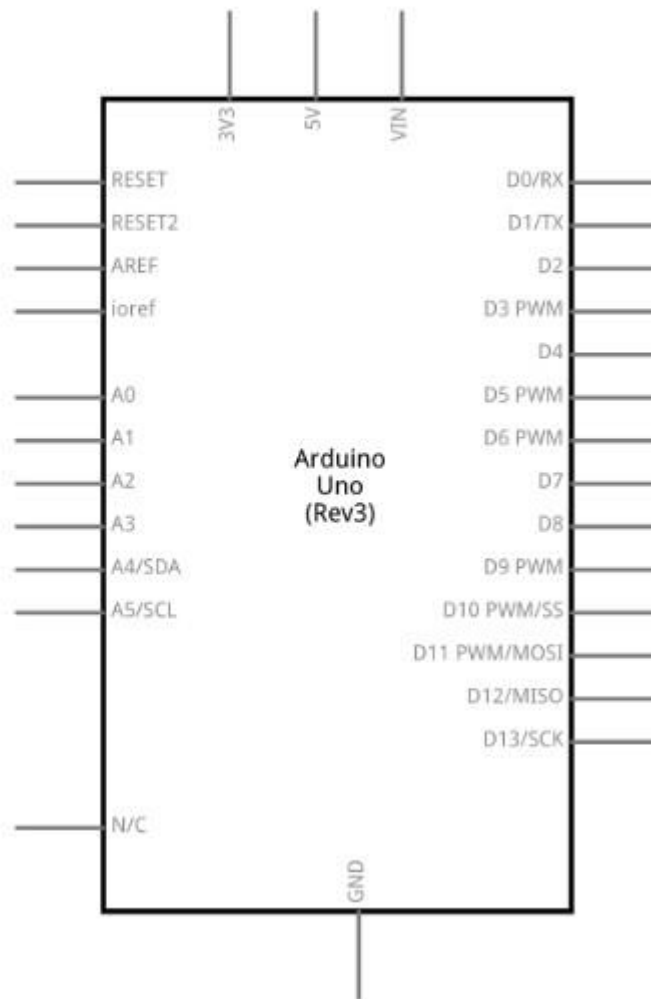
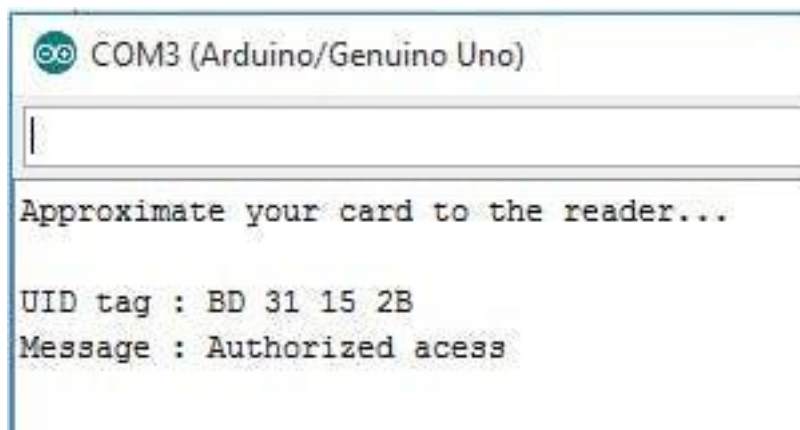


Figure 14 Arduino inputs .

- Explanatory explanation for arduino inputs.

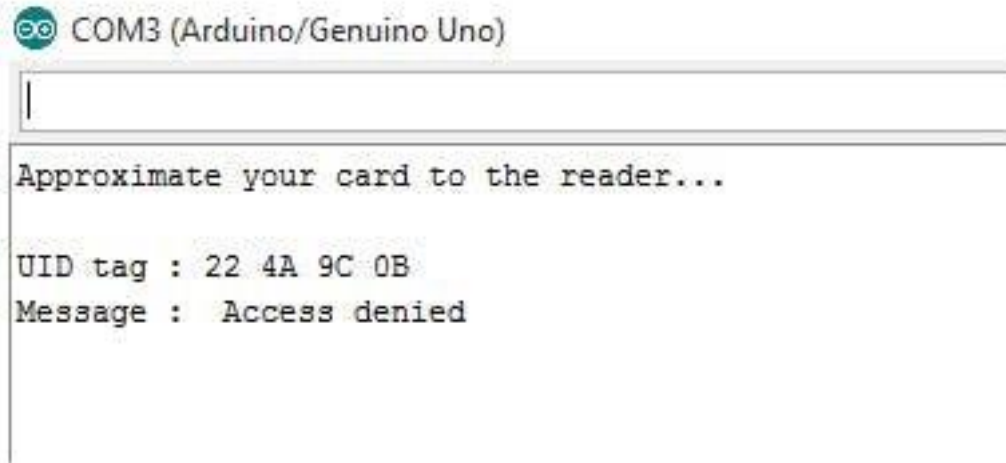
Accept the card



**Figure 15** the message when the machine accept .

- When the device has accept the student data stored in the card, this message will appear on the screen.

