**Pick and Place Robot for Shelf Applications**

By

Ms.Kettip Liampeng Student ID : 5911045

Mr.Wintavat Saeteng Student ID : 6117437

A report submitted in partial fulfillment of the requirements for   
the degree of Bachelor of Engineering in  
 Mechatronics Engineering and Electrical Engineering

Project Advisor:  
Assoc. Prof. Dr. Jiradech Kongthon

Examination Committee:  
Dr.Jerapong Rojanarowan

Dr. Wisuwat Plodpradista

Assoc.Prof.Dr. Jiradech Kongthon

Mr. Sunchanan Charanyananda,

Mr. Amulya Bhattarai

Mr. Ehsan Ali

Assumption University  
Vincent Mary School of Engineering  
Thailand  
October 2020

**Table of Content**

**Chapter I**

**- Abstract**

* 1. **Project Idea**
  2. **Project Objective**

**Chapter II**

**- Project overview and Theory**

**2.1 Microcontroller**

**2.1.1 Arduino MEGA ADK**

**2.2 Software apps**

**2.3 Stepping Motor**

**2.4 Mechanical arm**

**2.5 QR Code Module**

**2.6 Belt**

**2.7 Arduino MEGA 2560**

**2.8 Shield Expansion 3D Printer Engraving Machine**

**Chapter III**

- **Activities and Progress**

**3.1 Mechanism of warehouse**

**3.2 Circuit diagram stepping motor**

**3.3 Work completed**

**Chapter IV**

**- Conclusion**

**Flow Chart**

**References**

**Chapter I**

**1.Abstract**

Nowadays, the automation system has become more involved in our daily life.

The industrial used of the automation system in the manufacturing process. So, the automation system will make the industrial to reduce costs, increase quality, reduce labor and more secure. A warehouse is a place for storing small or large quantities of goods. Warehouse business is a business that a key role of the country’s industry that the growth has continued. Nowadays, warehouse has been upgraded quality and standard of energy saving and construction to become more sustainable warehouse.

**1.1 Project Idea**

In the industry, the storage of products is important. And we think that using the QR code to search for items in the warehouse Will make it easier and faster.

For example, we can add the QR code to the product on the website. So that, when customers see products from the website already Then come to our warehouse and can use the QR code to scan to receive the product immediately.

**1.2 Project Objective**

* To make more convenient
* To reduce labor
* Arduino can be used for control mechanical arm
* To build the model of mechanical arm by using stepping motor & mechanical arm combine it together for driving system
* To understand how to use QR code with Arduino
* To gain the knowledge and experience.

**Chapter II**

**2.Project overview and Theory**

Automated Storage Retrieval System (AS / RS) by use QR code is a working system of warehouse that controlled by material storage system, received material, including moving of component that working with warehouse. AS / RS systems are designed for automated storage and retrieval of parts. In general, the factors that affect the storage and retrieval capabilities of AS/RS devices are considered by the structure of the storage shelf and moving speed of AS/RS in horizontal direction. In addition, mechanical arm will be moving in vertical direction.

AS/RS Basic Components:

1. Camera scanner
2. Storage Structure
3. Storage / Retrieval Machine
4. Pickup and deposit Station

Equipment :

1. Camera QR Code scanner module
2. Controller [Aduino]
3. Mechanical Arm
4. Slide rail for Mechanical arm
5. Pickup and deposit Station

Separation of AS / RS into 2 types:

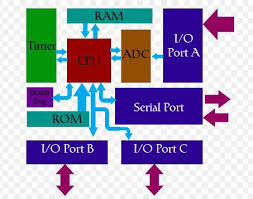
1. Automated Storage item by using QR code
2. Retrieval System item by using QR code

The AS / RS system is automated in 2 parts, the hardware uses mechanical arm technology with the software can be scan the QR code.

Benefits of mechanical arm automatic storage and retrieval systems :

1. Increased efficiency in goods issue
2. Fast and accurate
3. Human Resource Management
4. Save electricity in warehouse

**2.1 Microcontroller**

 A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.

