

Hello fellow explorers, gone are the days when we would have to make perilous journeys in the quest for greatness and even the most diligent and courageous explorers covered minimal distances.

This is the era of modern technology we use drones to do all the work for us and hence I am giving you this manual which will aid you in your explorations

### Matlab Download

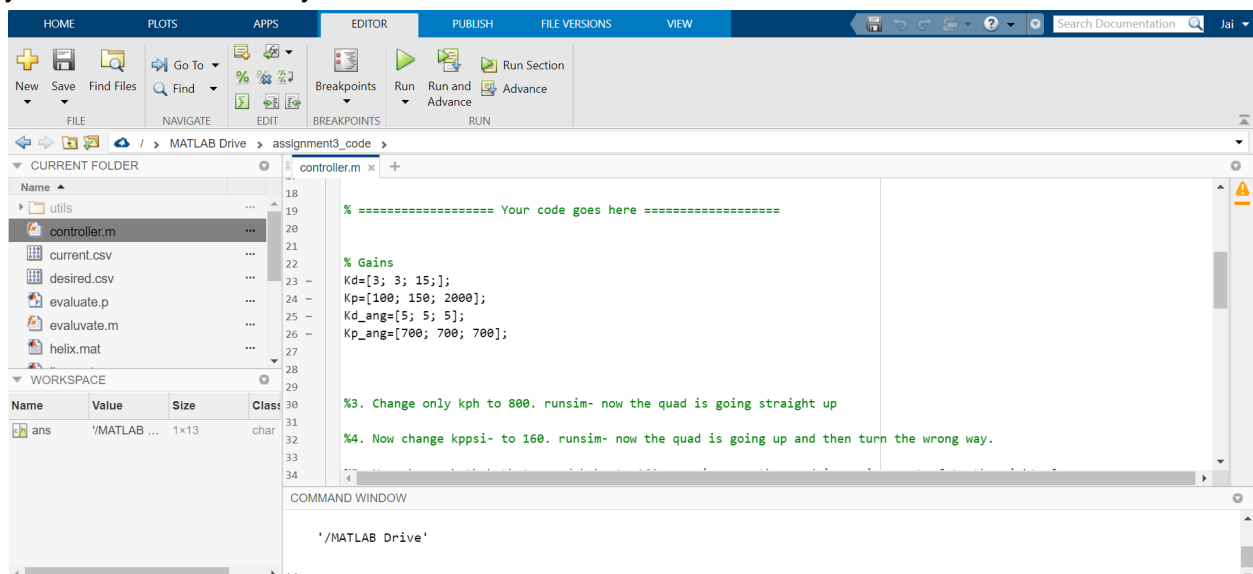
**It is highly recommended to use an offline version**, though I am attaching a [link](#) on how to work with Matlab online it just doesn't have the required processing power for the PS. That's the reason I'll go ahead and highlight the major stuff here you are recommended to use Matlab version 2019 and above for optimal usage (these are the ones tested by us).

First, you need to sign-up, go to <https://www.mathworks.com/mwaccount/> and register with your LDAP ID.

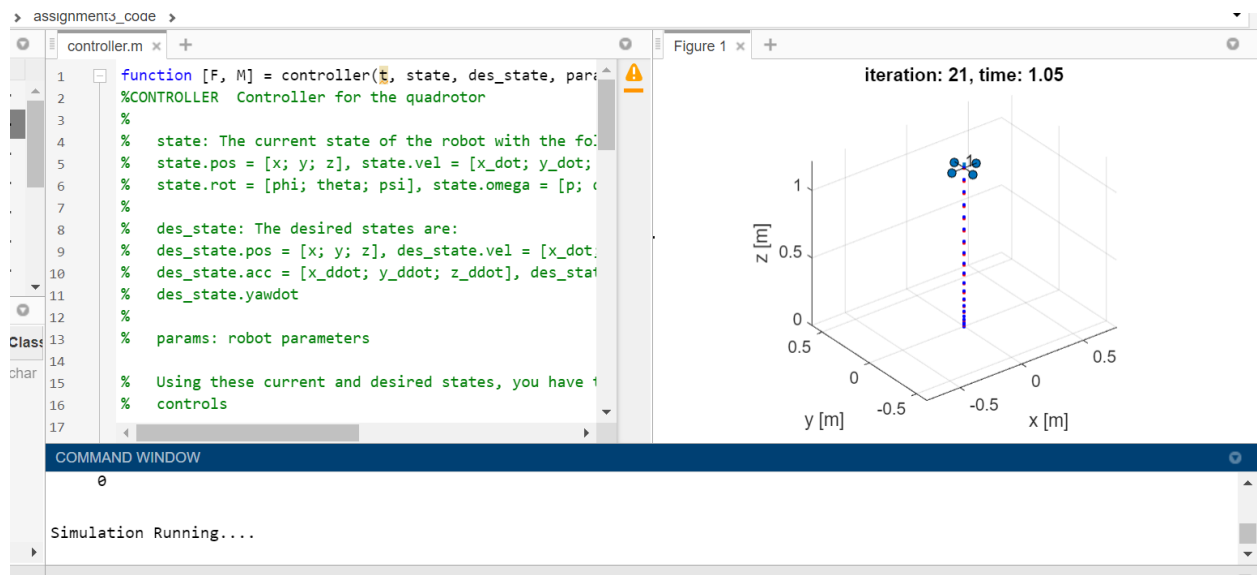
After that click on your profile and then on the license part, there you just need to follow steps and install.

### Introduction To Interface

In the given files your files of interest are **controller.m** and **traj\_line.m**, we have given you a default code for all the file so that you don't start from scratch but I'll give a general overview here so that you know what's happening, basically controller.m takes in the current state and the desired state and calculates the error to make the drone follow the trajectory for this one thing you need to do is tune your PID, more on it later.



One more thing you need to do to complete your PS is to design a trajectory for the same, in the code, we have given you a sample path, to check if you have reached this step without any mistakes write runsim and enter in the command window you'll get something like this



With this done let's move onto the Problem Statement

## PID Tuning

We have provided you with a suboptimally tuned PID, to tune it you need to go to controller.m under the comment gain update the values and use runsim to check for tuning. You may check the following videos for finer tuning

<https://youtube.com/playlist?list=PLn8PRpmsu08pQBjxYFXSsODEF3Jqmm-y>

<https://www.youtube.com/playlist?list=PLUMWjy5jgHK20UW0yM22HYEUTMJfla7Mb>

## Trajectory Planning

With PID sorted now we can focus on making a path so that you could cover as many points as you can as you already know the map now you need to decide on the points where the quad needs to go through as an example take 3 points: (0,0,0), (0,0,2) and (0,150,2) now you need to decide what will be the velocity and acceleration at all these points and the time at which these points needs to be attained (note this will depend on your tuning so be careful with the same)

Clearly at origin velocity is 0 and acc is 0

At (0,0,2) and (0,150,2) I assumed the velocity and acceleration to be 0 too

Now I'll find an interpolating polynomial parameterized with t of degree 5 and interpolating two points at a time (So basically a 5degree spline, you may use matrices for the same).

Use the above algorithm over all the points you planned to use and make the path in traj\_line.m, we will provide a sample path for help.