Lab experiment - 3

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Subject: drone appls, components & assembly

Subject code: CSE2040

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Slot: L43+L44

Give step-by-step procedure for installing the simulation for drones along with prerequisites. It should be a complete manual for someone who wishes to install drone simulation software. Give respective screenshots for successful installation.

Follow the given steps for successful simulation of a drone:

1. **We first install the required dependencies like CMake and git**

```
sudo apt update && \
sudo apt install -y software-properties-common lsb-release && \
sudo apt clean all
wget -O - https://apt.kitware.com/keys/kitware-archive-latest.asc
2>/dev/null | gpg --dearmor - | sudo tee
/etc/apt/trusted.gpg.d/kitware.gpg >/dev/null
sudo apt-add-repository "deb https://apt.kitware.com/ubuntu/
$(lsb_release -cs) main" sudo apt update
sudo apt install kitware-archive-keyring
sudo rm /etc/apt/trusted.gpg.d/kitware.gpg
sudo apt update
sudo apt install cmake -y
sudo add-apt-repository -y ppa:git-core/ppa
sudo apt-get update
sudo apt-get install git -y

sudo apt-get install git zip cmake build-essential genromfs ninja-
build exiftool astyle -y pip3 install argparse empy toml numpy
pip3 install pandas jinja2 pyserial pyyaml
pip3 install pyulog
```

2. **Installing ROS and Gazebo**

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu
$(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-
key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654

## For keyserver connection problems substitute hkp://pgp.mit.edu:80
or hkp://keyserver.ubuntu.com:80 above.
sudo apt-get update
## Get ROS/Gazebo

sudo apt install ros-noetic-desktop-full -y ## Initialize rosdep
sudo rosdep init
rosdep update

## Setup environment variables
rossource="source /opt/ros/noetic/setup.bash"
if grep -Fxq "$rossource" ~/.bashrc; then echo ROS setup.bash
already in .bashrc; else echo "$rossource" >> ~/.bashrc; fi
eval $rossource

## Install rosinstall and other dependencies
sudo apt install python3-rosdep python3-rosinstall python3-
rosinstall-generator python3-wstool build-essential -y
```

```
# MAVROS: https://dev.px4.io/en/ros/mavros_installation.html
## Install dependencies
sudo apt-get install python3-catkin-tools python3-rosinstall-
generator -y #sudo apt-get install ros-noetic-geographic_info -y
sudo apt-get install ros-noetic-geographic-msgs -y
sudo apt-get install libgeographic-dev ros-noetic-geographic-msgs -y

pip3 install catkin_pkg pip3 install empy

## Create catkin workspace mkdir -p ~/catkin_ws/src
cd ~/catkin_ws
catkin init
```

```
ubuntu@ubuntu-VivoBook:~$ mkdir -p ~/catkin_ws/src
ubuntu@ubuntu-VivoBook:~$ cd ~/catkin_ws
ubuntu@ubuntu-VivoBook:~/catkin_ws$ catkin init
Initializing catkin workspace in `/home/ubuntu/catkin_ws`.
----------------------------------------------------------------
Profile:                     default
Extending:             [env] /opt/ros/melodic
Workspace:                   /home/ubuntu/catkin_ws
----------------------------------------------------------------
Build Space:       [missing] /home/ubuntu/catkin_ws/build
Devel Space:       [missing] /home/ubuntu/catkin_ws/devel
Install Space:      [unused] /home/ubuntu/catkin_ws/install
Log Space:         [missing] /home/ubuntu/catkin_ws/logs
Source Space:       [exists] /home/ubuntu/catkin_ws/src
DESTDIR:            [unused] None
----------------------------------------------------------------
Devel Space Layout:          linked
Install Space Layout:        None
----------------------------------------------------------------
Additional CMake Args:       None
Additional Make Args:        None
Additional catkin Make Args: None
Internal Make Job Server:    True
Cache Job Environments:      False
----------------------------------------------------------------
Whitelisted Packages:        None
Blacklisted Packages:        None
----------------------------------------------------------------
Workspace configuration appears valid.
----------------------------------------------------------------
ubuntu@ubuntu-VivoBook:~/catkin_ws$ wstool init src
Writing /home/ubuntu/catkin_ws/src/.rosinstall

update complete.
```

```
wstool  init  src

## Install MAVLink
###we use the Kinetic reference for all ROS distros as it's not
distro-specific and up to date
rosinstall_generator --rosdistro kinetic mavlink | tee
/tmp/mavros.rosinstall
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ rosinstall_generator --r
link | tee /tmp/mavros.rosinstall
- git:
    local-name: mavlink
    uri: https://github.com/mavlink/mavlink-gbp-release.git
    version: release/kinetic/mavlink/2021.3.3-1
```

