



Create® 2 DJ Turntable I

Dum6 Sen5e



Introduction

We will create the DJ Turntable System using the most advanced robot in the future. The iRobot Create® 2 is used for enjoying DJ play as musical instrument, Aren't you excited ?

However, We have a long way to go before we bring the DJ Turntable to completion.

First, We have created the phonograph of iRobot Create® 2 to play the LP record.
<https://youtu.be/TV7yp2ephXI>

Finally, We will create the “Create® 2 DJ Turntable II” as completed “Tone arm” version by the end of this year.

In this document, We explain about the method of fabrication “Phonograph”.

Parts List (1/2)

Part Description	Qty	Where to Buy
iRobot Create® 2	2	http://www.irobot.com/About-iRobot/STEM/Create-2.aspx
Mini-DIN ConnectorCable for iRobotCreate2	1	https://www.adafruit.com/products/2438
Arduino Uno R3	1	http://uk.rs-online.com/web/p/processor-microcontroller-development-kits/7697409/
2N4403(Transister)	2	http://uk.rs-online.com/web/c/semiconductors/discrete-semiconductors/
1N4001(Diode)	1	http://uk.rs-online.com/web/c/semiconductors/discrete-semiconductors/
Raspberry Pi 2 Model B	1	http://uk.rs-online.com/web/p/processor-microcontroller-development-kits/832-6274/
Logic Level Converter	1	https://www.sparkfun.com/products/12009
DC/DC Step-Down (Buck) Converter	1	https://www.adafruit.com/products/1385
USB MicroB Plug Breakout	1	https://www.sparkfun.com/products/10031
M2.6 screw	2	http://www.amazon.com/s/ref=nb_sb_ss_i_2_4?url=search-alias

Parts List (2/2)

Part Description	Qty	Where to Buy
Wireless USB Adapter	1	http://www.amazon.com/gp/product/B003ZM17RA?keywords=WLI-UC-
M2P D-Jay	1	http://www.amazon.de/D-jay-Turntable-play-M2P-Make2play/dp/B00L1GVABK
Acrylic plate $\phi 350$ [mm]	1	https://hands.net/goods/4571253480148/
Spacer(length: 40.5mm, 20mm)	1	http://www.amazon.com/gp/product/B00Y81MJJM?
LP record	1	http://www.amazon.com/Vinyl-Records-Albums-LPs-Eps/b?
Antistatic mat (510mm × 510mm, 130.3mm × 1130mm)	1	http://www.amazon.com/s/ref=nb_sb_noss?url=search-alias%3Dcomputers&field-
PCB board (45mm × 45mm)	1	http://www.amazon.com/s/ref=nb_sb_ss_xo_0_9?url=search-alias
Sponge (30mm × 30mm × 5mm)	1	http://www.amazon.com/s/ref=sr_pg_6?rh=n%3A3760901%2Cn
Network Router	1	http://www.amazon.com/Routers-Networking-Online-Communication-Add-
Plastic board (60.5mm × 60.5mm)	1	http://www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias

Tool and other equipment

Tool and other equipment Description	Qty
Soldering Iron	1
Electric drill	1
Circuit tester	1
Cutter knife	1
Phillips Screwdriver	1
File	1
Ruler	1

1. Overview

We created the phonograph system using some trending parts.

- M2P D-Jay : It has a horn and stylus.
- iRobot Create® 2 : It is used as a turntable that is controlled by Arduino and Raspberry Pi.

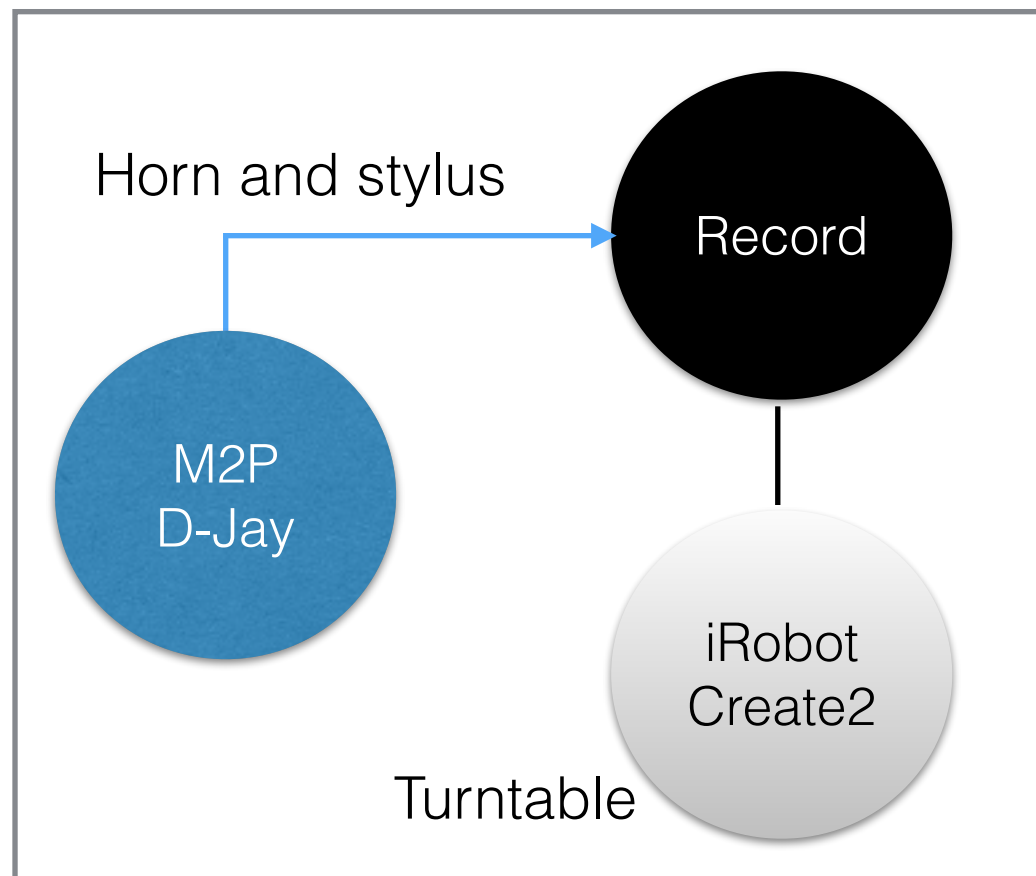


Figure1. System overview



Figure2. System image

2. System Diagram

Connect from Laptop to an inside of iRobot Create® 2 by Wi-Fi.

