Installation

Manual

Project RCA

Project: Robot Controlling Arm
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Revision history

Date	Version	Authors	Change Log
20/06/2019	1.0.0	INF2E	The first version

Table of Contents

This chapter will provide an explanation of the purpose of this document and explains how to install the required software on Mac.

1. Introduction

This document contains a brief installation guide regarding OpenCV and Python. It also provides a manual on how to set up the and Raspberry Pi and the Recognition software. There won't be any guide for installing the software for the robot, since most of it came pre-installed, however, there is a link in the references that provides a tutorial.

2. Setting up the raspberry pi

Setting up the raspberry
In order to set up the raspberry pi, you need to have

- An sd-card that is at least 8gb
- A USB mouse and keyboard
- HDMI monitor and cable

1. Connect the monitor, mouse, and keyboard to the raspberry before you hook it up to the power. (you could also install it without USB/monitor but you need another PC/Laptop https://www.raspberrypi.org/documentation/remote-access/ssh/unix.md)

2. Format the sd-card to "FAT32" (if you don't know how to do this here is a link for reference https://lmgtfy.com/?s=d&q=how+to+format+sd+card+to+FAT32).

3. Once you have done this go to https://www.raspberrypi.org/downloads/noobs/ and download the "NOOBS" version, not the lite one. Now you have to extract the files and copy all the files you need onto the sd-card and insert that in the correct slot on the raspberry.

4. If you have completed the previous steps it should install the software when you turn it on. Once it is done loading you see a window that asks you what OS and language you're going to use, in our case it's Raspbian and Python. Once you have completed these steps it should work and you can put in your personal preferences.

Connecting to the raspberry

1. Open the terminal and enter "ssh pi@192.168.0.105" (the local IP address of the pi) the password is the default one "raspberry". The raspberry should have picamera enabled and it should have a python script for streaming video, right now its hardcoded.

2. You should be connected to the local network called "MRROBOT24" the password is "welcome01". Now you have to check your own IP on the router(for windows its ipconfig, mac its ifconfig)

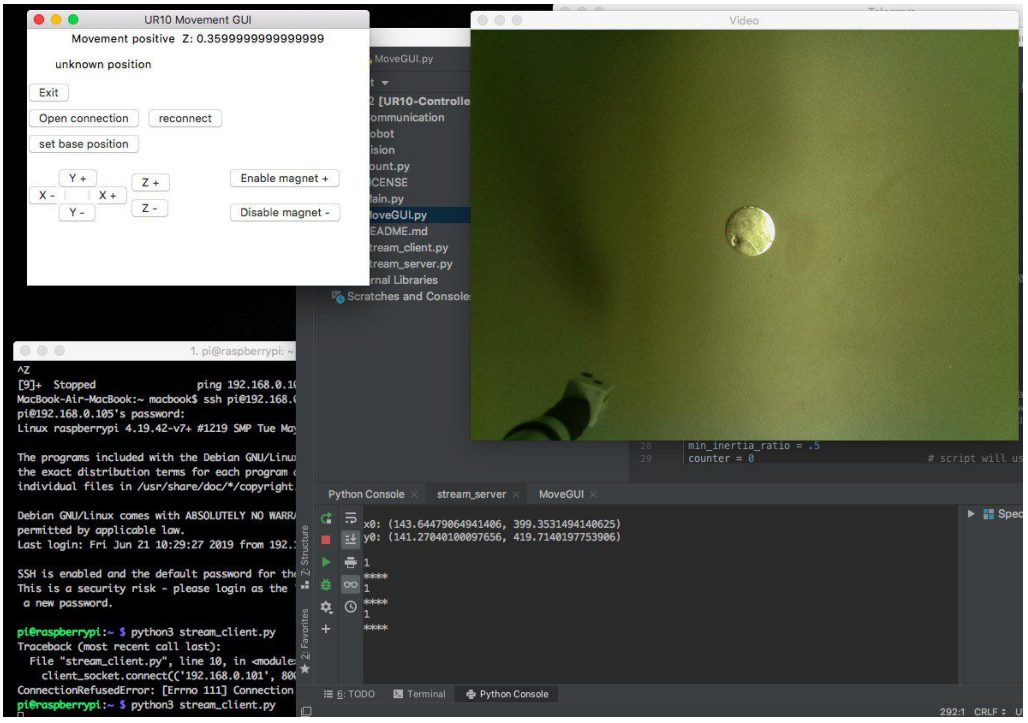
3. To edit the file on the raspberry you type "nano streamclient.py" and then you set the IP to your own ip after the file.