**2.1.1 Arduino MEGA ADK**

Arduino Mega is a microcontroller board. It’s based on the ATmega2560. It has 54 digital input and output pins , which 15 can be used as PWM outputs , 4 UARTs : hardware serial port ,16 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

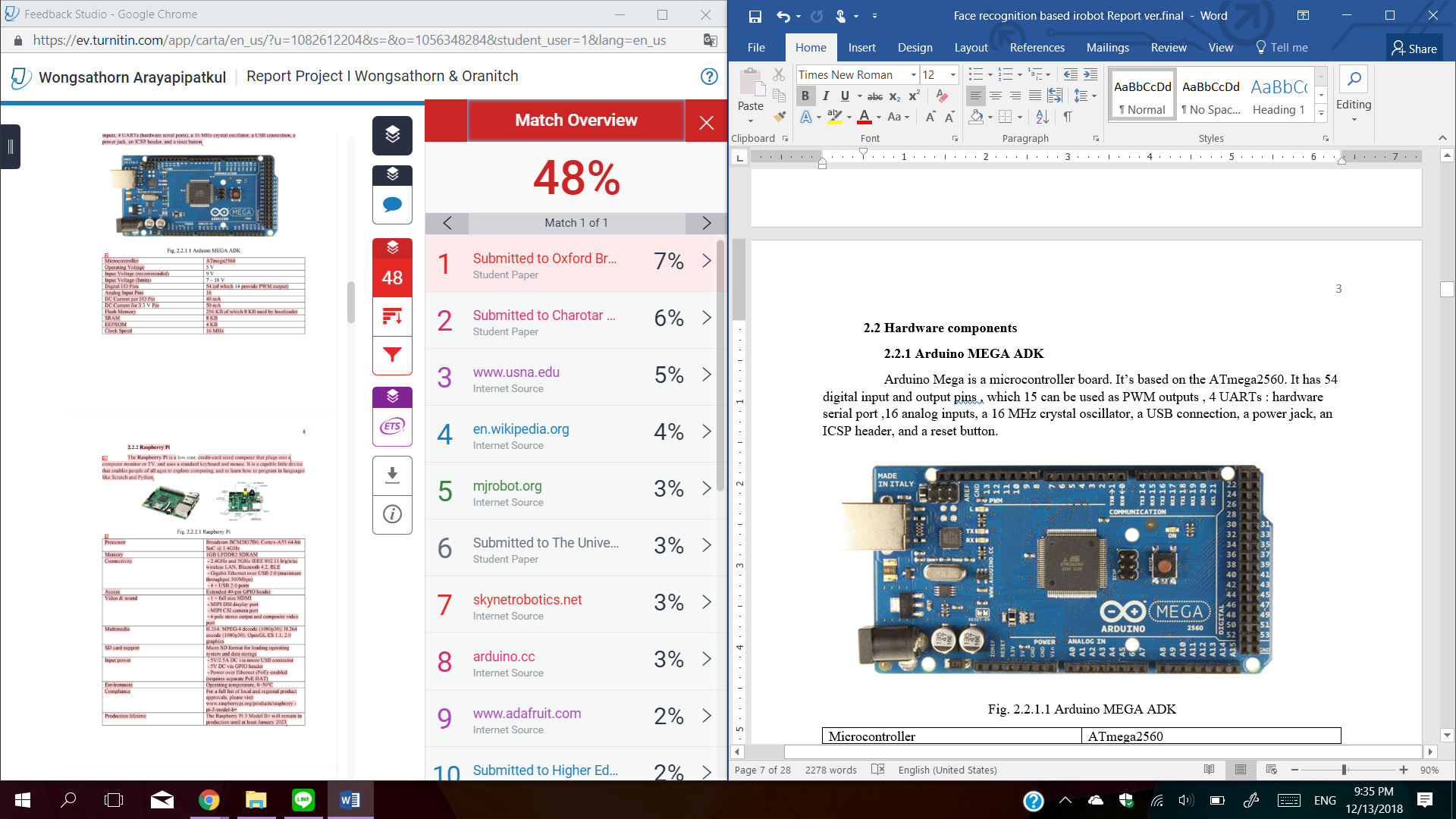


Fig. 2-2 Arduino MEGA

**Technical Data**

|  |  |
| --- | --- |
| Operating Voltage | 5 V |
| Input Voltage | 9 V |
| Input Voltage (limit) | 7 – 18 V |
| Digital input/output Pins | 54 (which 14 provide PWM output) |
| Analog Input Pins | 16 |
| DC Current per I/O Pin | 40 mA |
| DC Current for 3.3 V Pin | 50 mA |
| Flash Memory | 256 KB of which 8 KB used by bootloader |
| SRAM | 8 KB |
| EEPROM | 4 KB |
| Clock speed | 16 MHz |
| Microcontroller | ATmega2560 |



Fig. 2-3 Arduino Program

**2.2 Software apps**

**2.3 Stepping Motor**

Stepping Motor or Stepper Motor is a pulse-driven electric motor. The internal structure consists of a magnetic pole on the stator (Stator) made of steel plate ring. There are spokes spread out together. Each coil protrudes with a coil (coil) when coil current is generated by the electromagnetic field.