- This system is worked the Laptop to debug and simulate from the [ROS](#).
- the iRobot Create® 2 is controlled the Arduino to extend the Device (ex. Sensor and Robot Arm).

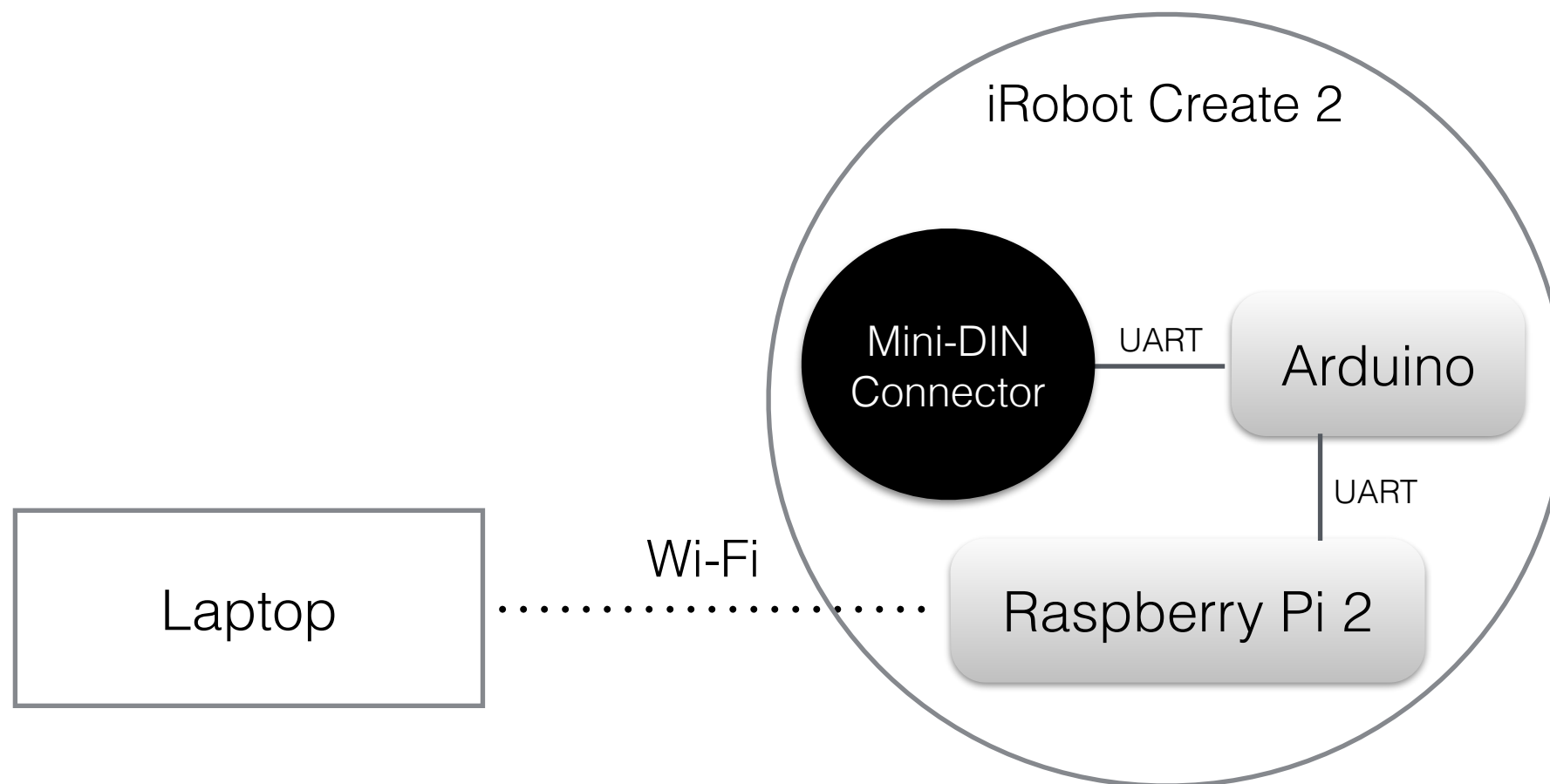


Figure3. System overview

3-1. Software Diagram

We can control the Create® 2 DJ Turntable using GUI tools of [Robot Operating System](#).

- Laptop: It controls the switch of turning and drive velocity with the ROS tools.
- Raspberry Pi 2: It relays messages between laptop and Arduino using the roserial protocol.
- Arduino: It controls the iRobot Create® 2 in according with the received messages.

