First Install all the requirements

Installing Ardupilot and MAVProxy

Clone ArduPilot

In home directory:

```
cd ~
sudo apt install git
git clone https://github.com/ArduPilot/ardupilot.git
cd ardupilot
git checkout Copter-3.6
git submodule update --init –recursive
```

Install dependencies:

```
sudo apt install python-matplotlib python-serial python-wxgtk3.0 python-wxtools
python-lxml python-scipy python-opencv ccache gawk python-pip python-pexpect
```

Use pip (Python package installer) to install mavproxy:

```
sudo pip install future pymavlink MAVProxy
```

Open ~/.bashrc for editing:
```
gedit ~/.bashrc
```

Add these lines to end of ~/.bashrc (the file open in the text editor):

```
export PATH=$PATH:$HOME/ardupilot/Tools/autotest
export PATH=/usr/lib/ccache:$PATH
```

Save and close the text editor.

Reload ~/.bashrc:
```
. ~/.bashrc
```

Run SITL (Software In The Loop) once to set params:

```
cd ~/ardupilot/ArduCopter
sim_vehicle.py -w
```

Installing Gazebo and ArduPilot Plugin

Install Gazebo for *18.04*

```
sudo sh -c 'echo "deb http://packages.osrfoundation.org/gazebo/ubuntu-stable
`lsb_release -cs` main" > /etc/apt/sources.list.d/gazebo-stable.list'
```

Setup keys:

```
wget http://packages.osrfoundation.org/gazebo.key -O - | sudo apt-key add –
```

Reload software list:

```
sudo apt update
```

Install Gazebo:

Ubuntu [*18.04*]

```
sudo apt install gazebo9 libgazebo9-dev
```

Install Gazebo plugin for APM (ArduPilot Master) :

```
cd ~
git clone https://github.com/khancyr/ardupilot_gazebo.git
cd ardupilot_gazebo
```

Ubuntu 18.04 only checkout dev

```
git checkout dev
```

build and install plugin

```
mkdir build
cd build
cmake ..
make -j4
sudo make install
echo 'source /usr/share/gazebo/setup.sh' >> ~/.bashrc
```

Set paths for models:

```
echo 'export GAZEBO_MODEL_PATH=~/ardupilot_gazebo/models' >> ~/.bashrc
. ~/.bashrc
```

Run Simulator

In one Terminal (Terminal 1), run Gazebo:

```
gazebo --verbose ~/ardupilot_gazebo/worlds/iris_arducopter_runway.world
```

In another Terminal (Terminal 2), run SITL:

```
cd ~/ardupilot/ArduCopter/
sim_vehicle.py -v ArduCopter -f gazebo-iris --console
```

Install ROS and Setup Catkin

Install ROS

Setup your computer to accept software from packages.ros.org.

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc
/apt/sources.list.d/ros-latest.list'
```

Set up your keys

```
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1C
F6E31E6BADE8868B172B4F42ED6FBAB17C654
```

Installation

First, make sure your Debian package index is up-to-date:

```
sudo apt update
sudo apt install ros-melodic-desktop-full
```

Environment setup

It's convenient if the ROS environment variables are automatically added to your bash session
every time a new shell is launched:

```
echo "source /opt/ros/melodic/setup.bash" >> ~/.bashrc

source ~/.bashrc
```

To install this tool and other dependencies for building ROS packages, run:

```
sudo apt install python-rosdep python-rosinstall python-rosinstall-generato
r python-wstool build-essential

sudo apt install python-rosdep
```

With the following, you can initialize `rosdep`.

```
sudo rosdep init

rosdep update
```

Now we are creating a catkin workspace and copy paste ros packages from Zipfile then running catkin build. Follow below steps.

If you don't want to create your own catkin workshop, you can just copy the catkin_ws folder {submitted in zip folder} in your home directory and then run command catkin build

1. Set Up Catkin workspace

We use `catkin build` instead of `catkin_make`. Please install the following:

```
sudo apt-get install python-wstool python-rosinstall-generator python-catkin-tools
```

Then, initialize the catkin workspace:

```
mkdir -p ~/catkin_ws/src
cd ~/catkin_ws
catkin init
```

2. Dependencies installation

Install `mavros` and `mavlink` from source:

