

```
if(parameters.contains("name")){
    hql += " and p.name = :name";
}
if(parameters.contains("age")){
    hql += " and p.age = :age";
}
TypedQuery<Person> query = em.createQuery(hql);
if(parameters.contains("name")){
    query.setParameter("name", values[0].value);
}
if(parameters.contains("age")){
    query.setParameter("age", Integer.valueOf(values[1].value));
}
```

Open Source Rover

Software Install Instructions



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1 Setting up the Raspberry Pi 3

In this section we'll go over setting up the Raspberry Pi and how to get all the code to run the rover going, as well as setting up the bluetooth pairing from the android device.

1.1 Getting the Pi online

1.1.1 Installing a new OS on the Pi

On the Raspberry Pi open up a terminal (**ctl + alt + t**) and then type the following commands:

```
cd /home/pi
```

```
git clone https://github.jpl.nasa.gov/ejunkins/osr_rover_code
```

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1.1.2 Installing packages

Below are the packages you will need to use Bluetooth communication through the raspberry pi. Open up a terminal on the Raspberry Pi and type the following commands:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

```
sudo apt-get install python-bluez
```

```
sudo apt-get install python-pip python-dev ipython
```

```
sudo apt-get install bluetooth libbluetooth-dev
```

```
sudo pip install pybluez
```

```
sudo systemctl start bluetooth
```

```
sudo nano /lib/systemd/system/bluetooth.service
```

- Add ”-C” after ’bluetoothd’, the file should look like the following:

```
[Unit]  
Description=Bluetooth service  
Documentation=man:bluetoothd(8)  
ConditionPathIsDirectory=/sys/class/bluetooth
```

```
[Service]  
Type=dbus  
BusName=org.bluez  
ExecStart=/usr/lib/bluetooth/bluetoothd -C  
NotifyAccess=main  
#WatchdogSec=10  
#Restart=on-failure  
CapabilityBoundingSet=CAP_NET_ADMIN CAP_NET_BIND_SERVICE  
LimitNPROC=1  
ProtectHome=true  
ProtectSystem=full
```

```
[Install]  
WantedBy=bluetooth.target  
Alias=dbus-org.bluez.service
```

- exit and save (ctrl + x, y, enter)

```
sudo reboot
```

```
sudo sdptool add SP
```

2 CONTROL METHOD

2 Control Method

The first thing to do is select which control method you want to use. There are two ways that are built into the code already to control the rover, one of which is a bluetooth app run on Android devices, and the other is using a wireless Xbox controller.

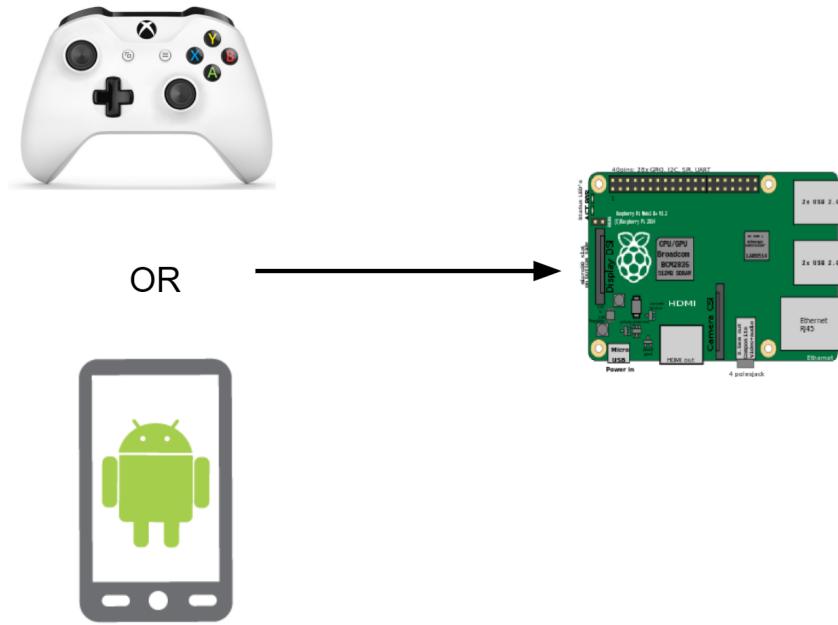


Figure 1: Control Methods

Any way that you can communicate to a Raspberry Pi is a way that you can control the rover, and we fully encourage finding and developing other methods of remote control. For these methods if you decide to use an Android device you will need to follow some steps to get the app loaded on your phone, as we provide the source code so you can edit and change things the next section will walk you through getting the source code.

2.1 Android App Control

2.1.1 Setting up Bluetooth on the RPi

There are a few ways to set up the Bluetooth pairing with your android device. For additional help you can follow steps

- <https://www.cnet.com/how-to/how-to-setup-bluetooth-on-a-raspberry-pi-3/>

2.1.2 Naming the Bluetooth Device

On the Raspberry Pi create a file that will name the bluetooth device your desired name¹.

First on the RPi type `sudo nano /etc/machine-info` and name your device by the following, where `deviceName` is what you want the name of your Raspberry Pi to be:

```
PRETTY_HOSTNAME=deviceName
```

Now in `sudo nano /etc/bluetooth/main.conf` Uncomment the "Name=" line and add your `deviceName`. The first couple lines should read:

```
[General]
```

```
# Default adapter name
# Defaults to 'BlueZ X.YZ'
Name = deviceName

# Default device class. Only the major and minor device class bits are
# considered. Defaults to '0x000000'.
#Class = 0x000100
```

¹This name must also be updated in the Android App such that the App finds the correct device

2.1.3 Pairing Bluetooth from Commandline

We're now ready to pair the device with your android device. Have your android phone discover-able and searching for Bluetooth (for individual phones look up instructions if necessary to do this)

`sudo bluetoothctl` and do the following commands:

`agent on`

`default-agent`

`scan on`

Once you find your device add it from it's address, `pair XX:XX:XX:XX:XX:XX`

and then type `yes`

You'll be prompted on the phone asking to accept the pairing, select okay

Type `quit` to exit the `bluetoothctl`

2.1.4 Downloading the Android App

To begin you need to download Android Studio, which will allow you to put the source code onto the android device ².

