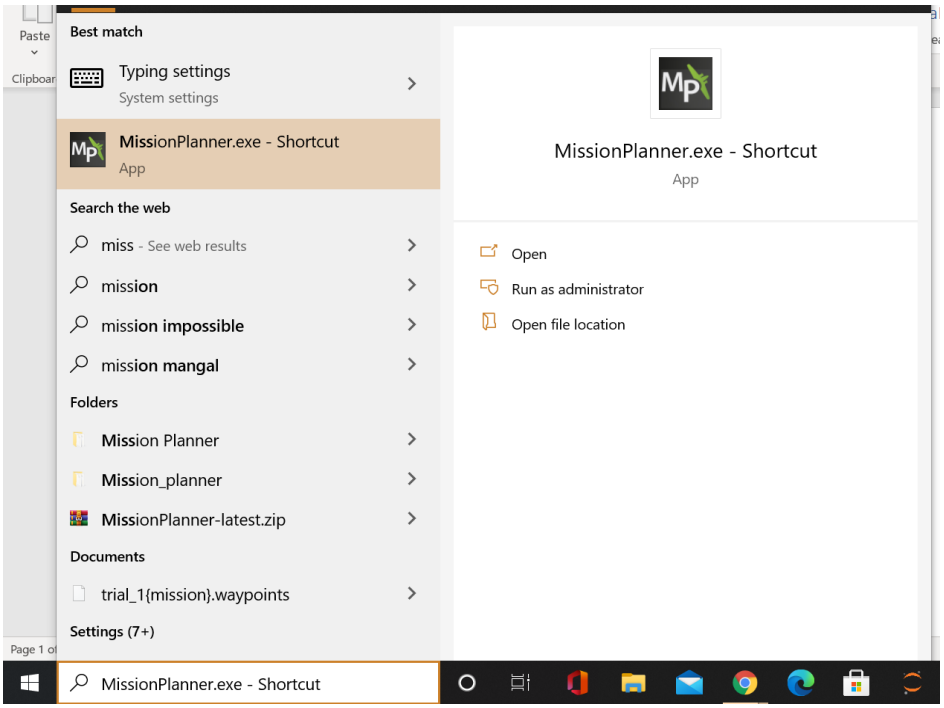
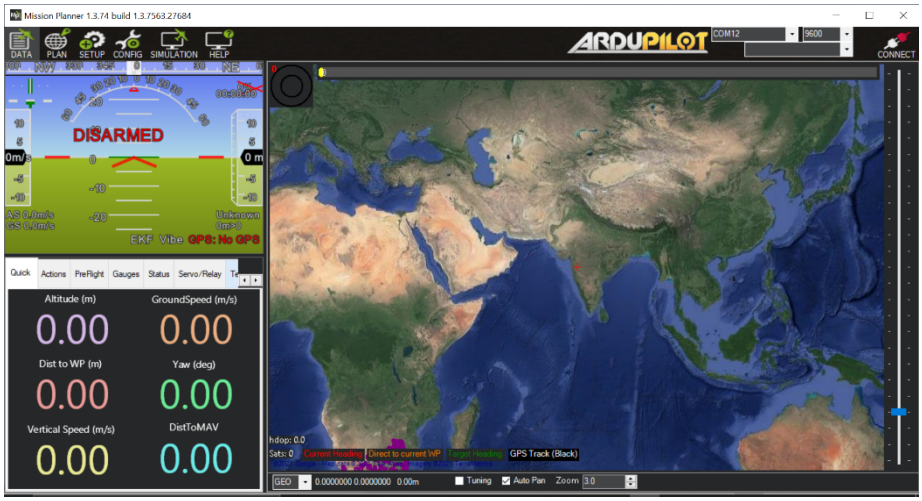
Manual for Drone:

<u>For Creating a Mission Plan</u>:

1) Open the Mission Planner application on your computer.



It will direct you to the home-screen of our software(Mission Planner), which will consist of all the important parameters related to our drone.

