CSE 396
COMPUTER ENGINEERING PROJECT
PROJECT REPORT

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1. Connections

1.1 Motor Connections

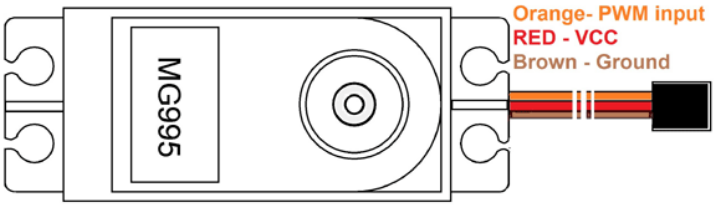


FIGURE 1 : Motor Cable Connection

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.

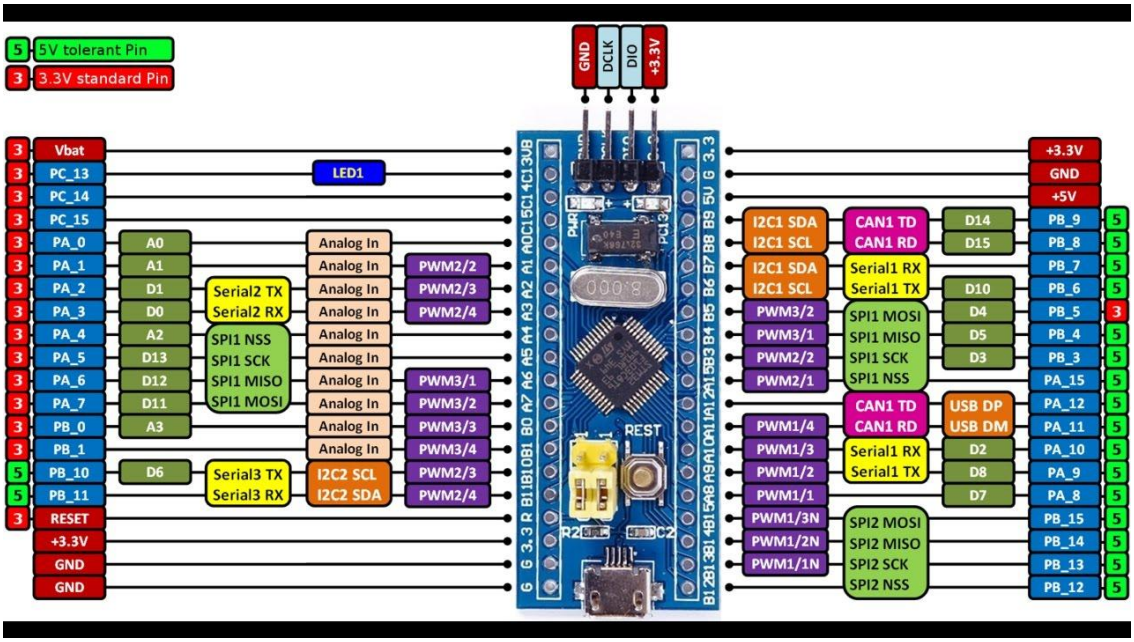


FIGURE 2 : STM32-F103 Pin Table

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-F103 board needs ST-Link to flash program.

Connect ST-Link as follows :

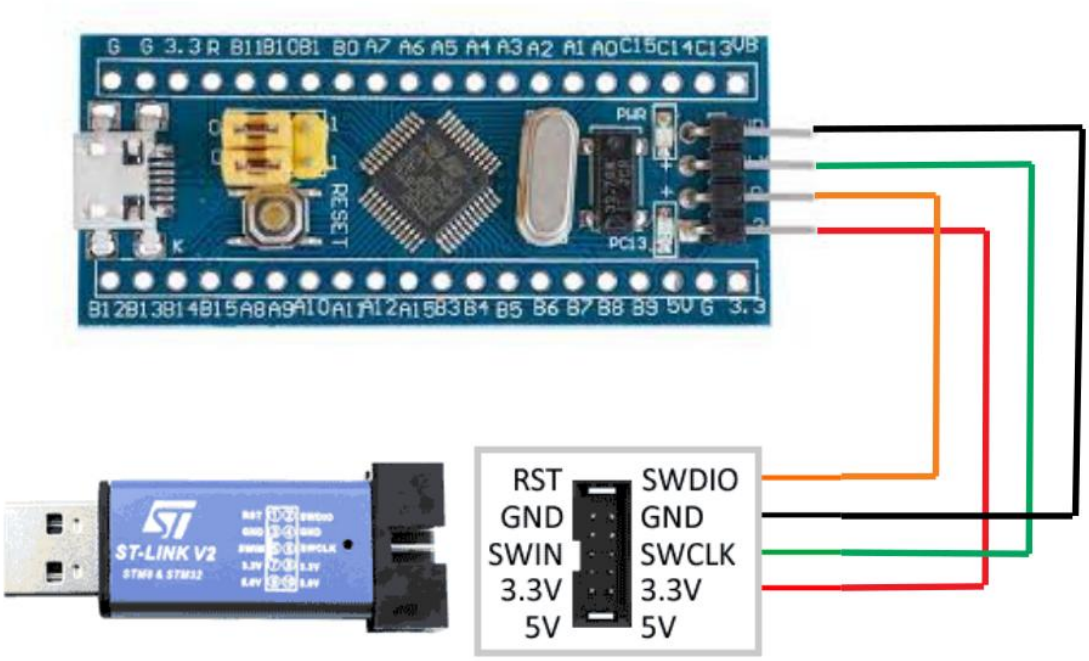


FIGURE 3 : ST – Link Connection

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 Prject

Install Project

```
$ git clone 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
```

3.4 Mobile Application

Android mobile application made from flutter and you need to install flutter and android studio to run the application.