```
## Build MAVROS
### Get source (upstream - released)
rosinstall_generator --upstream mavros | tee -a
/tmp/mavros.rosinstall
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ rosinstall_generator --upstream
 -a /tmp/mavros.rosinstall
Using ROS_DISTRO: melodic
- git:
    local-name: mavros
    uri: https://github.com/mavlink/mavros.git
    version: 1.15.0
```

3. **We will now setup the workspace**

```
#Install geographiclib
sudo apt install geographiclib-tools -y
echo "Downloading dependent script
'install_geographiclib_datasets.sh'"
# Source the install_geographiclib_datasets.sh script directly from
github install_geo=$(wget
https://raw.githubusercontent.com/mavlink/mavros/master/mavros/scrip
ts/install_geogra phiclib_datasets.sh -O -)
wget_return_code=$?
# If there was an error downloading the dependent script, we must
warn the user and exit at this point.
if [[ $wget_return_code -ne 0 ]]; then echo "Error downloading
'install_geographiclib_datasets.sh'. Sorry but I cannot proceed
further :("; exit 1; fi
# Otherwise source the downloaded script.
sudo bash -c "$install_geo"
## Build!
catkin build
## Re-source environment to reflect new packages/build environment
catkin_ws_source="source ~/catkin_ws/devel/setup.bash"
if grep -Fxq "$catkin_ws_source" ~/.bashrc; then echo ROS catkin_ws
setup.bash already in .bashrc;
else echo "$catkin_ws_source" >> ~/.bashrc; fi
eval $catkin_ws_source
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ catkin build
--------------------------------------------------------------
Profile:                     default
Extending:             [env] /opt/ros/melodic
Workspace:                   /home/ubuntu/catkin_ws
--------------------------------------------------------------
Build Space:        [exists] /home/ubuntu/catkin_ws/build
Devel Space:        [exists] /home/ubuntu/catkin_ws/devel
Install Space:      [unused] /home/ubuntu/catkin_ws/install
Log Space:         [missing] /home/ubuntu/catkin_ws/logs
Source Space:       [exists] /home/ubuntu/catkin_ws/src
DESTDIR:            [unused] None
--------------------------------------------------------------
Devel Space Layout:          linked
Install Space Layout:        None
--------------------------------------------------------------
```

```
 ]
Starting  >>> test_mavros
Finished  <<< test_mavros                          [ 58.3 seconds ]
[build] Summary: All 7 packages succeeded!
[build]   Ignored:   None.
[build]   Warnings:  2 packages succeeded with warnings.
[build]   Abandoned: None.
[build]   Failed:    None.
[build] Runtime: 49 minutes and 11.2 seconds total.
[build] Note: Workspace packages have changed, please re-source setup files
se them.
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ rosdep install --from-paths src --ignore-src -y

executing command [sudo -H apt-get install -y ros-melodic-geographic-msgs]
[sudo] password for ubuntu:
Sorry, try again.
[sudo] password for ubuntu:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libmbim-glib4 libmbim-proxy libqmi-glib5 libqmi-proxy usb-modeswitch
  usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  ros-melodic-uuid-msgs
The following NEW packages will be installed:
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ wstool update -t src -j4
[mavlink,mavros] still active
[mavlink] Fetching https://github.com/mavlink/mavlink-gbp-release.git (ver
rc/mavlink
[mavros] Fetching https://github.com/mavlink/mavros.git (version 1.15.0) t
Cloning into '/home/ubuntu/catkin_ws/src/mavlink'...
Cloning into '/home/ubuntu/catkin_ws/src/mavros'...
[mavlink,mavros] still active
remote: Enumerating objects: 20906, done.
remote: Counting objects: 100% (266/266), done.
remote: Compressing objects: 100% (160/160), done.
[mavlink,mavros] still active906)
remote: Enumerating objects: 36777, done.
remote: Counting objects: 100% (5896/5896), done.
remote: Compressing objects: 100% (3839/3839), done.
[mavlink,mavros] still active36777), 68.01 KiB | 127.00 KiB/s
[mavlink,mavros] still active/36777), 508.01 KiB | 197.00 KiB/s
```

4. **We will now download the QGroundControl to control the drone.**