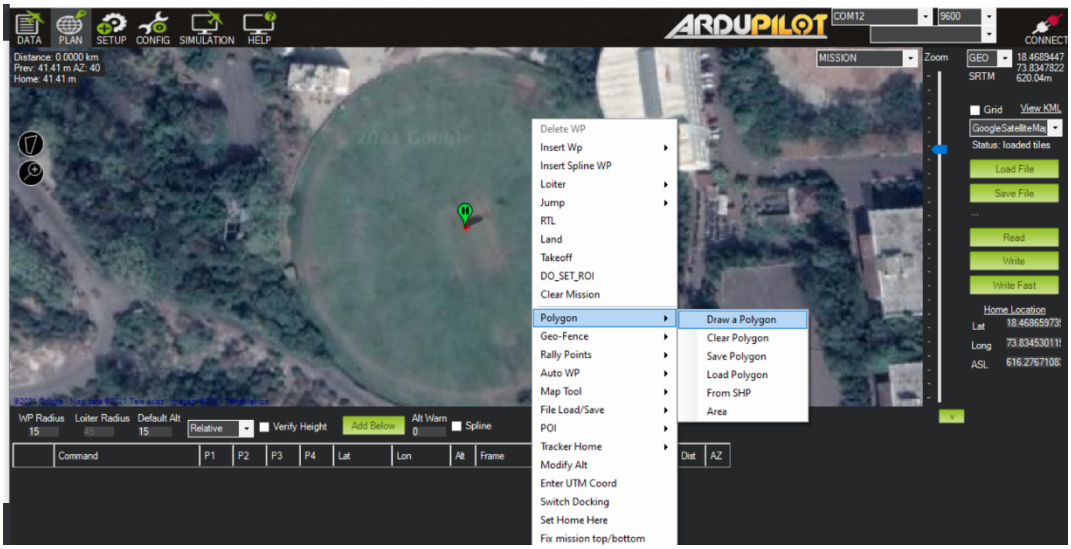


Home screen shows us the values of the sensors such as GPS, Gyro, Acceleremeter etc. It tells us about the status of our drone. As in this image the drone is not connected hence, in the right upper corner we have option of connect.

2) Click on the Plan option present on the left upper portion of your screen. It will direct you to the map simulation place where we can design the route which our drone would follow.

In this we have chosen the location of a cricket ground present in the premises of Sinhgad College of engineering, Pune. The screen shows us the exact latitude and longitude value on the lower right portion.

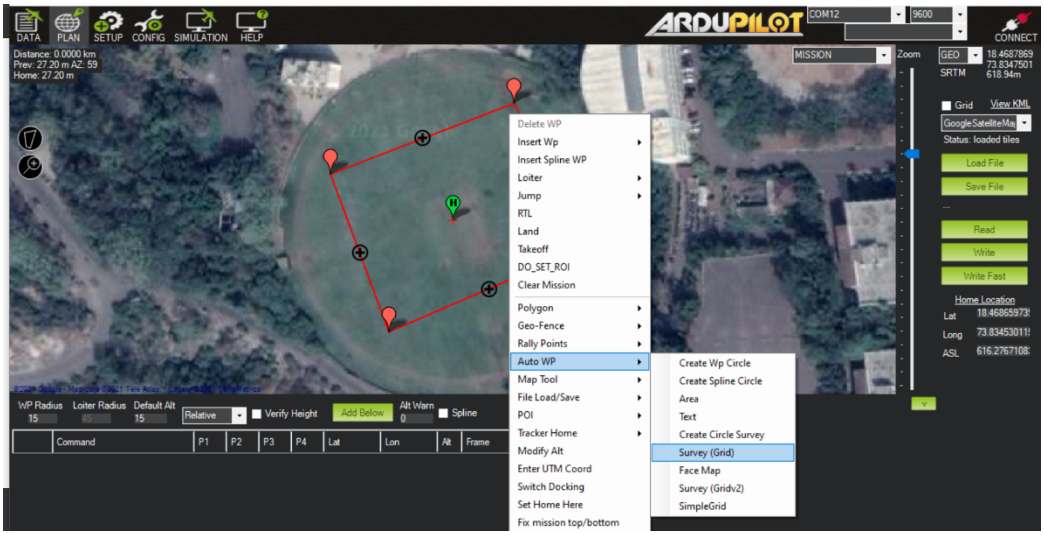
3) Right click on the virtual map to bring out the number of options availabe for planning a mission route.



4) Choose the “Polygon” option from the drop-down menu and then choose “Draw a Polygon” from the sub-options.