## Reject the card



**Figure 16 the message when the machine reject .**

- When the device has reject the student data stored in the card, this message will appear on the screen.

## 4.4 Code

```
#include <SPI.h>
#include <MFRC522.h>
#define RELAY 8
#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance.
void setup()
{
  pinMode (RELAY,OUTPUT);
  Serial.begin(9600); // Initiate a serial communication
  SPI.begin(); // Initiate SPI bus
  mfrc522.PCD_Init(); // Initiate MFRC522
  Serial.println("Approximate your card to the reader...");
  Serial.println();
}
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent() )
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial() )
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag :");
  String content= "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[i], HEX);
    content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
    content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
  Serial.println();
  Serial.print("Message : ");
  Serial.print("RELAY: ");
  content.toUpperCase();
  if (content.substring(1) == "89 18 79 63") //change here the UID of the
  card/cards that you want to give access
  {
    Serial.println("Authorized access");
    Serial.println();
    Serial.println("Relay on");
    digitalWrite (RELAY,LOW);
    delay(1000);
  }
  else {
    Serial.println(" Access denied");
    Serial.println(" RELAY off");
    Serial.println(" SmartTonics");
    digitalWrite(RELAY,HIGH);
  }
}
```



```

#include <SPI.h>
#include <MFRC522.h>

#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance.

void setup()
{
  Serial.begin(9600); // Initiate a serial communication
  SPI.begin(); // Initiate SPI bus
  mfrc522.PCD_Init(); // Initiate MFRC522
  Serial.println("Approximate your card to the reader...");
  Serial.println();
}

void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent() )
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial() )
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag :");
  String content= "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[i], HEX);
    content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : "
  "));
    content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
  Serial.println();
  Serial.print("Message : ");
  content.toUpperCase();
  if (content.substring(1) == "BD 31 15 2B") //change here the UID
of the card/cards that you want to give access
  {

```

```
    Serial.println("Authorized access");  
    Serial.println();  
    delay(3000);  
  }  
  
  else {  
    Serial.println(" Access denied");  
    delay(3000);  
  }  
}
```

## Conclusion

In conclusion, this project develop an application which is programmed using c language to integrate both application and smart card reader, the developed application can be used for college student. The proposed system can help student to have an access to many university services automaticity without any connection with human. We hope that I have reached what I aspired to, and that I have developed the card, and made it more effective and beneficial to the student and the university more.

## References:

1. 2/ <https://drive.google.com/open?id=0B27...>
2. 3/ <http://acoptex.com/project/27/basics-project-005e-sg90-micro-servo-motor-with-leds-lcd1602-i2c-rfid-rc522-and-piezo-buzzer-at-acoptexcom/#sthash.NSfz6Wz1.dpbs>
3. 4/ [https://www.youtube.com/watch?v=llrfSv6\\_AWw](https://www.youtube.com/watch?v=llrfSv6_AWw)
4. 5/ [https://www.google.com/search?q=8.+RFID+RC522+module&safe=strict&rlz=1C1EJFC\\_enSA821SA821&sxsrf=ALeKk02OMAlld2LTjsvzdSMtzOMC66b\\_2Q:1584877820283&source=lnms&tbm=isch&sa=X&ved=2ahUKEwi25vX7ga7oAhUBDmMBHay9BIwQ\\_AUoAXoECAwQAaw&biw=1536&bih=706](https://www.google.com/search?q=8.+RFID+RC522+module&safe=strict&rlz=1C1EJFC_enSA821SA821&sxsrf=ALeKk02OMAlld2LTjsvzdSMtzOMC66b_2Q:1584877820283&source=lnms&tbm=isch&sa=X&ved=2ahUKEwi25vX7ga7oAhUBDmMBHay9BIwQ_AUoAXoECAwQAaw&biw=1536&bih=706)
5. 6/ <https://www.arduino.cc/en/guide/introduction>