```
sudo usermod -a -G dialout $USER

sudo apt-get remove modemmanager -y

sudo apt install gstreamer1.0-plugins-bad gstreamer1.0-libav
gstreamer1.0-gl -y

sudo apt install libqt5gui5 -y

sudo apt install libfuse2 -y
```

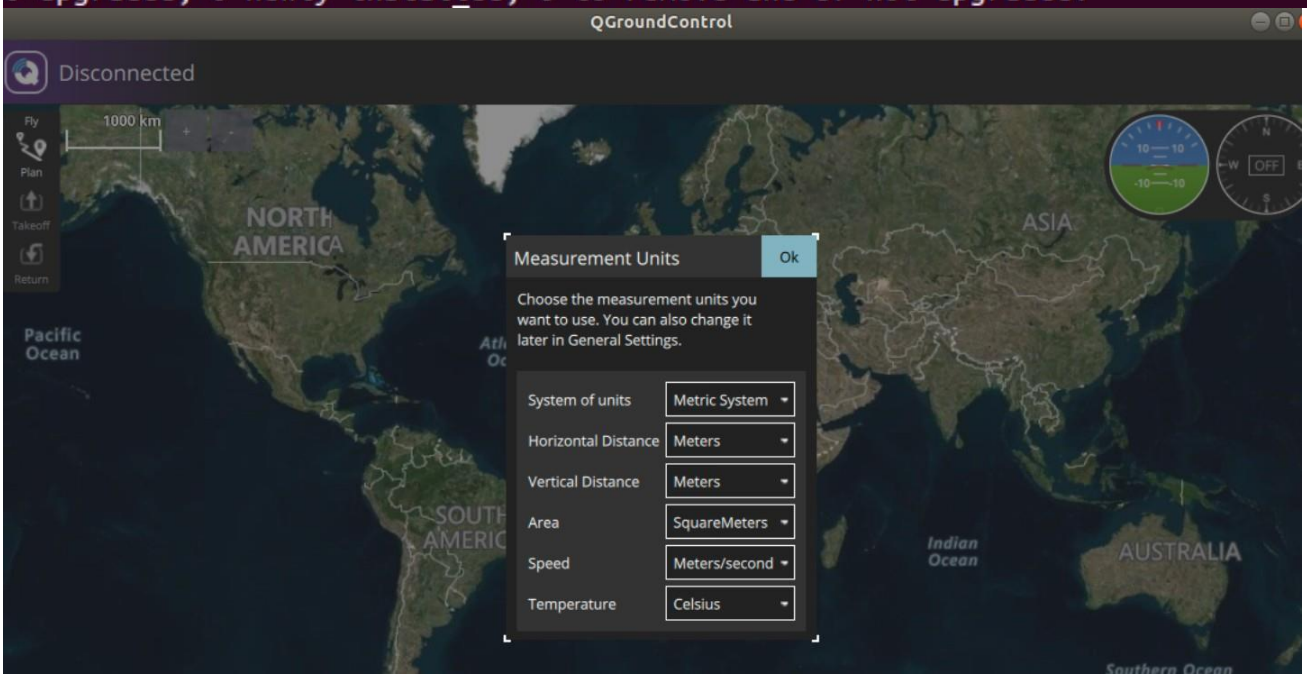
Download the image file from the official website

```
chmod +x ./QGroundControl.AppImage ./QGroundControl.AppImage
```

```
ubuntu@ubuntu-VivoBook:~/catkin_ws$ cd
ubuntu@ubuntu-VivoBook:~$ sudo usermod -a -G dialout $USER
[sudo] password for ubuntu:
ubuntu@ubuntu-VivoBook:~$ sudo apt-get remove modemmanager -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'modemmanager' is not installed, so not removed
The following packages were automatically installed and are no longer required
  libmbim-glib4 libmbim-proxy libqmi-glib5 libqmi-proxy usb-modeswitch
  usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 87 not upgraded.
```

```
ubuntu@ubuntu-VivoBook:~$ sudo apt install gstreamer1.0-plugins-bad gstreamer1.0
-libav gstreamer1.0-gl -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
gstreamer1.0-gl is already the newest version (1.14.5-0ubuntu1~18.04.3).
gstreamer1.0-libav is already the newest version (1.14.5-0ubuntu1~18.04.1).
gstreamer1.0-plugins-bad is already the newest version (1.14.5-0ubuntu1~18.04.1)
.
The following packages were automatically installed and are no longer required:
  libmbim-glib4 libmbim-proxy libqmi-glib5 libqmi-proxy usb-modeswitch
  usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 87 not upgraded.
```