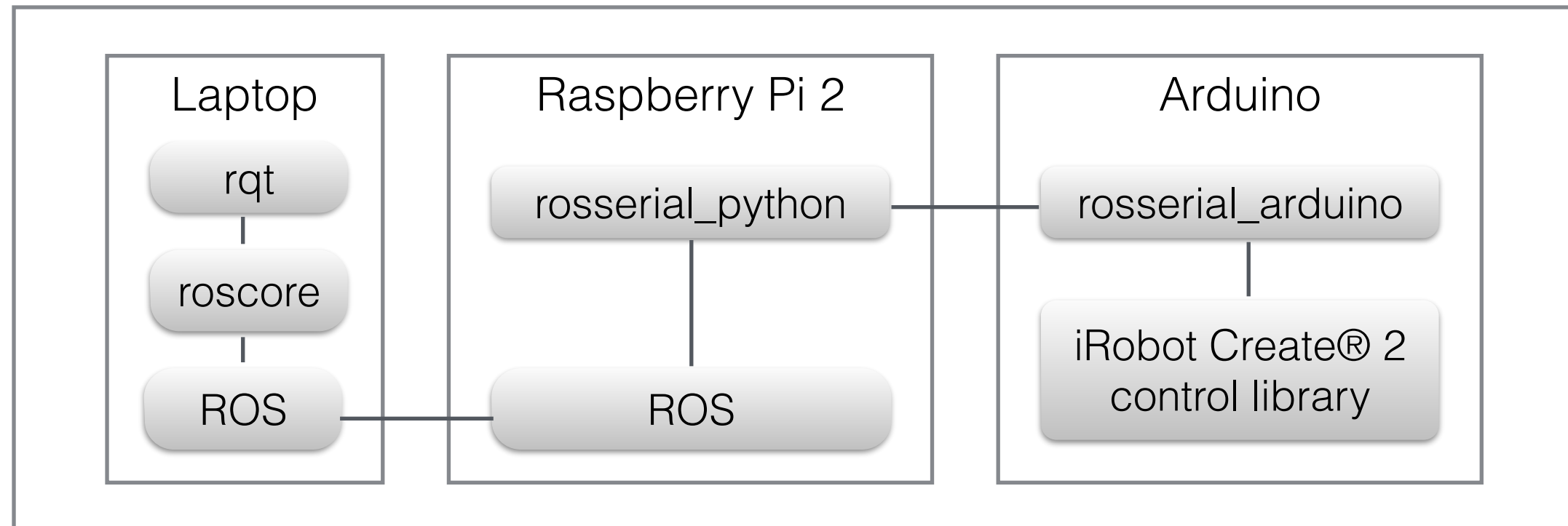


Figure4. Software diagram

3-2. Setup Laptop and Arduino

On the Laptop, We install the ROS related packages and build the Arduino library. All packages are the open source software, including the iRobot Create® 2 control library which developed by us.

Packages	Version	Reference
Ubuntu (OS)	14.04 LTS	http://www.ubuntu.com
Arduino IDE (IDE)	1.0.5 or later	https://www.arduino.cc/en/Main/Software
ROS (Middleware)	indigo	http://wiki.ros.org/indigo/Installation/Ubuntu
roserial (ROS package)	indigo	http://wiki.ros.org/roserial
roserial-arduino (ROS package)	indigo	http://wiki.ros.org/roserial_arduino/Tutorials
rqt_ez_publisher (ROS package)	indigo	http://wiki.ros.org/rqt_ez_publisher
iRobot Create® 2 control library (Arduino library)	1.0.0 or later	https://github.com/5ide6urnslab/iRobotCreate2

Figure5. Software package list in the Laptop and the Arduino

3-3. Setup the Raspberry Pi 2

On the Raspberry Pi 2, we install the ROS related packages for relaying messages between the laptop and the Arduino. We need to configure the UART settings like a [this page](#) for communication to the Arduino. Additionally, we need to configure the SSH and Wifi settings like a [this page](#) for communication to the Laptop.

