1. Experiment Title and Objective

1.1. Title of the Experiment

> Camera Framing Experiment

1.2. Objective of the Experiment

> Get three camera images in RGB, grayscale and depth through python interface.

1.3. Key Learning Outcomes

> Config.json file for camera sensor configuration, the configuration parameters are explained below:

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    "SeqID" stands for the first sensor. This represents the 1st sensor (the free version only supports 2 plots).
    "TypeID" stands for sensor type ID, 1:RGB map (free version only supports RGB map), 2:depth map, 3:grayscale  map. "TargetCopter" is the ID of the target aircraft loaded by the sensor, which can be changed.
    "TargetMountType" represents the coordinate type, 0: fixed on the plane (relative geometric center), 1: fixed on the plane      (relative bottom center), 2: on fixed ground (monitoring) also variable.
    "DataWidth" is the data or image width here 640, "DataHeight" is the data or image height here 480.  "DataCheckFreq " Check Data Update Frequency is 30HZ here.
    "SendProtocol[8]" is the transmission mode and address, SendProtocol[0] takes the value 0: shared memory (free version only supports  shared memory), 1: UDP direct png compressed, 2: UDP direct image uncompressed, 3: UDP direct jpg compressed; SendProtocol[8] is the transmission method and address.    SendProtocol[1-4]: IP address; SendProtocol[5] port number.
    CameraFOV" is the field of view of the camera (vision sensors only), and can be changed in degrees.
    "SensorPosXYZ[3]" is the sensor mounting position, the unit meters can also be changed.
    "SensorAngEular[3]" is the sensor mounting angle in degrees °  can also be changed.
    The data output from the depth camera is stored and transmitted as uinit16, which has a range of 0 to 65535. by default    By default, one unit represents 1mm (controlled by otherParams[2]), which means the maximum range is 0 to 65.535 meters.   However, the data range does not represent the actual detection distance of the camera, and it is necessary to set the minimum detection distance in otherParams[0].     otherParams[1] sets the maximum detection distance. otherParams[0]: the minimum recognition distance of the depth camera (single bit meters), if the depth distance is less than 0 to 65.535 meters, the maximum range is 0 to 65.535 meters.  otherParams[0]: the minimum recognition distance of the depth camera (in meters), if the depth distance is less than this value, then output NaN corresponds to 65535. otherParams[1]: the maximum recognition distance of the depth camera (in meters).          