****

**2.4 Mechanical arm**

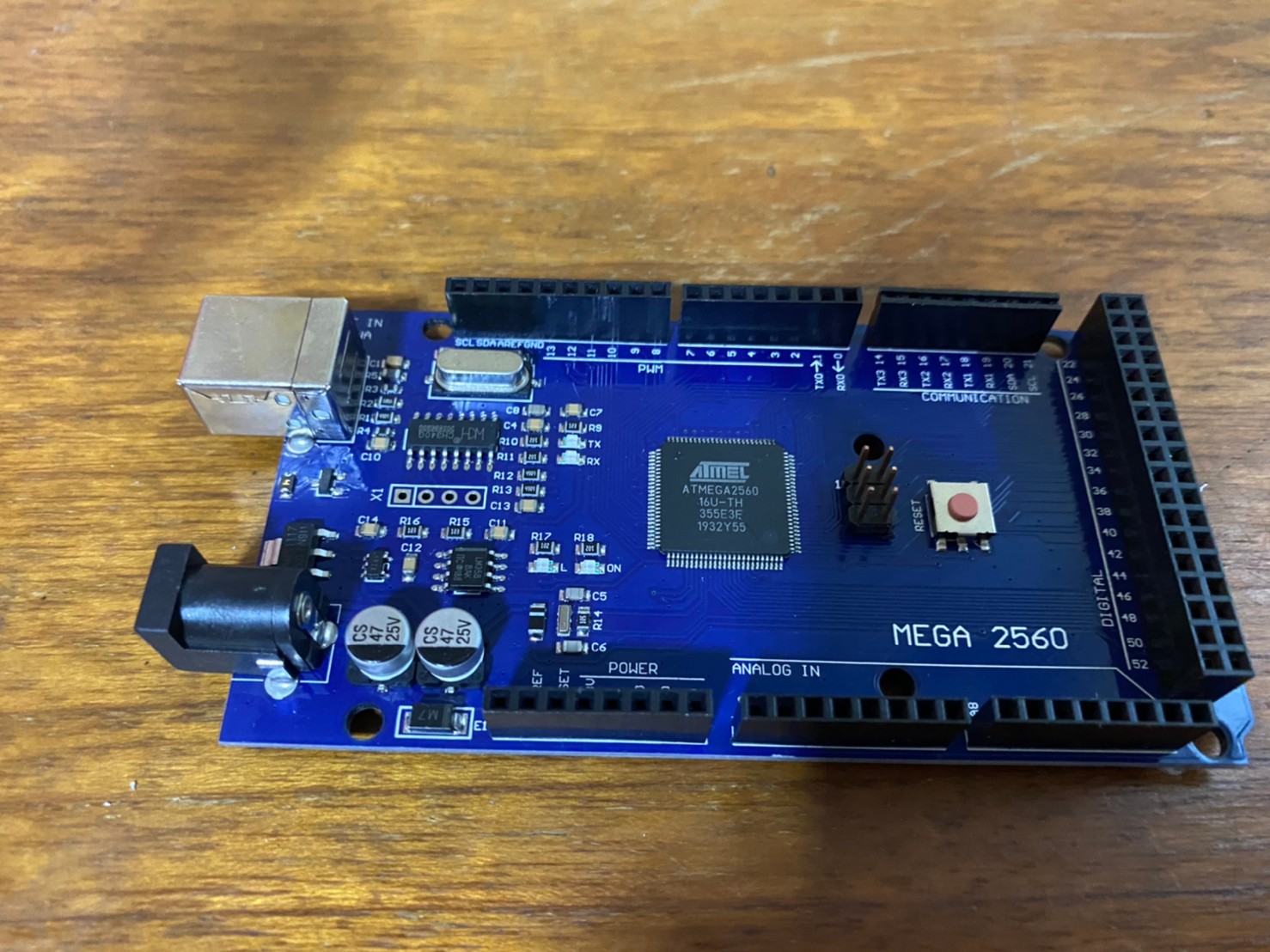
**2.5 QR Code Module**

**2.6 Belt**

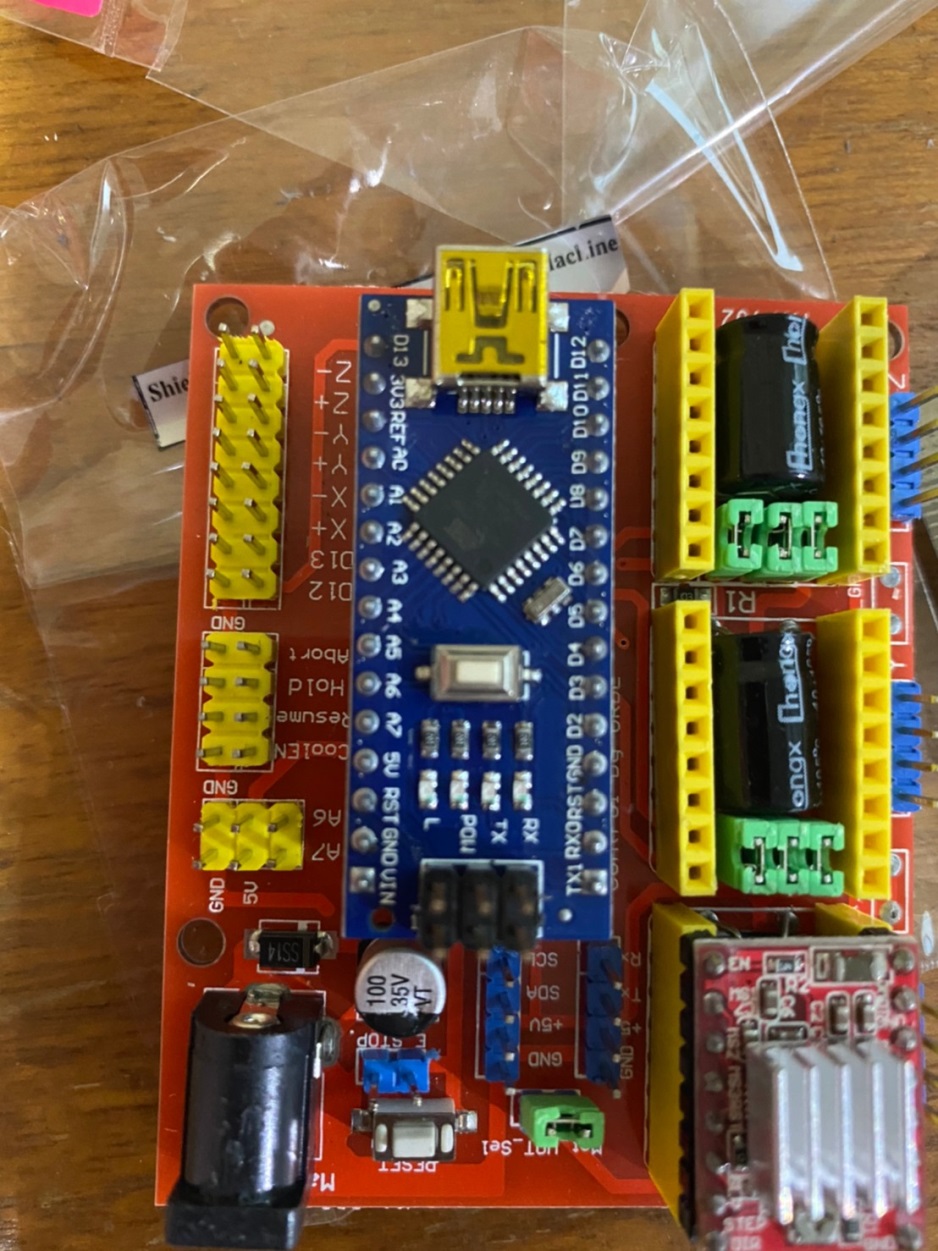
****

**2.7 Arduino MEGA 2560**

The **Arduino Mega 2560** is a microcontroller board based on the [ATmega2560](http://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-2549-8-bit-AVR-Microcontroller-ATmega640-1280-1281-2560-2561_datasheet.pdf). It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