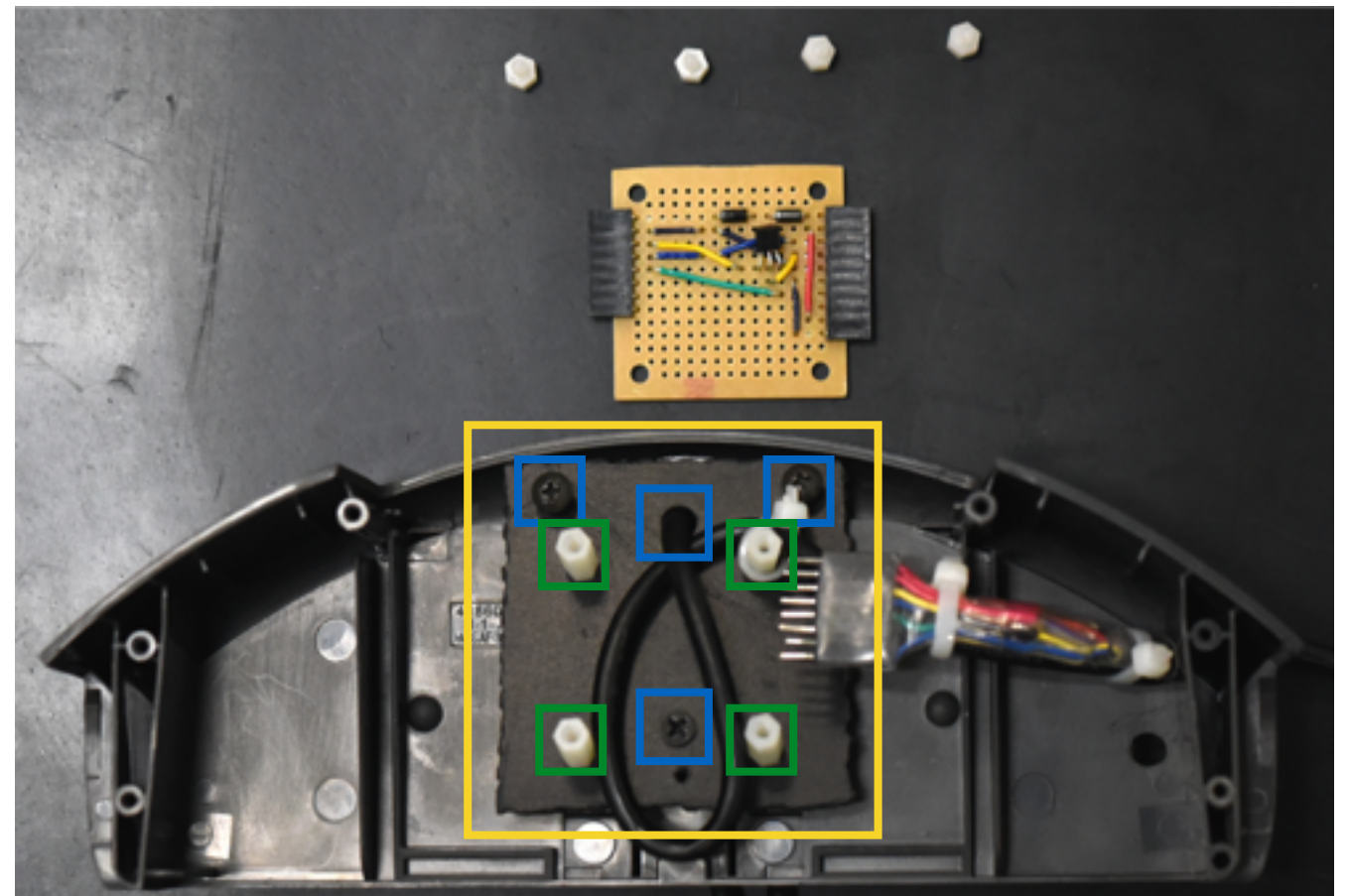
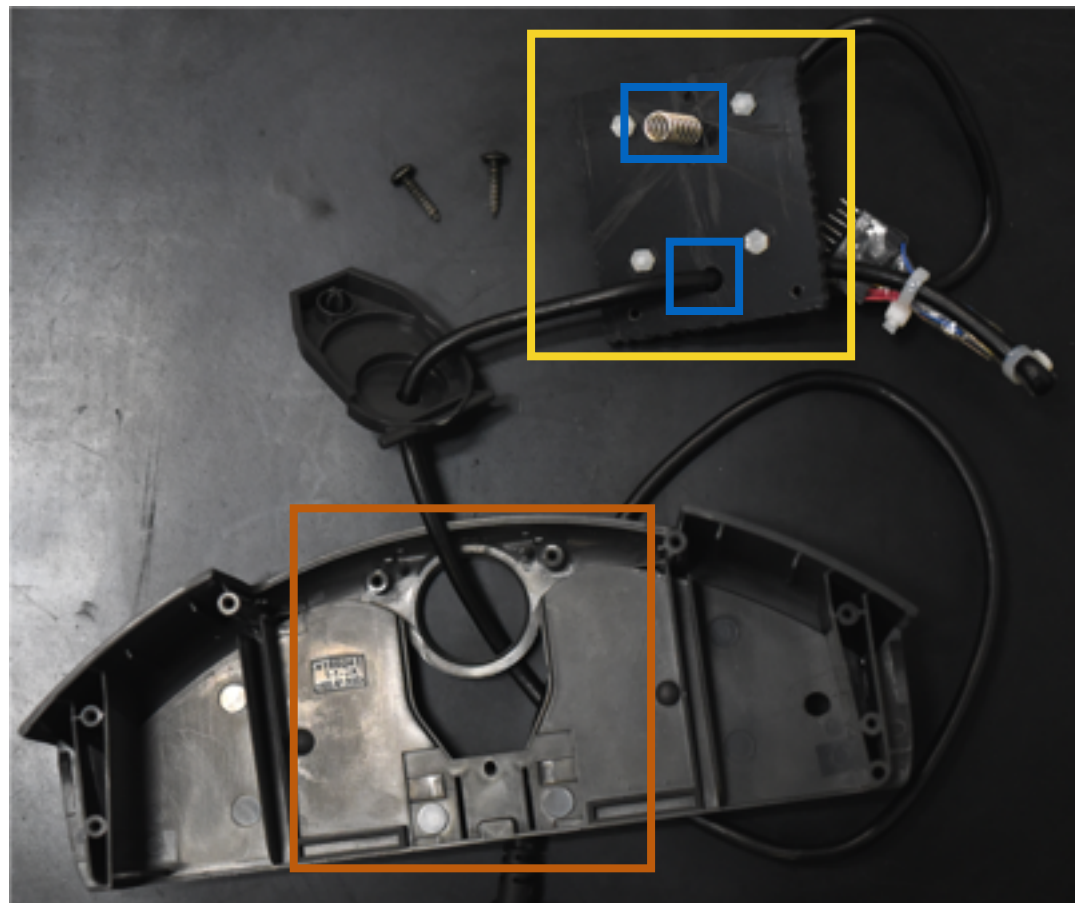
Packages	Version	Reference
Raspbian Wheezy (OS)	3.18 or later	https://www.raspberrypi.org/downloads/raspbian/
ROS-Comm (Middleware)	indigo	http://wiki.ros.org/ROSberryPi/Installing%20ROS%20Indigo%20on%20Raspberry
roserial_embeddedlinux (ROS package)	indigo	http://wiki.ros.org/roserial_embeddedlinux/Tutorials
common_msgs (ROS package)	indigo	http://wiki.ros.org/common_msgs/Tutorials

Figure6. Software package list in the Laptop and the Raspberry Pi 2

4-1. Custom the vacuum bin

We need to custom the vacuum bin to install the electronics parts.

- a) Remove the vacuum fan.
- b) Set the plastic board for layering the PCB board.
- c) Set a spring and pierce the Mini-DIN Connector Cable, then fix it to the upper the vacuum bin.
- d) Set four spacers for layering the PCB board.



a)

b)

c)

d)

4-2. Wire the Electronics

Wire the electronics which is Arduino and Raspberry Pi, DC/DC converter board, Power supply board to supply the battery of iRobot Create® 2. Please refer the following diagram and links for detail.