OtherParams[1]: the maximum recognition distance of the depth camera (unit meter), if the depth distance is greater than this value, then the output NaN corresponds to 65535.   otherParams[2]: the scale unit of the output value of the depth camera uint16 (unit meter), by default the depth value is in milliseconds, so you need to fill in 0.      By default, the depth value is in milliseconds, so you need to fill in 0.001. Note, if you fill in 0 for the default value, it will be replaced with otherParams[2]=0.001. actual depth value in meters = depth picture value (uint16 range) * otherParams[2].
```

2. Experimental Results

In this experiment, Json defines three cameras, RGB, grayscale, and depth, and displays the images in real time.

3. File Contents

Folder/File Name	clarification
VisionCapAPIDemo.bat	Starting the emulation profile
VisionCapAPIDemo.py	Python experiment code
Config.json	Vision Sensor Profiles

4. Operating Environment

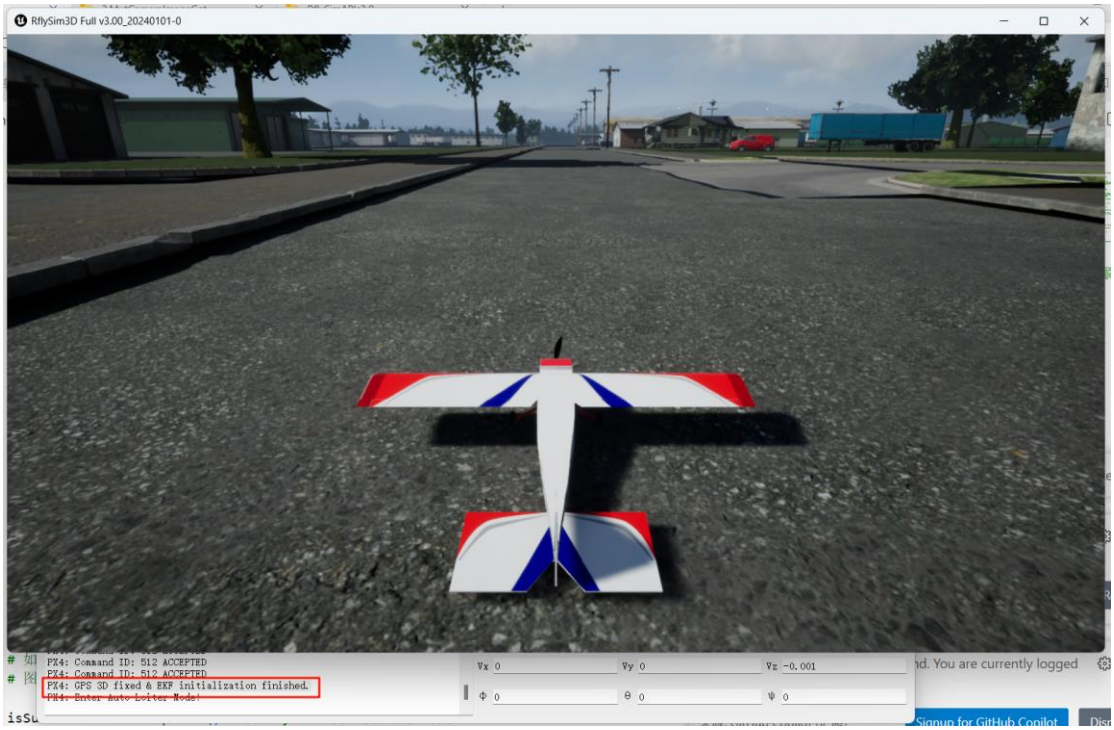
serial number	**Software Requirements**	**hardware requirement**	
		name (of a thing)	**quantities**
1	Windows 10 and above	Laptop/Desktop①	1
2	RflySim Platform Free Edition and above		
3	Visual Studio Cod		

①: Recommended configurations can be found at: https://doc.RflySim.com

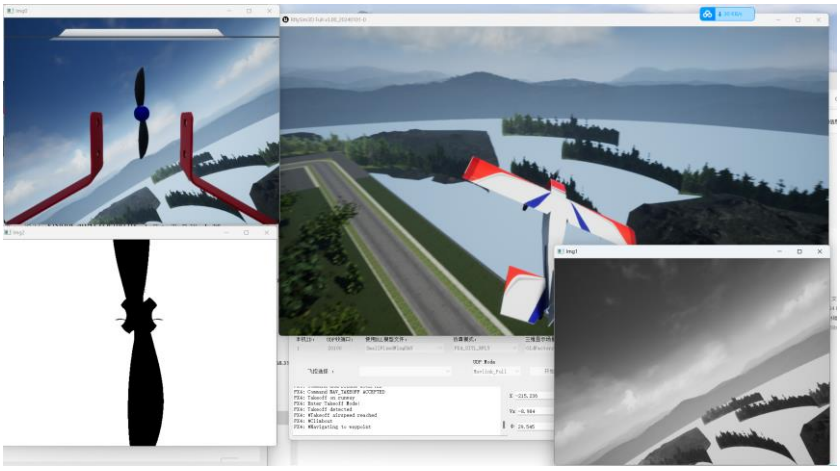
5. Experimental Procedure

5.1. camera pickup

Run VisionCapAPIDemo.bat as administrator to start the SITL software in-loop simulation. One QGC ground station will be started, one CopterSim software with GPS 3D fixed & EKF initialization finished must be printed in the log bar under the software to indicate that the initialization is complete, and one UAV will be available in the RflySim3D software.



Use VScode to open to the path folder of this experiment, run the VisionCapAPIDemo.py file. And press T to turn on or off the airplane track recording function , T+number * to turn on/change the track thickness to *. Config.json file creates three cameras, one RGB map camera, one depth map camera, and one grayscale map camera. there is also a data printout in VScode, and you can s ee the effect as shown in the following figure.



In the Command Prompt CMD window opened by the "VisionCapAPIDemo.bat" script show n below, press the Enter key (any key) to quickly close all programs such as CopterSim, QGC, Rfl ySim3D and others.

In VS Code, click on "Terminate Terminal" to exit the script completely.

6. References

[1] None.

7. Frequently Asked Questions (FAQs)

Q1:***

A1:***