



**CSE 396**  
**COMPUTER ENGINEERING PROJECT**  
**PROJECT REPORT**

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# 1. Connections

## 1.1 Motor Connections

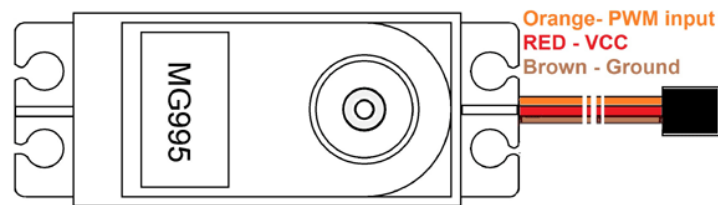


FIGURE 1 : Motor Cable Connection

4 motors are used in the project.

Red cables are connected to the Vcc pin of breadboard.

Brown cables are connected to the Ground pin of breadboard.

Power supply is set to 7 Volts for the motors. Maximum ampere is 5 A.

Orange cables are PWM input pin and they are connected to the STM board as follows :

Motor 1 is connected to the PA8 pin.

Motor 2 is connected to the PA9 pin.

Motor 3 is connected to the PA10 pin.

Motor 4 is connected to the PA11 pin.

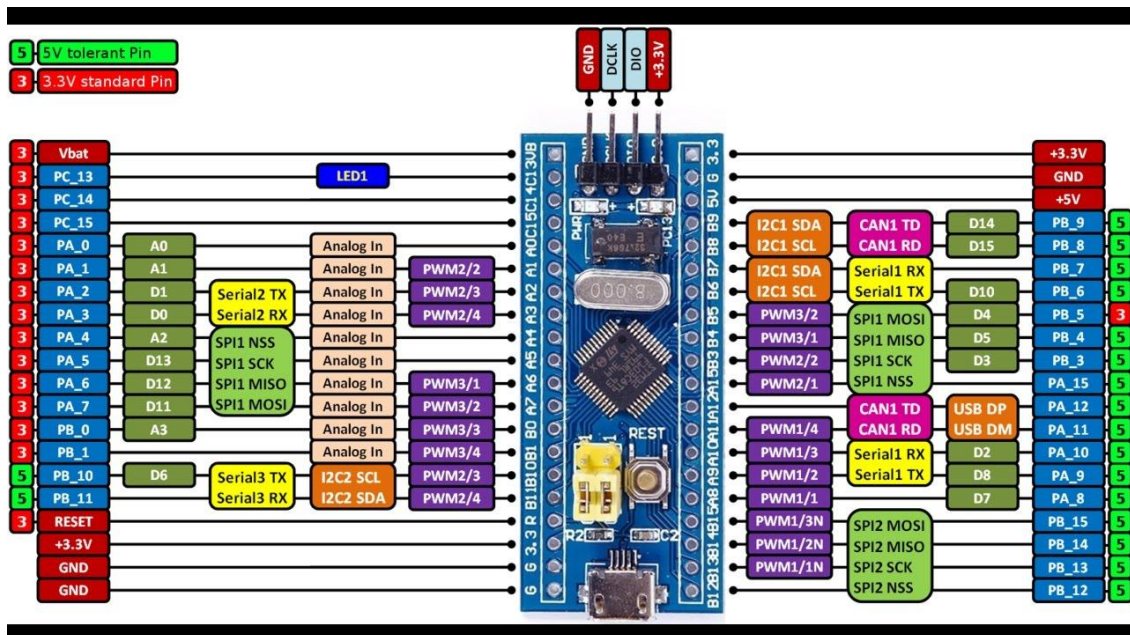


FIGURE 2 : STM32-F103 Pin Table

## 1.2 Data Transfer Connections

STM32- F103 board communicate with computer with the help of Arduino board.

Arduino is used as USB to TTL converter.

Pin connections :

Arduino Reset pin → Arduino GND pin

Arduino 5 V pin → STM32 5 V pin

Arduino GND pin → STM32 GND pin

Arduino Tx pin → STM32 PA2 pin

Arduino Rx pin → STM32 PA3 pin

USB cable is connected to the Arduino board and computer.

Camera cable is connected to the computer.

## 2. STM32 Board Program Load

STM32CubeIde is used to program STM32-F103 board.

STM32-F104 board needs ST-Link to flash program.

Connect ST-Link as follows :