Parts	Reference
Mini-DIN Connector and Cable	http://www.irobotweb.com/~media/MainSite/PDFs/About/STEM/Create/Create_2_to_5V_Logic.pdf?la=en
Arduino UNO	http://cdn.dev.classmethod.jp/wp-content/uploads/2014/12/arduino-pinout-diagram.png
Logic Level Converter	https://www.sparkfun.com/products/12009
Raspberry Pi 2	http://www.element14.com/community/docs/DOC-73950/l/raspberry-pi-2-model-b-gpio-40-pin-block-pinout

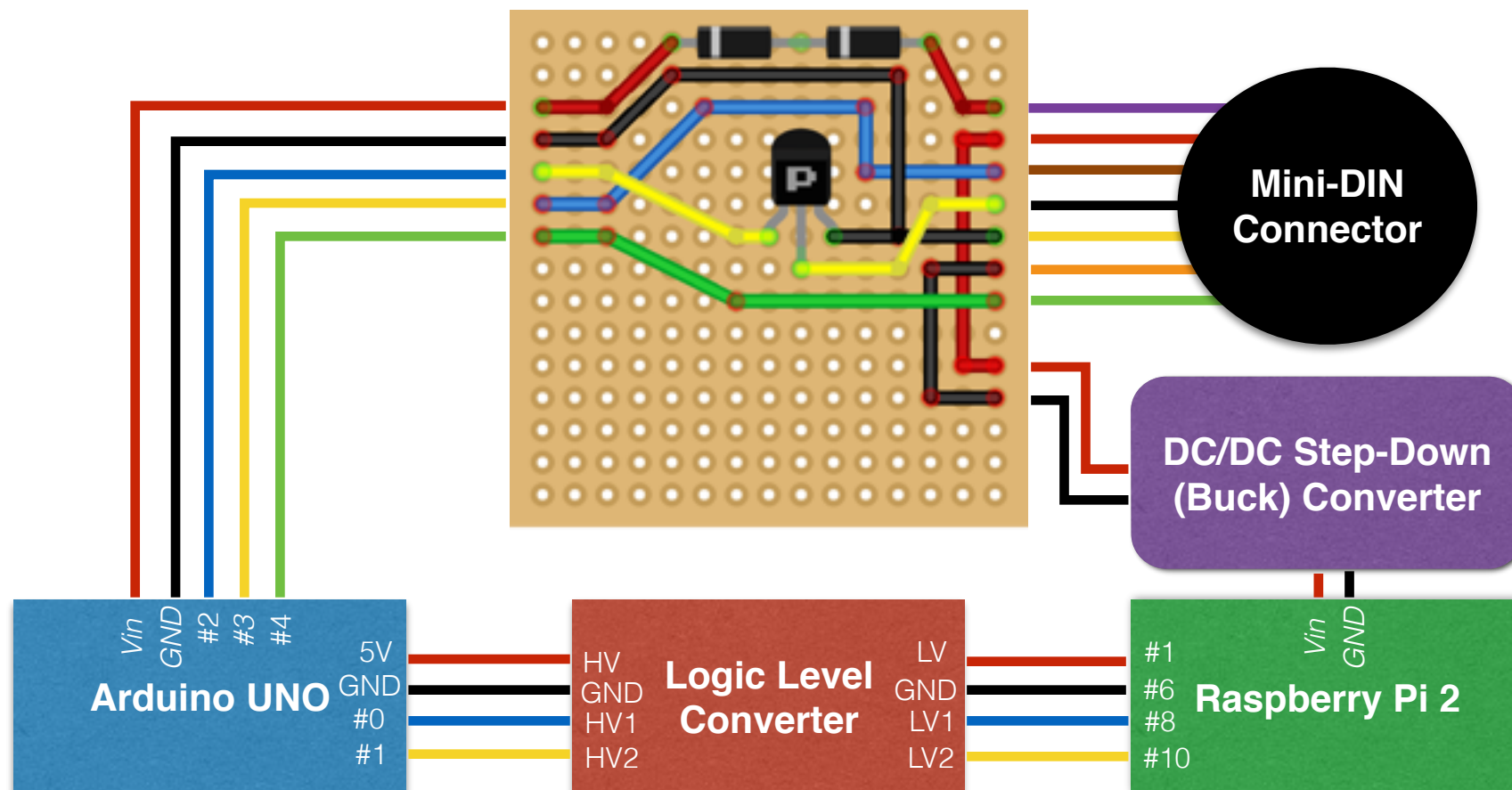


Figure7. Electronics parts diagram

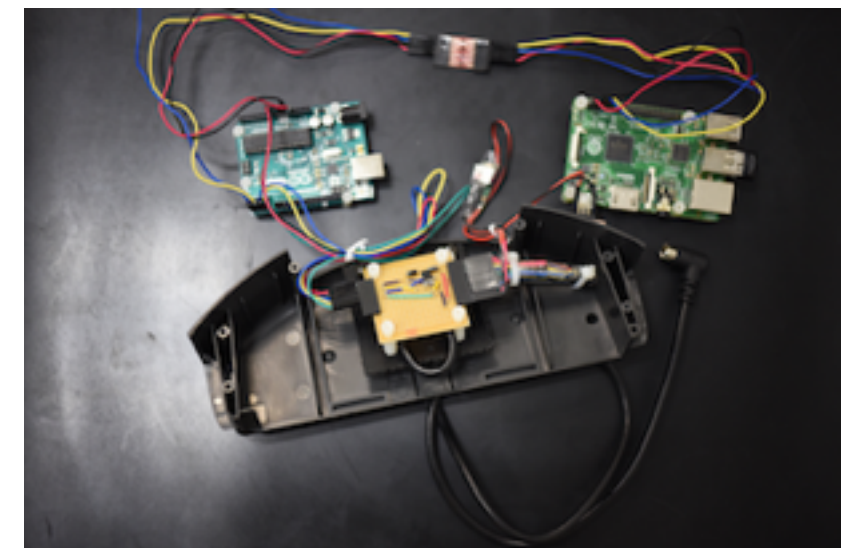


Figure8. Wired electronics parts image

4-3. Install the Electronics

Install the electronics in your vacuum bin.