4. Now we have to run a server on our pc/laptop, we do that by running "stream_server.py" in pycharm. If need edits the IP of the file to match your own, also make sure that the port on the client and the raspberry pi are the same. That opens a socket that listens to the stream of the raspberry.

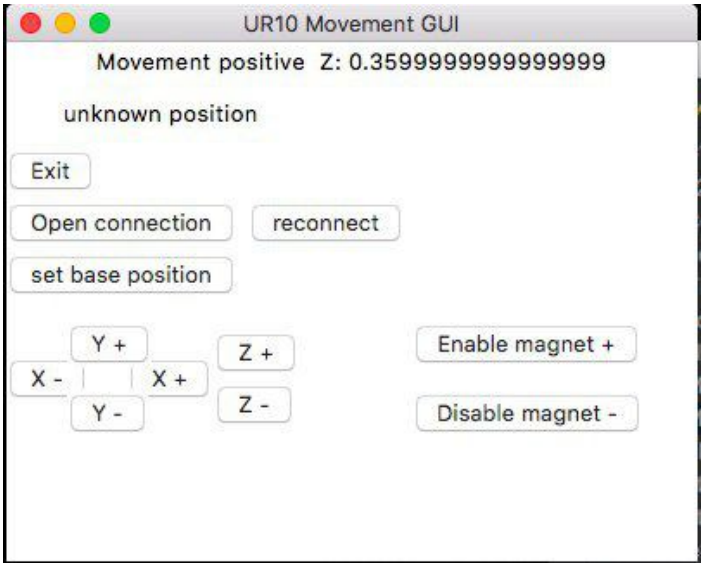
5. If you have done that you now have to run the file on the raspberry, you do this by typing "python3 stream_streamclient.py" (the stream is going over the network and is

pretty slow). If it doesn't work (“out of resources”) you might have to restart the whole raspberry, you do this by typing “sudo reboot -h”.