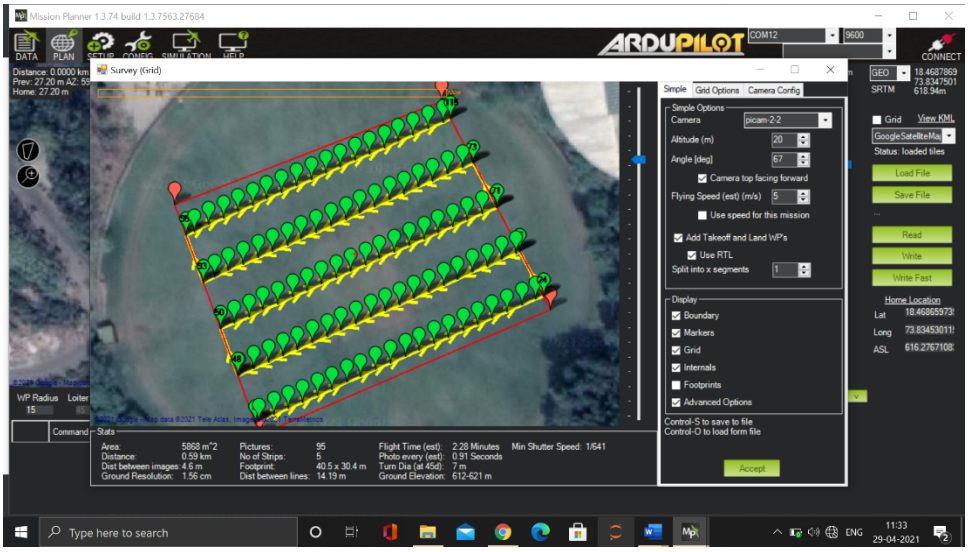
5) Draw a polygon using a cursor making a shape of your own choice. Need not to be regular or irregular.

6) After designing the shape, right click the cursor placing it inside the polygon.

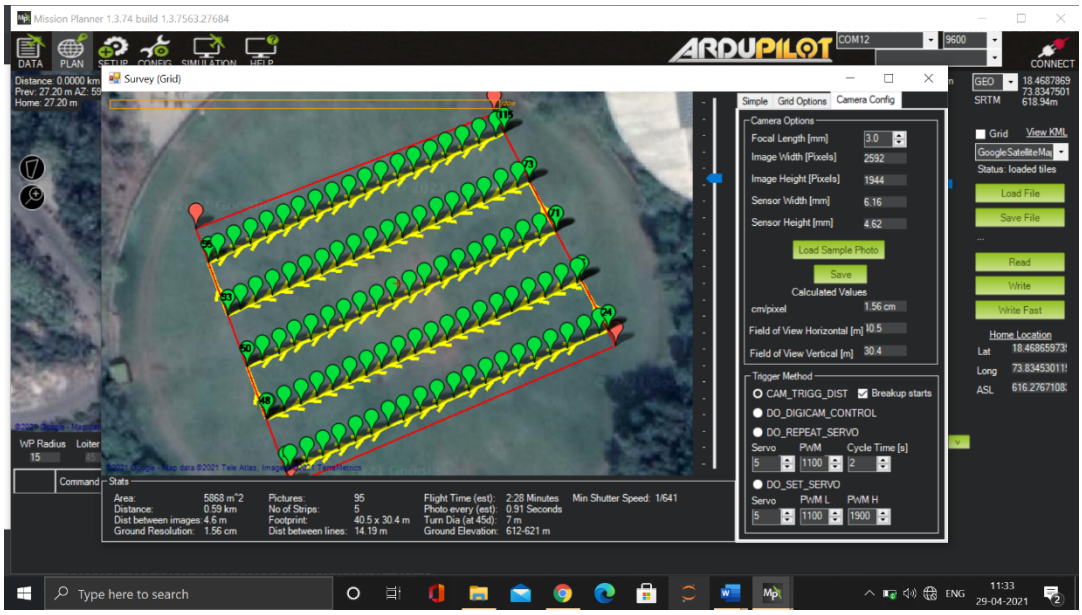


7) Choose the “Auto WP” option from the drop-down menu and then choose the option “Survey (Grid)” from the sub-option.

8) It will open a dialog-box which will explain about the parameters to choose and how many images will be clicked in the entire duration of the flight and time duration between two images, speed of the drone and at what altitude the drone will fly.