- a) Install the electronics parts and fix the upper and lower bin housings.
- b) Install your new bin into the robot.
- c) Connect the Mini-DIN cable to iRobot Create® 2.

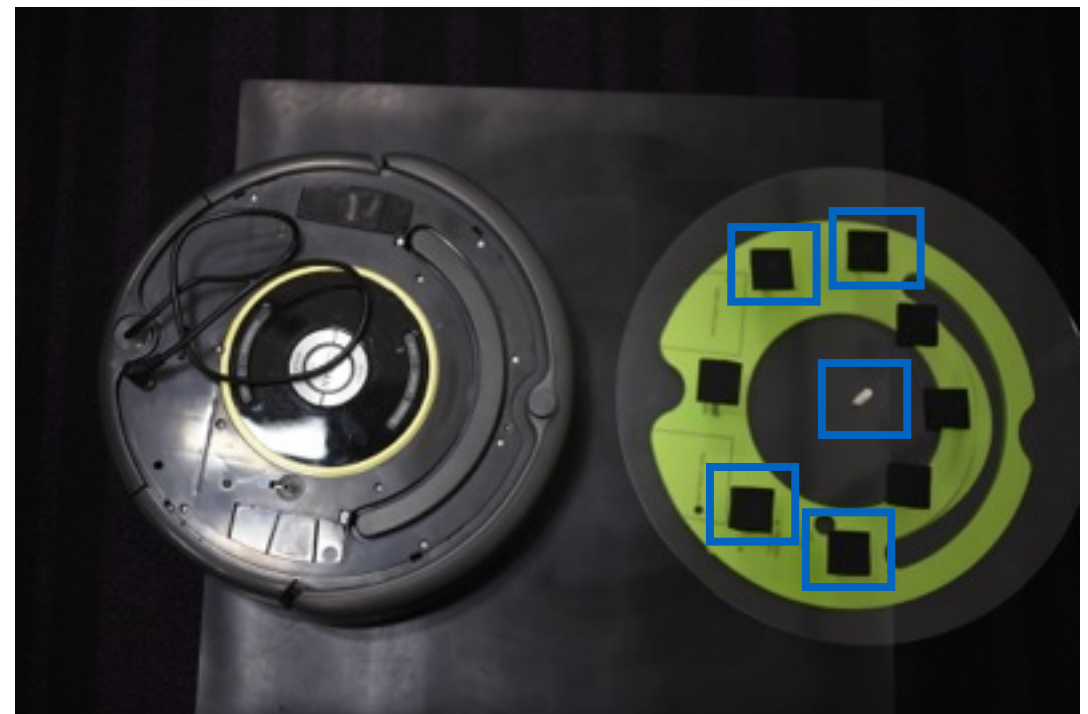
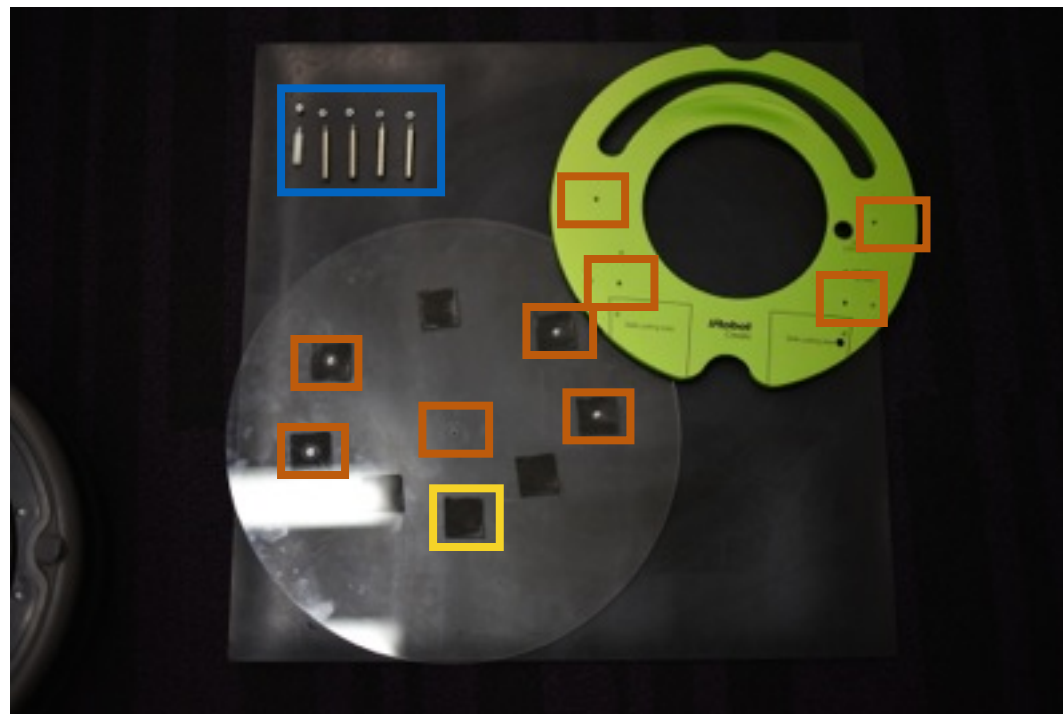
When turn on the power, the iRobot Create® 2 is rotated in a clockwise direction.



4-4. Install the Turntable

Create the Turntable for putting on a record.