****

**2.8 Shield Expansion 3D Printer Engraving Machine**

****

****

Fig. 2-10 Scan Barcode Reader Module

Barcode Reader Module Barcode Scanner 1D / 2D / QR Code Module

* Supports Arduino IDE
* Read barcode type (1D): UPC / EAN, UPC / EAN with supplementals, BooklandEAN, ISSN,  
  UCC Coupon Extended Code, Code 128, GS1-128, ISBT 128, Code 39, Code 39 Full  
  ASCII, Trioptic Code 39, Code 32 , Code 93, Code 11, Matrix 2 of 5, Interleaved  
  2 of 5, Discrete 2 of 5, Codabar, MSI, Chinese 2 of 5, GS1 DataBar variants,  
  Korean 3 of 5, ISBT Concat
* QR code type (2D): QR Code, PDF417, Data Matrix

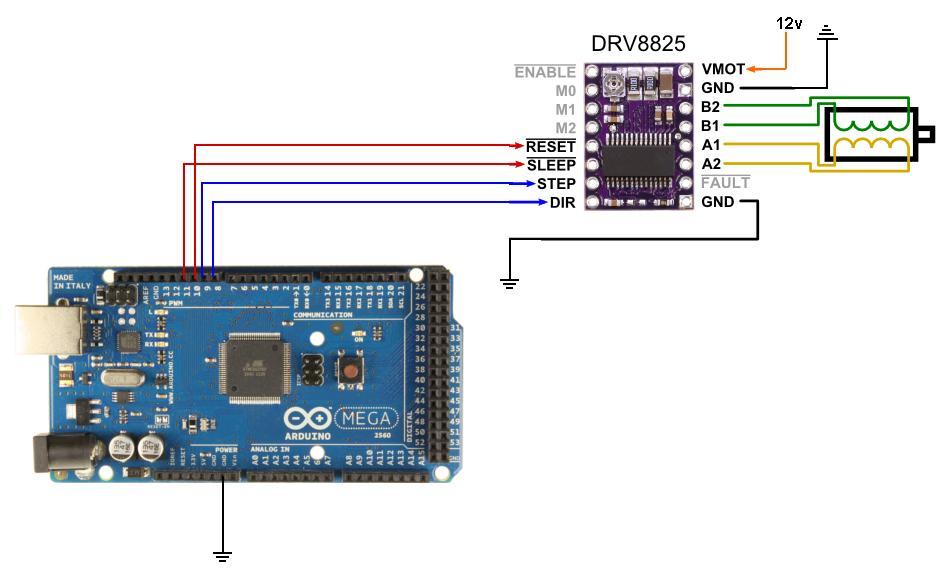
**Chapter III**

**3.** **Activities and Progress**

The researcher will perform the automated warehouse model. Therefore, the researcher will have to study the information on the equipment to be used for make it to be easy to apply with the model. Furthermore, the researcher will have to study the information on the equipment of mechanical arm and stepping motor to apply both together.

**3.1 Mechanism of warehouse**

**3.2 Circuit diagram stepping motor**

****

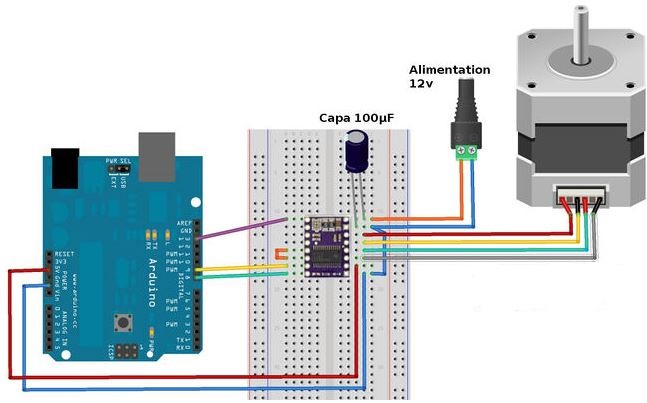
Fig. 3-1 Arduino Mega with DRV 8825

Fig. 3-2 Arduino with DRV 8825 and stepping Motor

**3.3 Work completed**

**-** Study about Automated warehouse

**-** Design automated warehouse model

**3.4 Work in processing**

**-** Study circuit of stepping Motor

- Study DRV 8825

- Study about QR Code.