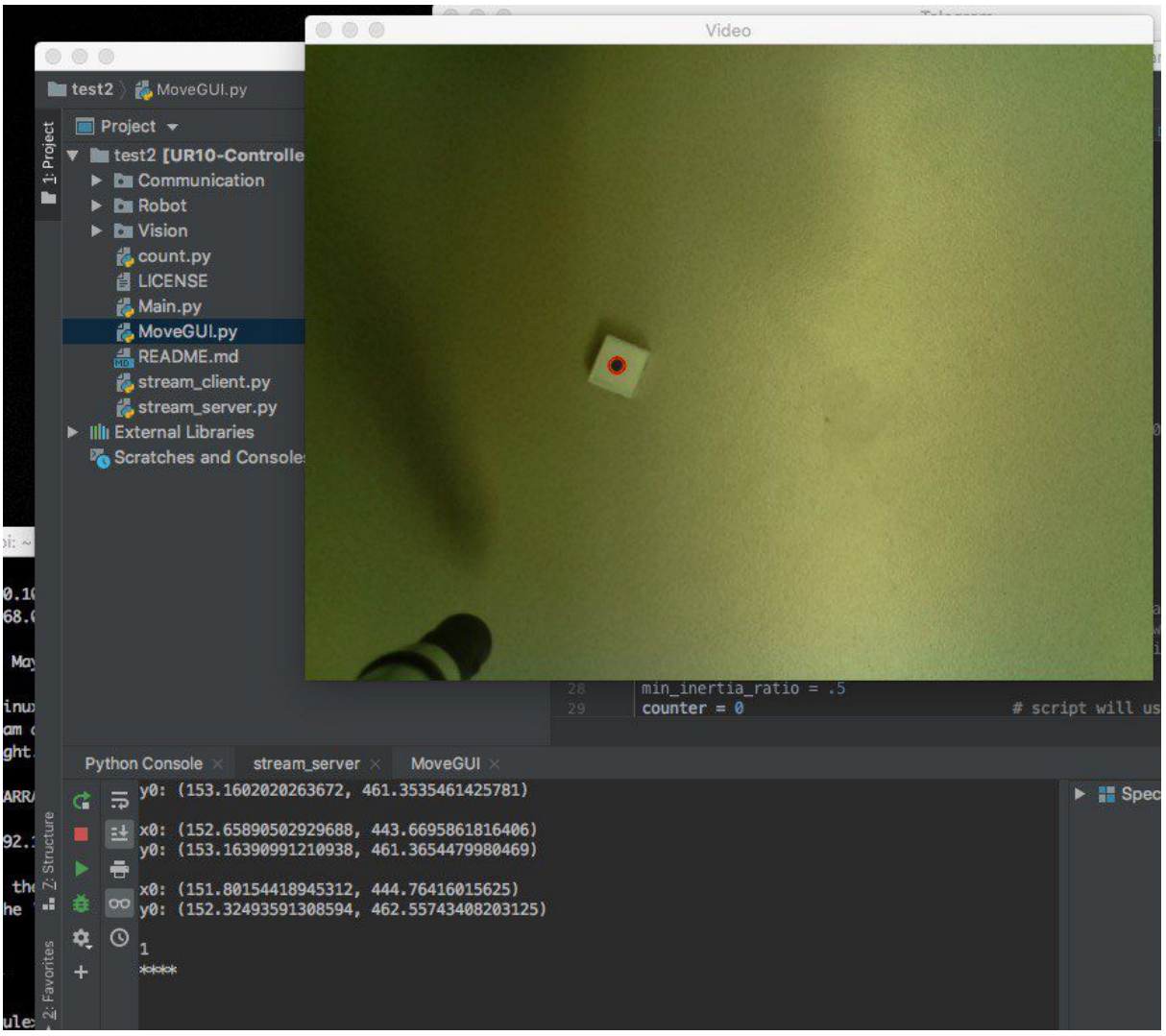
6. After this repeat the steps from the beginning. There should now be a live stream running from the raspberry to your pc.



7. Now we should be able to control the robot, run the file called “moveGui.py” and there should be an interface where you can connect and move the robot (assuming your still on the network)



The dice will be outlined in red cirles when recognized in a following way:


Video
test2
MoveGUI.py
Project
test2 [UR10-Controlle
Communication
Robot
Vision
count.py
LICENSE
Main.py
MoveGUI.py
README.md
stream_client.py
stream_server.py
External Libraries
Scratches and Console
min_inertia_ratio = .5
counter = 0
# script will us
Python Console
stream_server
MoveGUI
y0: (153.1602020263672, 461.3535461425781)
x0: (152.65890502929688, 443.6695861816406)
y0: (153.16390991210938, 461.3654479980469)
x0: (151.80154418945312, 444.76416015625)
y0: (152.32493591308594, 462.55743408203125)
1
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3. Installing Python and OpenCV for Mac

1. install "Xcode" from the Apple Appstore (https://apps.apple.com/us/app/xcode/id497799835?mt=12)
2. Open the terminal and enter "$ sudo xcodebuild -license" and accept the license.
3. now we need Apple command line tools so open the terminal and enter "$ sudo xcode-select --install"
4. Install homebrew, open the terminal and enter "$ /usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)""
5. Open the terminal and type "$ brew update" to get the latest version
6. Open the nano text editor and open your bash profile with "$ nano ~/.bash_profile"
7. Edit the bash profile path with "# Homebrew export PATH=/usr/local/bin:$PATH" and save it.
8. Then source the profile with "$ source ~/.bash_profile"
9. Installing the right python version with "$ brew install https://raw.githubusercontent.com/Homebrew/homebrew-core/f2a764ef944b1080be64bd88dca9a1d80130c558/Formula/python.rb $ brew switch python 3.6.5_1" after type "$ which python3" to verify that you are using homebrew python. If you see " /usr/local/bin/python3" then you have done the install correctly
10. next up we need to use the following commands before we can install opencv "