- a) Make holes in top of your Create® 2 faceplate (× 4) and Acrylic plate (× 5).
The location where you make a hole is written on your Create® 2 faceplate.
The Acrylic plate is added to that. And the middle hole is the middle of the Acrylic plate.
- b) Put a sponge on Acrylic plate. Anywhere is fine.
- c) Put metal spacers (× 4). And put a Plastic spacer in the middle of the Acrylic plate to fix a record.



a)

b)

c)

4-5. Install the Turntable

Create the Turntable cover for getting stable rotation and turning down the motor sound.

- a) Create a hoop by antistatic mat (130.3mm × 1130mm).
- b) Put an antistatic mat around the iRobot Create® 2.



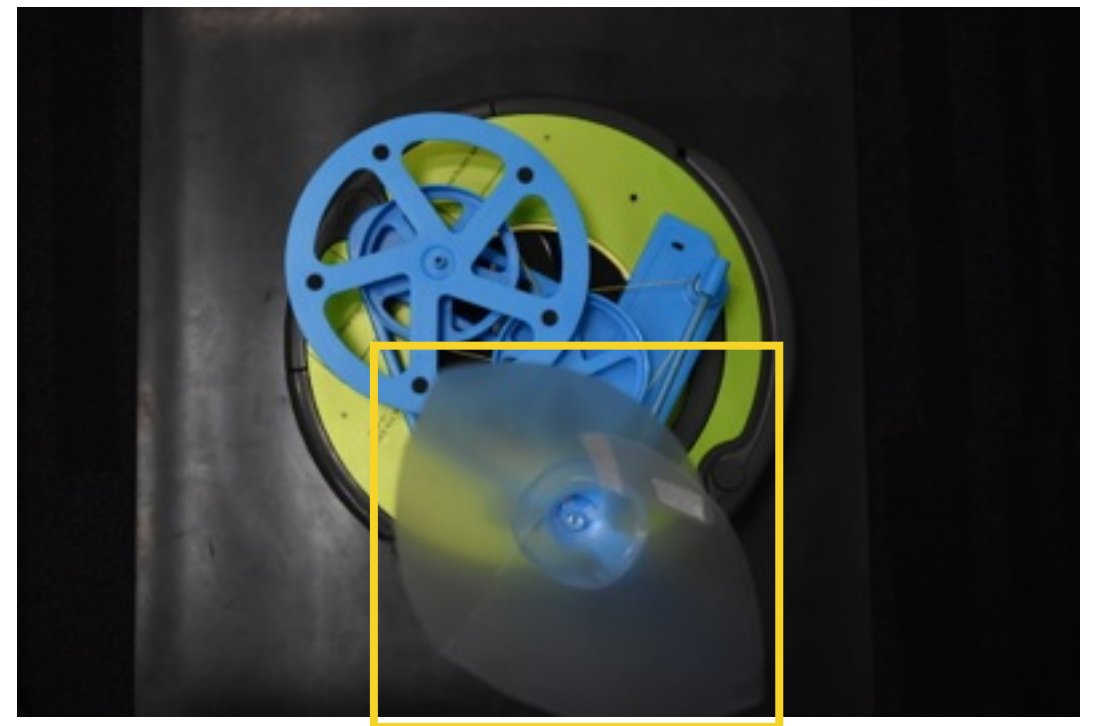
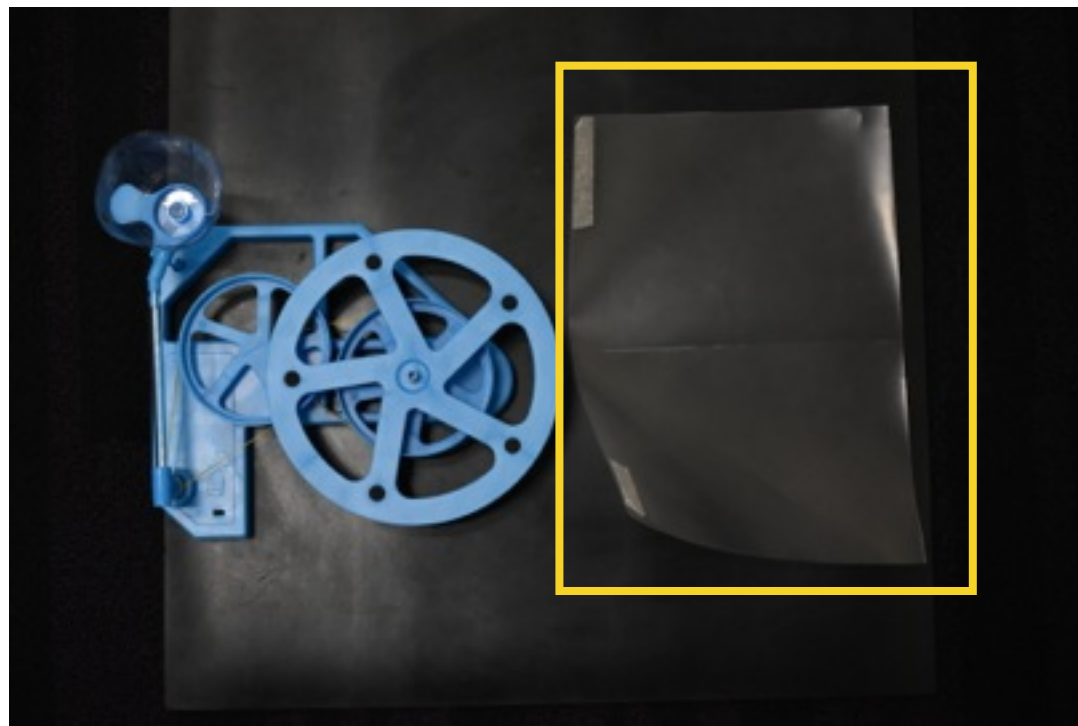
a)

b)

4-6. Install the Horn and Stylus

Create the Horn and Stylus for playing a record.