```
ubuntu@ubuntu-VivoBook:~$ sudo apt install libqt5gui5 -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
libqt5gui5 is already the newest version (5.9.5+dfsg-0ubuntu2.6).
The following packages were automatically installed and are no longer required:
  libmbim-glib4 libmbim-proxy libqmi-glib5 libqmi-proxy usb-modeswitch
  usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 87 not upgraded.
ubuntu@ubuntu-VivoBook:~$ sudo apt install libfuse2 -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
libfuse2 is already the newest version (2.9.7-1ubuntu1).
The following packages were automatically installed and are no longer required:
  libmbim-glib4 libmbim-proxy libqmi-glib5 libqmi-proxy usb-modeswitch
  usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 87 not upgraded.
```

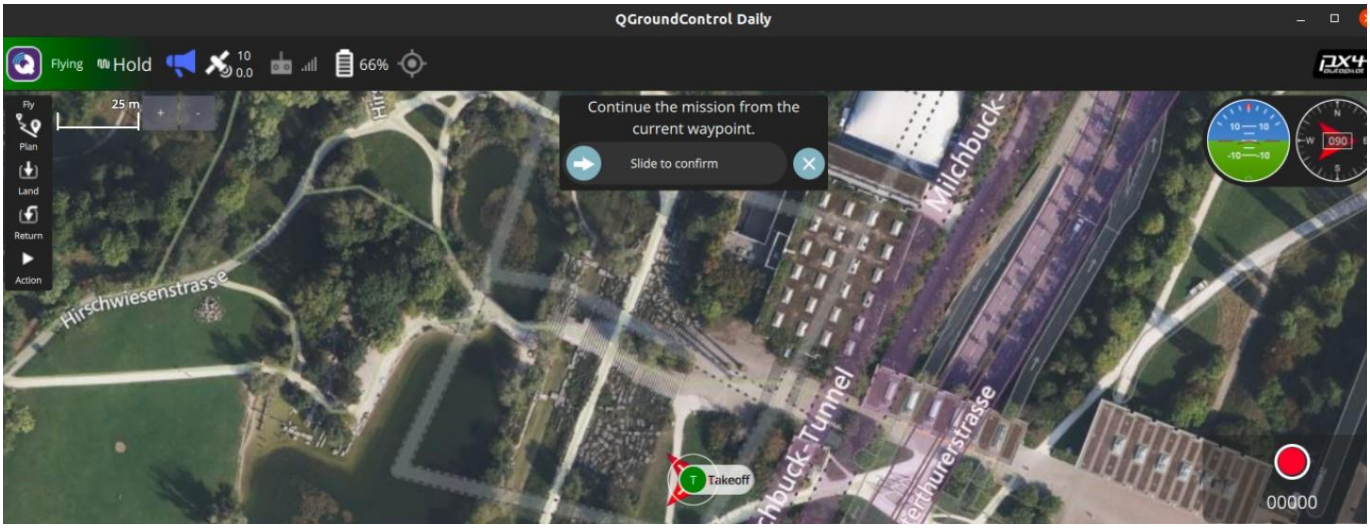


5. **We will now download the PX4 code**

```
ubuntu@ubuntu-VivoBook:~/Downloads$ git clone https://github.com/PX4/Firmware.gi
t
Cloning into 'Firmware'...
remote: Enumerating objects: 434610, done.
remote: Counting objects: 100% (834/834), done.
remote: Compressing objects: 100% (463/463), done.
remote: Total 434610 (delta 512), reused 593 (delta 369), pack-reused 433776
Receiving objects: 100% (434610/434610), 202.79 MiB | 2.74 MiB/s, done.
Resolving deltas: 100% (321672/321672), done.
Checking out files: 100% (5807/5807), done.
```

6. **We will now run Gazebo, PX4 and QGroundControl**

```
drones_lab $./QGroundControl.AppImage
Settings location "/home/kiran/.config/QGroundControl.org/QGroundControl Daily.i
ni" Is writable?: true
Filter rules "*Log.debug=false\nGStreamerAPILog.debug=true\nqt.qml.connections=f
alse"
System reported locale: QLocale(English, Latin, India) ; Name "en_IN" ; Preffere
d (used in maps):  "en-IN"
LocalizationLog: Qt lib localization for "en_IN" is not present
LocalizationLog: Error loading source localization for "en_IN"
LocalizationLog: Error loading json localization for "en_IN"
VideoReceiverLog: Stop called on empty URI
VideoReceiverLog: Stop called on empty URI
setCurrentPlanViewSeqNum
setCurrentPlanViewSeqNum
Adding target QHostAddress("127.0.0.1") 18570
setCurrentPlanViewSeqNum
setCurrentPlanViewSeqNum
ParameterManagerLog: Attemping load from cache
```



Working of the PX4 in Gazebo