- <https://developer.android.com/studio/index.html>

In order to allow the android device to be able to have source code loaded onto it you'll need to enable USB debugging, which is going to be different for a lot of different versions of phones. The best way to figure this out is to google "android usb debugging" for your specific device and follow the steps there. Android studio also provides lots of support information and forums to help getting through any problems and issues had on that end, consult those if there are issues.

²This is to be done on a laptop or desktop computer, not the Raspberry Pi

To get the code for the app you can run the following command in a terminal at the location you desire it to be put:

```
git clone https://github.jpl.nasa.gov/ejunkins/osr_android_app
```

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Or you can navigate to the URL at:

https://github.jpl.nasa.gov/ejunkins/osr_android_app

THIS LINK TO CHANGE UPON RELEASE TO FINAL LINK LOCATION

and under the Clone or download button click Download ZIP and extract the files in that manner.

Now open up the source code just downloaded in Android Studio. In order for the App to communicate to the Raspberry Pi you'll need to make sure it selects the correct bluetooth device, on line 198 in the MainActivity.java file change the variable *connection_name* to be equal to whatever you named the Raspberry Pi in the previous section. Now hit run in the upper panel, and the android app should build and load onto your device.

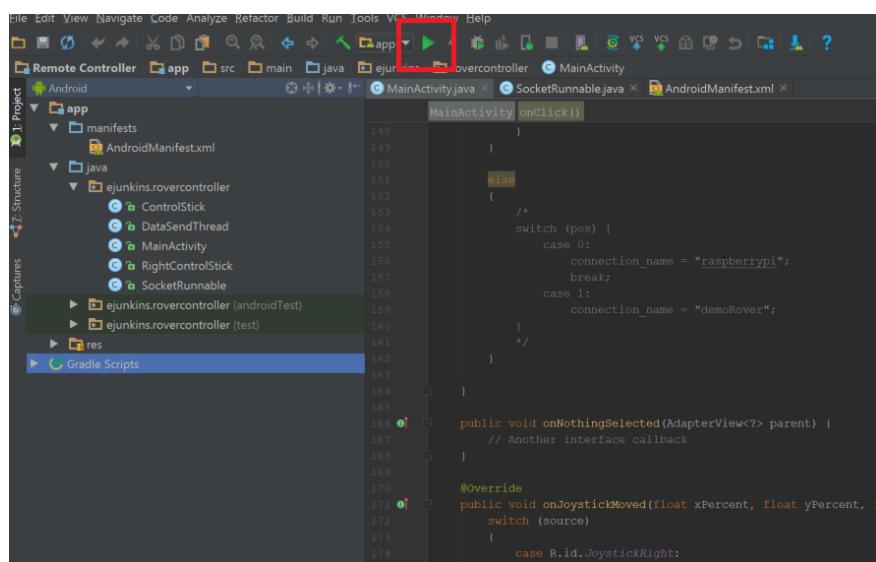


Figure 2

2.2 Init Script

We will want the code on the rover to run when the pi boots up, so we will add that to an init script, which on Raspberry Pi can be found at /etc/rc.local. In a terminal type `sudo nano /etc/rc.local` and then add the following lines after the if statement and before exit, it should look like the following.

```
#!/bin/sh -e

#
# rc.local
#
# This script is executed at the end of each multiuser runlevel.
# Make sure that the script will "exit 0" on success or any other
# value on error.
#
# In order to enable or disable this script just change the execution
# bits.
#
# By default this script does nothing.

# Print the IP address
_IP=$(hostname -I) || true
if [ "$_IP" ]; then
    printf "My IP address is %s\n" "$_IP"
fi

cd /home/pi/Desktop
sleep 10
sudo python -m osr.rover.main &
```

```
python -m osr.led.screen &

exit 0
```

2.3 Setting up serial communication

In this project we will be using serial communication to talk to the motor controllers. This is a communication protocol that describes how bits of information will be transferred between one device and another. More information on this can be found at:

- <https://learn.sparkfun.com/tutorials/serial-communication>

Do the following to setup/enable the serial communication for the RoboClaws:

```
sudo raspi-config
```

Select->InterfaceOptions->Serial

- Would you like a login shell to be accessible over serial? – > No
- Would you like the serial port hardware to be enabled? – > Yes
- Would you like to reboot now? – > Yes

```
ls -l /dev/serial*
```

- Make sure that serial0 -> ttyS0

```
sudo nano /boot/cmdline.txt
```

- Edit **ONLY** the part with "console =", change it to be "console=tty1" and remove any other instance where it references console. The first bit of that line looks like the following:

```
dwc_otg.lpm_enable=0 console=tty1 root=/dev/mmcblk0p7\$
```

Here is a link to help with this process if necessary.

- <https://spellfoundry.com/2016/05/29/configuring-gpio-serial-port-raspbian-jessie-including-pi-3/>.

Once this is all done then reboot the pi.

```
sudo reboot
```

There are two files in test_files that will allow you to test the serial connection, use a jumper wire between pin 14 and 15 (see GPIO pinout if necessary). In two different terminal windows navigate to the desktop and then run the test files by:

```
python -m osr.test_files.serial_write
```

```
python -m osr.test_files.serial_read
```

If the serial communication is working properly then in one terminal you will be printing out a counting number, and in the other you will be reading that number over the serial port.