$ brew install cmake pkg-config
$ brew install jpeg libpng libtiff openexr
$ brew install eigen tbb"
Next use the following command "$ brew install wget"

11. Now we need to install openCV for Python so use the following command

"$ wget https://bootstrap.pypa.io/get-pip.py
$ sudo python3 get-pip.py"

3.1.1. "$ sudo pip3 install virtualenv virtualenvwrapper $ sudo rm -rf ~/get-pip.py ~/.cache/pip"

3.1.2. Next up "$ sudo rm -rf ~/get-pip.py ~/.cache/pip" and add this "# virtualenv and virtualenvwrapper

export WORKON_HOME=$HOME/.virtualenvs
export VIRTUALENVWRAPPER_PYTHON=/usr/local/bin/python3
source /usr/local/bin/virtualenvwrapper.sh" at the end of the file"

3.1.3. then we do "$ source ~/.bash_profile"

3.1.4. And "$ mkvirtualenv cv -p python3" in the commandline

3.1.5. Now we type "$ workon cv" to have the environment installed

3.1.6. And then install numpy "$ pip install numpy"

3.1.7. Now we need to download OpenCV so type "$ cd ~

$ wget -O opencv.zip https://github.com/opencv/opencv/archive/4.0.0.zip
$ wget -O opencv_contrib.zip https://github.com/opencv/opencv_contrib/archive/4.0.0.zip"

3.1.8. Next up we unzip the files "$ unzip opencv.zip
$ unzip opencv_contrib.zip"

3.1.9. Then rename the documents "$ mv opencv-4.0.0 opencv
$ mv opencv_contrib-4.0.0 opencv_contrib"

3.1.10. Now we go to the correct repo and build the directory "$ cd ~/opencv
$ mkdir build

$ cd build

3.1.11. Now we execute "$ workon cv

```
$ cmake -D CMAKE_BUILD_TYPE=RELEASE \
    -D CMAKE_INSTALL_PREFIX=/usr/local \
    -D OPENCV_EXTRA_MODULES_PATH=~/opencv_contrib/modules \
        -D PYTHON3_LIBRARY=`python -c 'import subprocess ; import sys ; s = subprocess.check_output("python-config --configdir", shell=True).decode("utf-8").strip() ; (M, m) = sys.version_info[:2] ; print("{}/libpython{}.{}.dylib".format(s, M, m))'` \
            -D PYTHON3_INCLUDE_DIR=`python -c 'import distutils.sysconfig as s; print(s.get_python_inc())'` \
    -D PYTHON3_EXECUTABLE=$VIRTUAL_ENV/bin/python \
    -D BUILD_opencv_python2=OFF \
    -D BUILD_opencv_python3=ON \
    -D INSTALL_PYTHON_EXAMPLES=ON \
    -D INSTALL_C_EXAMPLES=OFF \
    -D OPENCV_ENABLE_NONFREE=ON \
-D BUILD_EXAMPLES=ON ..” in the terminal
```

3.1.12. now to make OpenCV type "$ make" and then "$ sudo make install"

3.1.13. then do the following "$ ls /usr/local/python/cv2/python-3.6

3.1.14. Install OpenCV 4 on macOSShell

"$ cd /usr/local/python/cv2/python-3.6"
"$ sudo mv cv2.cpython-36m-darwin.so cv2.so"
"$ cd /usr/local/python/cv2/python-3.6"
"$ sudo mv cv2.cpython-36m-darwin.so cv2.so"

3.1.15. Were almost done so now type "$ cd ~/.virtualenvs/cv/lib/python3.6/site-packages/

3.1.16. $ ln -s /usr/local/python/cv2/python-3.6/cv2.so cv2.so"

3.1.17. Next up "$ workon cv

$ pip install imutils"

3.1.18. .And now we need to test if it works so type

```
"$ workon cv
$ python
>>> import cv2
>>> cv2.__version__
'4.0.0'
>>> exit()"
```

References

https://www.techtimes.com/articles/190438/20161231/how-to-set-up-your-raspberry-pi-3-a-step-by-step-guide.htm
https://www.pyimagesearch.com/2018/08/17/install-opencv-4-on-macos/
https://wiki.ros.org/kinetic/Installation/OSX/Homebrew/Source