

Task 1A : Building a Control System

[task-1](#) , [blogpost-style](#)

[Smit](#) #1 September 12, 2022, 6:51am

[@sd22](#)



Task 1A Stabilising the Quadcopter

Aim

The aim of this task is to build a **PID** control system to stabilise the quadcopter at any given position in a simulation environment in Gazebo

Prerequisites

It is presumed that you have successfully completed Task 0 and completed the codechef challenge. Also this task involves writing programs in Python programming language, so get acquainted with the basics of Python and ROS libraries for Python. Follow the given resources to get started with the topics and do not limit yourself with the resources listed, internet is a vast ocean of knowledge, make use of it !

Installations

Before proceeding further, you need to install the some softwares and packages. To do that, follow these commands

- Create a catkin workspace

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

- Build your workspace

```
cd ~/catkin_ws
catkin build
```

- Each time you build your workspace, you need to source *setup.bash* file from the *catkin_ws/devel* folder. Instead of doing this manually, let us add a line in *.bashrc*

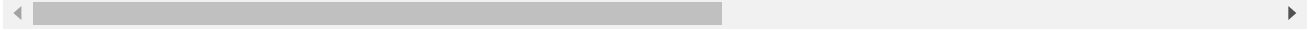
```
echo "source ~/catkin_ws/devel/setup.bash" >> ~/.bashrc
```

- Now clone the sentinel drone and other ros packages form GitHub

```
cd ~/catkin_ws/src
git clone https://github.com/erts-RnD/sentinel_drone.git --recursive
git clone https://github.com/simmubhangu/pid_tune.git
```

- Install dependencies

```
sudo apt install ros-noetic-octomap-msgs ros-noetic-octomap-ros ros-noet
```



- Now build your workspace

```
cd ~/catkin_ws
catkin build
source ~/.bashrc
```

Resources

1. Python

[Python for Beginners - Learn Python in 1 Hour - Programming with Mosh](#)

2. ROS

[ROS Tutorials - ROS wiki](#)

Go through the tutorials till section **1.16**

3. Getting started with Quadcopters

[Getting started with Quadcopters](#)

4. Understanding the edrone model in gazebo simulator

[Understanding the edrone model in gazebo](#)

5. PID controller

[Understanding PID Control, Part 1: What Is PID Control? - MATLAB](#)

[PID controller for Sentinel Drone](#)

6. Walkthrough and live Q&A session for task 1

Stay tuned for live session for task 1

Problem Statement

- The task is to build a PID controller for controlling position (x,y,z) of the quadcopter in Gazebo world.
- The PID controller will be a closed loop controller with real time position of the quadcopter being fed-back to the controller as a feedback.
- The output of the controller will be commands to the quadcopter as angle-setpoints which the quadcopter is supposed to tilt at.
- The PID controller will be written as a *roscnode* written in python programming language
- After the PID controller is build and tuned successfully, the quadcopter should be able to move and stabilise at the given setpoint **[2,2,20]** in the gazebo environment and stay within the error range of **$\pm 0.2\text{m}$** in all the coordinates.
- Refer to the expected output section to check the output of a PID controller

Procedure

- Launch the Gazebo world containing the quadcopter and the overhead camera by typing the following command

```
roslaunch sentinel_drone task_1.launch
```

- Read the boiler-plate python program *position_hold.py* given in the *catkin_ws/src/sentinel_drone/sentinel_drone/scripts* folder thoroughly and complete the script to build the PID controller
- Tune the PID controller to optimise the performance of the quadcopter and achieve the desired output. After tuning, fix the P, I and D gains in your python script.
- Follow the recording and submission instructions to submit your task

Recording and Submission instructions

Recording and submission instructions will be added soon

Deadline

Deadline for Task 1A is 14th October 23:59 hrs

All the best !!

Next: [Task 1B: Geo referencing aerial image using QGIS](#)

5 Likes

[Understanding the edrone model in gazebo](#)

[Smit](#) closed #2 September 12, 2022, 7:06am

[Smit](#) unlisted #3 September 12, 2022, 7:06am

[Smit](#) listed #4 September 12, 2022, 7:07am