**3.5 Work in future**

- Integration all components

- Design program flowchart.

- Construction the mechanical arm.

- Combine all of the materials.

-Design the mechanical arm into stepping Moter.

- Calculate for motor power of arm.

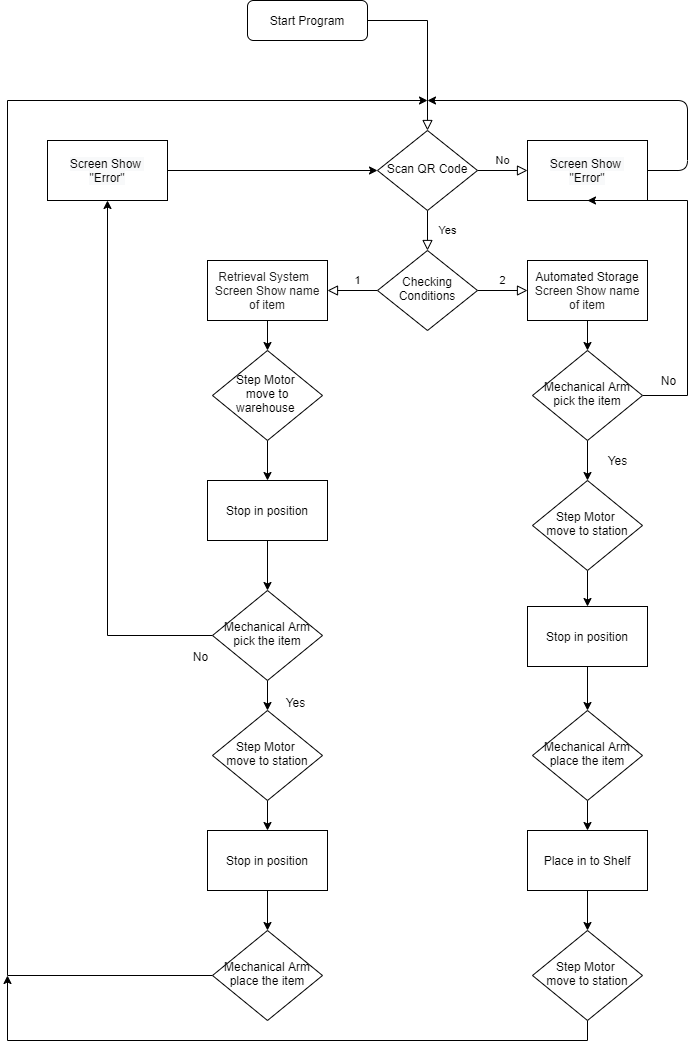
- Testing the OR Code code in Arduino.

**Chapter IV**

**4. Conclusion**

We are planning how to connect it together with 3 objects that is stepping Moter, mechanical arm , and Barcode Reader Module Barcode Scanner. Also, we are finish about study automated warehouse and design automated warehouse model to use it in my project. Next, we will combine all of materials to test that it work and it can be as I expected.

**Flow Chart**



**References**

1. https://www.inc.com/encyclopedia/inventory-control-systems.html

2. https://www.thaieasyelec.com/article-wiki/embedded-electronics-application/espino32camqrcoderecognition.html

3.https://en.wikipedia.org/wiki/Visual\_Basic

4.https://jiradabbc.wordpress.com/%E0%B8%81%E0%B8%B2%E0%B8%A3%E0%B8%88%E0%B8%B1%E0%B8%94%E0%B8%81%E0%B8%B2%E0%B8%A3%E0%B8%81%E0%B8%A3%E0%B8%B0%E0%B8%88%E0%B8%B2%E0%B8%A2%E0%B8%AA%E0%B8%B4%E0%B8%99%E0%B8%84%E0%B9%89%E0%B8%B2/

5.https://create.arduino.cc/projecthub/MisterBotBreak/how-to-make-a-robotic-arm-783525

6.http://rassoft.net/rassoftshop/en/robotics/296-aluminium-robot-6-dof-arm-mechanical-robotic-arm-clamp-claw-mount-kit-and-servos-and-controller-for-arduino.html