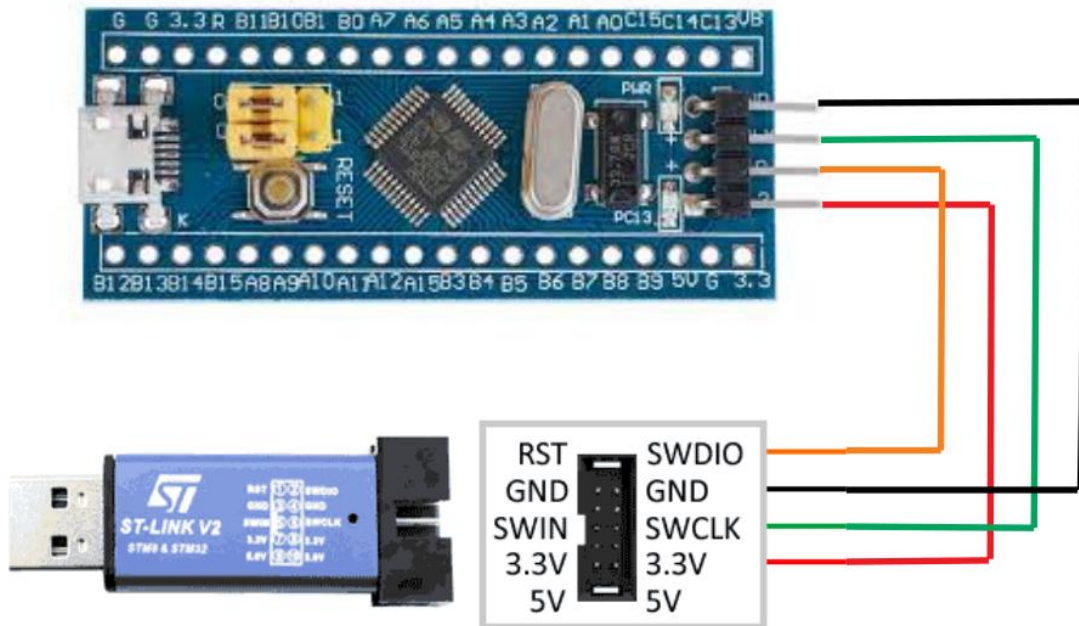


FIGURE 3 : ST – Link Connection

Open STM32F103-BounceBall project in STM32CubeIde and load the program.

## 3. Compiling Project in Linux

### 3.1 Install Opencv Dependencies

To Update the system, run following command.

```
$ sudo apt-get update
```

Install gcc, g++ compiler and cmake

```
$ sudo apt-get install build-essential cmake
```

Install libraries for camera and gui support

```
$ sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev  
$ sudo apt-get install libgtk-3-dev
```

Install git and download opencv

```
$ sudo apt-get install git  
$ git clone https://github.com/opencv/opencv.git
```

Create a build file and run cmake to build binary files

```
$ cd opencv  
$ mkdir build  
$ cd build  
$ cmake ../
```

Run make file and install opencv libraries under /usr/local

```
$ make  
$ sudo make install
```

### 3.2 Install QT Dependencies

Install qt libraries

```
$ sudo apt-get install qt5-default
```

Install camera support for QT

```
$ sudo apt-get install qtmultimedia5-dev
```

Install serial port connection library

```
$ sudo apt-get install libqt5serialport5  
$ sudo apt-get install libqt5serialport5-dev
```

### 3.3 Compile and Run Project

Install Project

```
https://github.com/ferhatsirin/BounceBallProject.git
```

Run qmake to create a makefile

```
$ cd BallBouncerProject  
$ qmake BounceBallProject.pro
```

Run makefile to create an executable file

```
$ make
```

Run project

```
$ ./BounceBallProject
```

## 4. USER INTERFACE

The screenshot shows a window titled "Bounce Ball" with a light gray background. The interface includes several input fields, buttons, and sliders. Numbered annotations (1-7) point to specific elements:

- 1** points to the "Open Camera" button.
- 2** points to the "Show Range" button.
- 3** points to the "Connect" button for the Port field.
- 4** points to the "Connect" button for the IP field.
- 5** points to the "Set Position" button.
- 6** points to the "Bounce Ball" button.
- 7** points to the "Draw Circle" button.

The controls are organized as follows:

- Position:** Two input fields for "X:" and "Y:" are located above the "Set Position" button (5).
- Distance:** An input field for "Distance:" is located below the "Position" fields.
- IP:** An input field for "IP:" is located below the "Distance" field, with an example "Ex: 192.168.188.111" below it. A "Connect" button (4) is to its right.
- Port:** A dropdown menu for "Port:" is located to the right of the IP field, with a "Connect" button (3) to its right.
- HSV Sliders:** Two sets of sliders are at the bottom. The left set is labeled "Min HSV" and the right set is labeled "Max HSV". Each set has sliders for H, S, and V, with numerical values to the right of each slider.

Category	Parameter	Value
Min HSV	H	108
	S	44
	V	41
Max HSV	H	255
	S	255
	V	255
- Buttons:** "Bounce Ball" (6) and "Draw Circle" (7) are located above the "Open Camera" button (1).

Below the IP and Port fields, the status "Disconnected" is displayed for both.

1. Set camera port and click Open Camera button to open camera.
2. Click Show Range button and adjust the HSV values to detect the ball more accurately.
3. Set the port that stm32 connected and click Connect to communicate with board.
4. Click Connect button to listen computer ip address for android device connection.  
No need to enter ip address to listen local host.
5. Enter position values for X , Y and click Set Position button. Ball Bouncer will set the ball on the bouncer to that position.
6. Bounce Ball button will bounce ball.
7. Draw circle button will draw a circle on the ball bouncer. To draw a circle, Ball Bouncer will place the ball to the predetermined position one minute apart.