3.4.1 Install Flutter

Download flutter

https://storage.googleapis.com/flutter_infra/releases/stable/linux/flutter_linux_1.20.3-stable.tar.xz

This .tar.xz file is in “Download” folder. Extract here:

```
$ tar xf ~/Downloads/flutter_linux_1.20.3-stable.tar.xz
```

Learn the path, use this command:

```
$ pwd
```

Example output: /home/usr/Downloads

Copy the result path. Then add the PATH. We paste the place we copied in place of the red word.

```
$ export PATH="$PATH: pwd/flutter/bin"
```

Example: **export PATH="$PATH: /home/usr/Downloads/flutter/bin"**

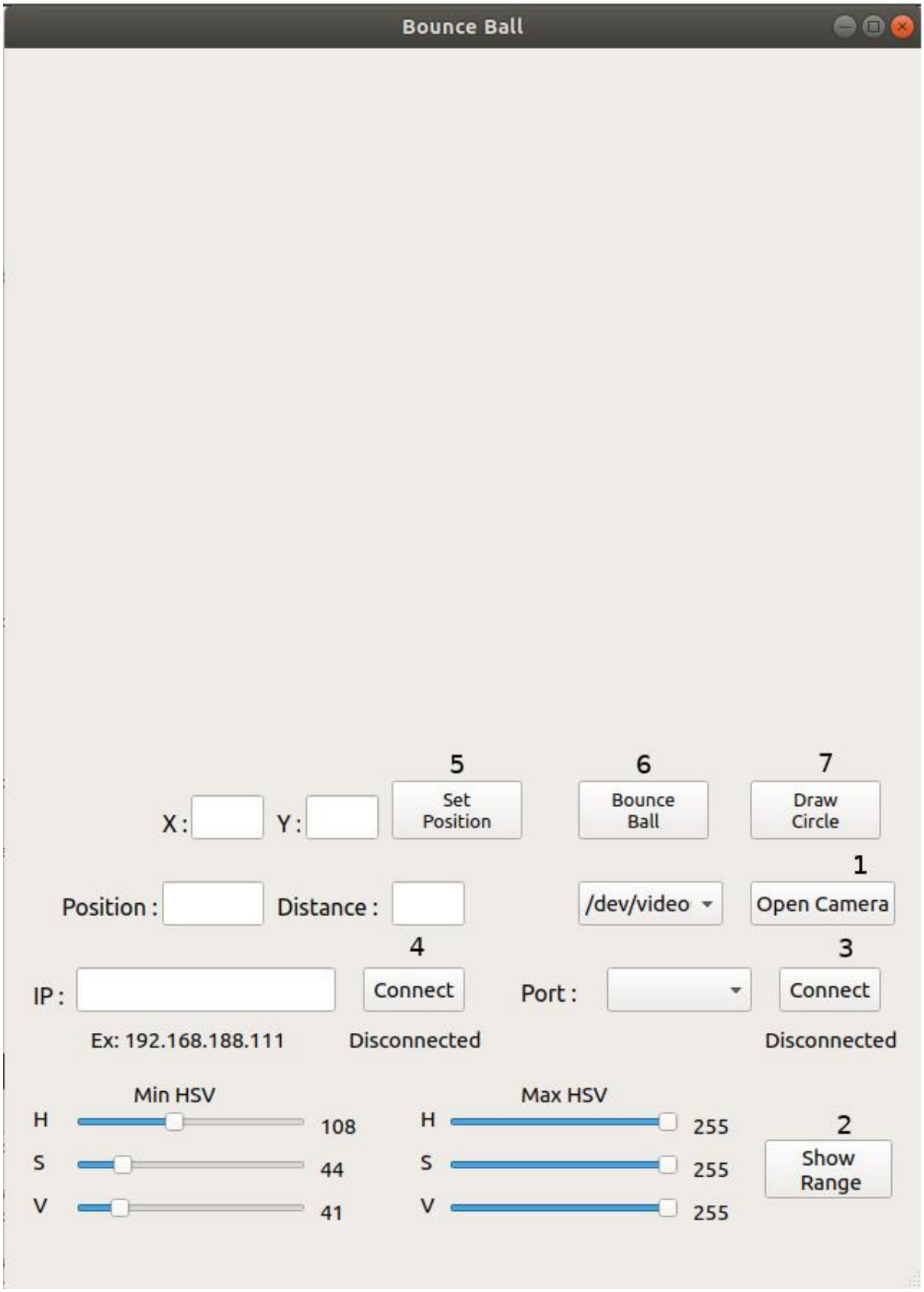
3.4.2 Install Android Studio

You need to install Android Studio from this link.

Or :

```
$ sudo snap install android-studio --classic
```

4. USER INTERFACE



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.