```
cd ~/catkin_ws
wstool init ~/catkin_ws/src

rosinstall_generator --upstream mavros | tee /tmp/mavros.rosinstall
rosinstall_generator mavlink | tee -a /tmp/mavros.rosinstall
wstool merge -t src /tmp/mavros.rosinstall
wstool update -t src
rosdep install --from-paths src --ignore-src --rosdistro `echo $ROS_DISTRO` -y

catkin build
```

Add a line to end of `~/.bashrc` by running the following command:
```
echo "source ~/catkin_ws/devel/setup.bash" >> ~/.bashrc
```

update global variables

```
source ~/.bashrc
```

install geographiclib dependancy

```
sudo ~/catkin_ws/src/mavros/mavros/scripts/install_geographiclib_datasets.sh
```

3. just copy paste three folder { interiit 21, opencvtest, iq_gnc} from submitted zip file

After copying all the three folders into **catkin_ws/src/** run the following command

```
echo
"GAZEBO_MODEL_PATH=${GAZEBO_MODEL_PATH}:$HOME/catkin_ws/src/interiit21/models" >>
~/.bashrc
```
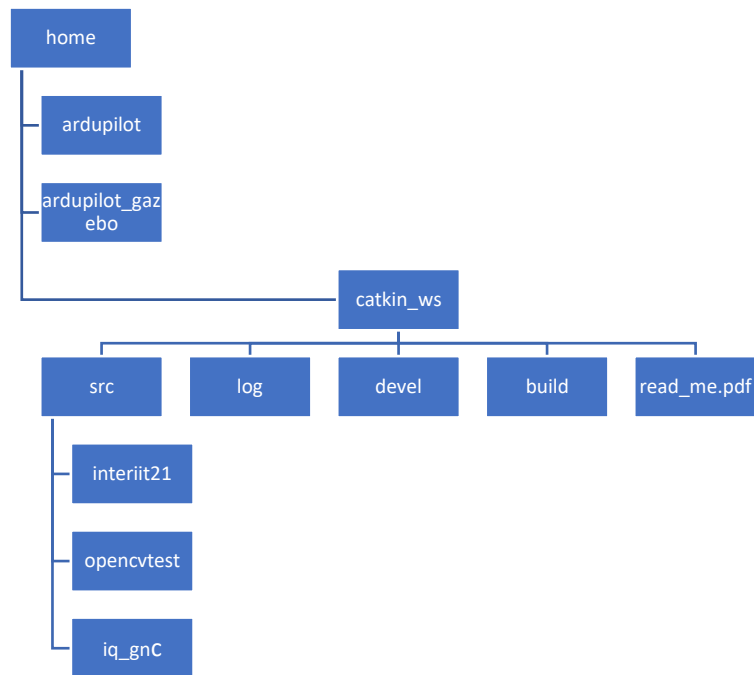
4. Build instructions

Inside `catkin_ws`, run `catkin build`:
```
cd ~/catkin_ws
catkin build
```

update global variables

```
source ~/.bashrc
```

Now we have setup almost everything, our folder structure will look like:

```
home
├── ardupilot
├── ardupilot_gaz
│   ebo
└── catkin_ws
    ├── src          log   devel   build   read_me.pdf
    │   ├── interiit21
    │   ├── opencvtest
    │   └── iq_gnC
```

Run the below commands in terminal to run the project {follow the below steps} :

Open terminal

Change directory by following command:

cd~ /catkin_ws/src/interiit21

Run following

bash ./start_sim.sh

At this point you will see a model loaded in gazebo with drone console. Keep looking at console until every system is ready

{ last two line looks like

APM:EKF2 IMU0 I using GPS,

APM:EKF2 IMU1 I using GPS,   }

Run following command in three new terminals to change directory

cd~ /catkin_ws/src

Run following command in terminal 1:

rosrun iq_gnc square

Run following command in terminal 2:

rosrun opencvtest DepthCamera2.py

Run following command in terminal 3:

rosrun opencvtest aruco2.py

Now you can start simulation by changing drone navigation mode to "GUIDED" . You can do this by typing following command in MAV> drone console

MAV> mode GUIDED

In case of any difficulties, you can contact:

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