- a) See the following [a M2P D-Jay manual](#).
- b) Cut a one side of A4 clear folder. And roll up it like Megaphone to easily hear the music of a record.
There is nothing wrong with A4 paper instead of A4 clear folder.
- c) Put a M2P D-Jay on the iRobot Create® 2.



5-1. Start up the ROS communication

Start up the ROS communication system to control the Create® 2 DJ Turntable.

1. [Laptop]: Enable the wifi.

2. [Laptop]: Start the ROS Master.

```
$ roscore
```

3. [Laptop]: Login to the Raspberry Pi 2 with SSH.

4. [Raspberry Pi 2]: Start the ROS node.

```
$ export ROS_MASTER_URI=http://***.***.***.***:11311
```

```
$ export ROS_IP=***.***.***.***
```

```
$ rosrun roserial_python serial_node.py _port:=/dev/ttyAMA0
```

5. [Laptop]: Start the GUI tool of ROS.

```
$ export ROS_IP=***.***.***.***
```

```
$ rqt
```

6. [Laptop]: Start the plugin of rqt (“rqt_plot” and “rqt_ez_publisher”).

7. [Laptop]: Select the ROS topics of Create® 2 DJ Turntable (“/iRobot_driveStatus” and “/iRobot_driveVelocity”).

Note: Please set the own IP address to the characters that is written in red.

5-2. Control the Create® 2 DJ Turntable

You can control the Create® 2 DJ Turntable using the following parts of rqt.

- a) The check box is able to switch the turning.
- b) The slide bar is able to set the drive velocity.

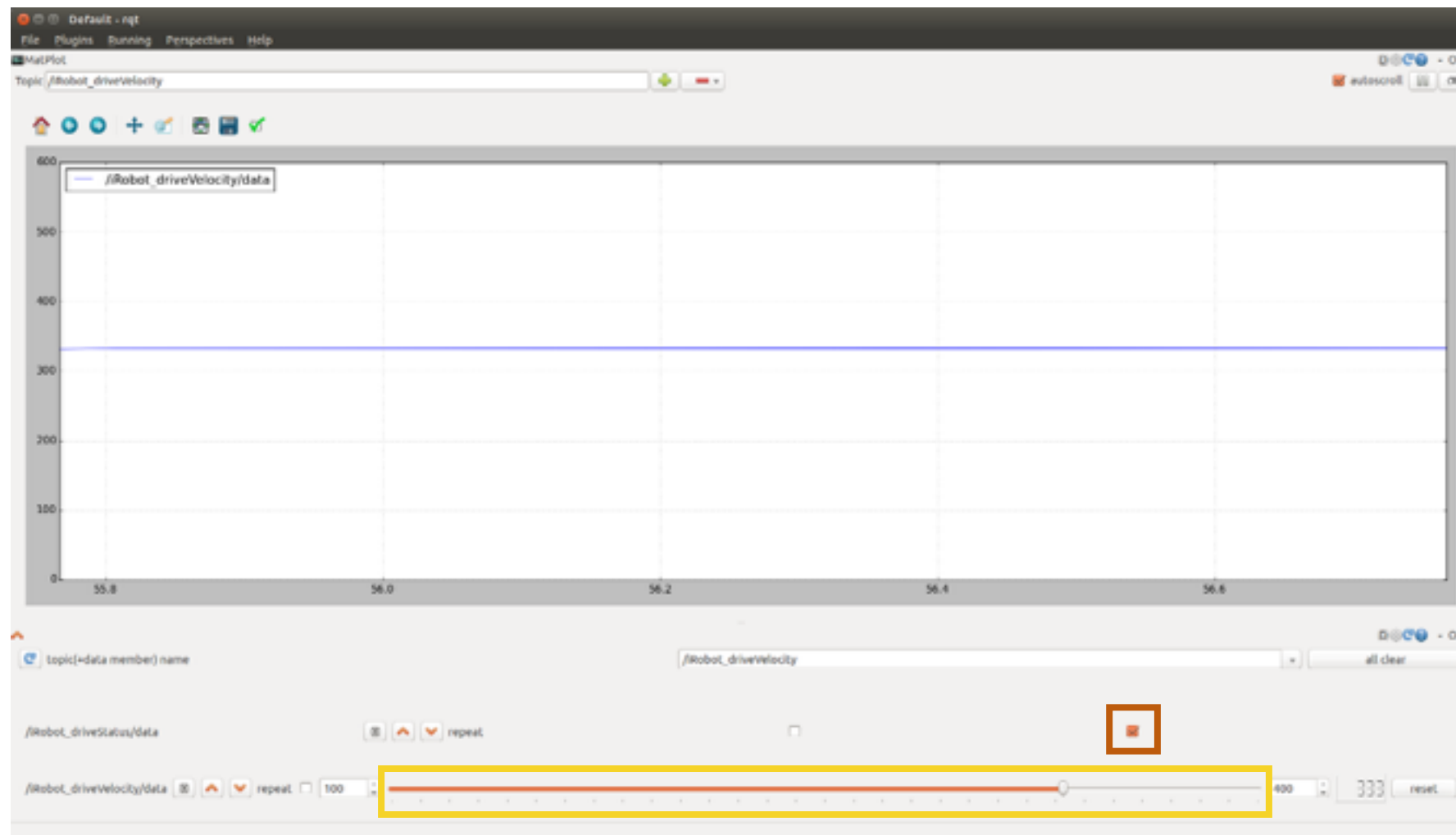


Figure9. rqt (GUI tool of ROS) operation image

6-1. Test the Operation

Complete the “Create® 2 DJ Turntable I”.

- a) Turn on the power and drop the stylus on a record.
- b) When completed, this system is worked like following movie.
Click on the right of image or read QR code by QR code reader.





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