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COSC 480 Cloud Computing
Fall 2019

Drone Project: Part 1

WHAT WE GOT TO WORK

Regular Assignment:

- Installed Ubuntu v19.04 on my MS Windows 7 laptop.
- Installed Python3, Pip3, TelloPy and related dependencies.
- Made TelloPy work with keyboard and video on Ubuntu
- Made TelloPy work with a controller and video.

Extra Credit (26 pts):

- Made TelloPy work with a total 3 controllers
  - PS4 (both wired and wireless)
  - Xbox (wired only)
  - PS3 (both wired and wireless
- Modified code to allow user to program buttons for any controller.
- Extended TelloPy to print in-flight data to console.

Additional Work:

- Wrote a Python script to test joystick input and report button/joystick commands. This helped not only to insure the joystick was reporting but to assign buttons to various TelloPy commands.

WHAT WE TRIED HARD BUT DIDN'T GET TO WORK

- Did not get keyboard controls working on Windows OS.
- While we can display altitude, have not yet figured out how to display x, y coordinates.

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TUTORIAL

Install Ubuntu as a second OS:

While installing Ubuntu wasn't too troublesome, it was time-consuming. The main steps include:

1. Backup your hard drive (or at a minimum your personal files)
2. Make a new partition on your hard drive to hold Ubuntu
3. Create a bootable Ubuntu installation disk
4. Install Ubuntu

This site Ultimate Windows 7-Ubuntu Dual Boot Guide is a great reference. The only hiccup I had is that I originally created the bootable Ubuntu flash drive using the .iso image that comes with USB Installer utility and it did not work. Once I downloaded the official .iso image from Ubuntu and created to bootable flash drive from that, things progressed smoothly.

Install Python3 and Pip3:

For my first attempt to install pip, I used the command "sudo apt install python-pip". I then proceeded to install TelloPy and related libraries. While I got the keyboard working, I could not get the joystick working. I realized that I was using an older version of python and pip that seemed to be causing trouble with the Pygame library that handles joystick communication. Once I installed Python 3.73 and reinstalled all dependencies, controlling the drone went smootly.

Install TelloPy:

The TelloPy library can be installed with "pip install tellopy" (or pip3 depending on your python version). But I do recommend cloning the TelloPy repository and building it from source so you can use the development version 0.7.0. It seems to handle logging better and produced fewer error messages than the most recent released version (0.6.0).

Install TelloPy Dependencies:

The required dependencies can be found on the TelloPy GitHub site. While I original had trouble installing the 'av' package, once I updated to the current versions of python and pip, I had no further trouble.

Install mplayer:

You can install the mplayer video player with the command "sudo apt install mplayer". I originally tried a highly recommended video player, VLC media player, but only got black and white video. After installing mplayer, I was able to get full color video.

Run TelloPy example scripts:

At this point you should have everything you need to run the TelloPy example scripts found in the TelloPy installation directory. There is a one for simple takeoff; one for keyboard and video; and one for joystick and video. The scripts include keyboard and joystick mappings in the comments and code.

Notes on Joystick Use:

If you receive a message saying “no supported joystick found”, you will need to determine the name of the controller and modify the python script. The controller name is typically printed with the error message. In the ‘main’ function of the script there is a series of if/else statements that are used to identify your joystick. Add your joystick name to the appropriate list of joysticks and your joystick should be recognized.

Joystick customization:

I wrote a simple Python script to test they joystick is successfully connected to the computer and to find the button numbers, axis numbers and axis values. This helped me to customize the controls and map different commands to the joystick.

My partner, Xavier, modified the code such that it will prompt you to push the joystick button you want to use for specific functions.

Data output:

By default, the joystick example script will print basic flight data. Additional flight data is available and the output can be customized by modifying the ‘handler’ function to print the desired data. Below is reference information to show what information is made available.

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Tello Drone and TelloPy Reference Information

INPUT EVENTS:

Event Number	Event Enum	Event Data
2	KEYDOWN	key, mod, unicode, scancode
3	KEYUP	key, mod
4	MOUSEMOTION	pos, rel, buttons
5	MOUSEBUTTONDOWN	pos, button
6	MOUSEBUTTONUP	pos, button
7	JOYAXISMOTION	joy, axis, value
8	JOYBALLMOTION	joy, ball, rel
9	JOYHATMOTION	joy, hat, value
10	JOYBUTTONDOWN	joy, button
11	JOYBUTTONUP	joy, button
12	QUIT	none

FLIGHT DATA PROPERTIES:

```
{
        'battery_low': 0,              ‘battery_lower': 0,                  'battery_percentage': 69,
        'battery_state': 0,            'camera_state': 0,                   'down_visual_state': 0,
        'drone_battery_left': 0,       'drone_fly_time_left': -61591,       'drone_hover': 0,
        'em_open': 0,                  'em_sky': 0,                         'em_ground': 0,
        'east_speed': 0,               'electrical_machinery_state': 0,     'factory_mode': 0,
        'fly_mode': 6, '               fly_speed': 0,                       'fly_time': 106,
        'front_in': 0,                 'front_lsc': 0,                      'front_out': 0,
        'gravity_state': 0,            'ground_speed': 0,                   'height': 0,
        'imu_calibration_state': 0,    'imu_state': 0,                      'light_strength': 0,
        'north_speed': 0,              'outage_recording': 0,               'power_state': 0,
        'pressure_state': 0,           'smart_video_exit_mode': 0,          'temperature_height': 1,
        'throw_fly_timer': 0,          'wifi_disturb': 0,                   'wifi_strength': 0,
        'wind_state': 0
}
```