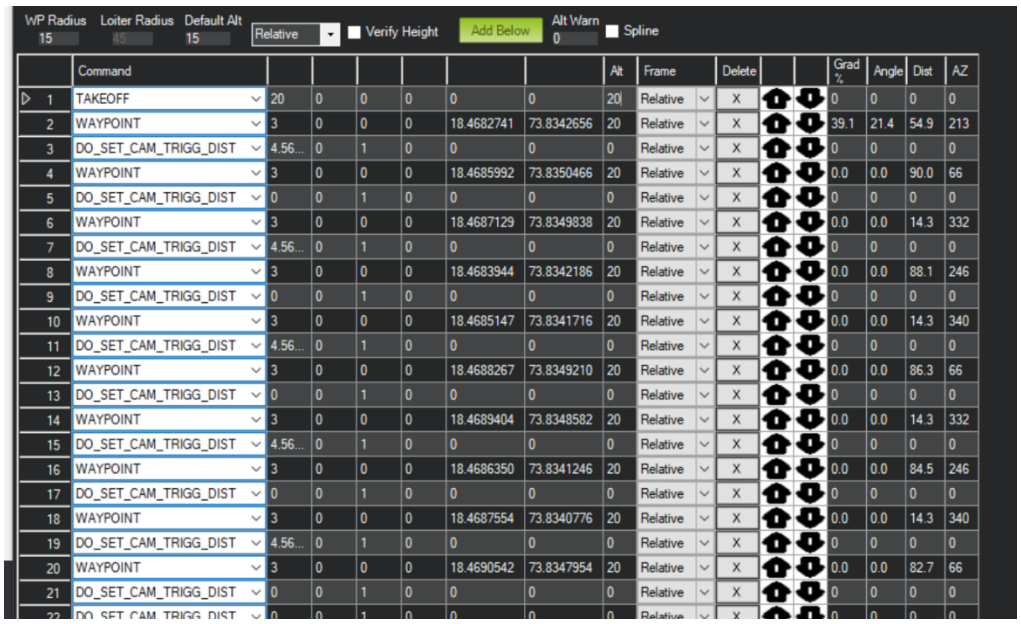
9) From the upper right portion of this dialog-box, click on the “Camera Config” and it will open the entire configuration of the camera which is installed with the drone to click the images.



Here we have choosen, the Pie-camera(custom designed by uploading the samples of the images clicked by the pi-camera) with the drone altitude to be set at 20m high. And we can see the number of images to be clicked are 96 and the focal length to be set at 3mm.

10) Hit on accept button in the lower right-corner of the dialog box. And after that we reach back to the map simulation, showing us this plan oin which it shows us the route our drone will follow while capturing the images of the land we covered using our polygon.

There will lot of instructions stored in the form of .waypoint file extention, which will let us know about the specifications of our drone flight.



WP Radius 15 | Loiter Radius 45 | Default Alt 15 | Relative | Verify Height | Add Below | Alt Warn 0 | Spline

	Command							Alt	Frame	Delete			Grad %	Angle	Dist	AZ
1	TAKEOFF	20	0	0	0	0	0	20	Relative	X			0	0	0	0
2	WAYPOINT	3	0	0	0	18.4682741	73.8342656	20	Relative	X			39.1	21.4	54.9	213
3	DO_SET_CAM_TRIGG_DIST	4.56...	0	1	0	0	0	0	Relative	X			0	0	0	0
4	WAYPOINT	3	0	0	0	18.4685992	73.8350466	20	Relative	X			0.0	0.0	90.0	66
5	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0
6	WAYPOINT	3	0	0	0	18.4687129	73.8349838	20	Relative	X			0.0	0.0	14.3	332
7	DO_SET_CAM_TRIGG_DIST	4.56...	0	1	0	0	0	0	Relative	X			0	0	0	0
8	WAYPOINT	3	0	0	0	18.4683944	73.8342186	20	Relative	X			0.0	0.0	88.1	246
9	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0
10	WAYPOINT	3	0	0	0	18.4685147	73.8341716	20	Relative	X			0.0	0.0	14.3	340
11	DO_SET_CAM_TRIGG_DIST	4.56...	0	1	0	0	0	0	Relative	X			0	0	0	0
12	WAYPOINT	3	0	0	0	18.4688267	73.8349210	20	Relative	X			0.0	0.0	86.3	66
13	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0
14	WAYPOINT	3	0	0	0	18.4689404	73.8348582	20	Relative	X			0.0	0.0	14.3	332
15	DO_SET_CAM_TRIGG_DIST	4.56...	0	1	0	0	0	0	Relative	X			0	0	0	0
16	WAYPOINT	3	0	0	0	18.4686350	73.8341246	20	Relative	X			0.0	0.0	84.5	246
17	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0
18	WAYPOINT	3	0	0	0	18.4687554	73.8340776	20	Relative	X			0.0	0.0	14.3	340
19	DO_SET_CAM_TRIGG_DIST	4.56...	0	1	0	0	0	0	Relative	X			0	0	0	0
20	WAYPOINT	3	0	0	0	18.4690542	73.8347954	20	Relative	X			0.0	0.0	82.7	66
21	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0
22	DO_SET_CAM_TRIGG_DIST	0	0	1	0	0	0	0	Relative	X			0	0	0	0

Explaining us about the different action taking place at different instance of time.We are alllowed to make changes between the parameters such as height at which the drone will reach while taking off, the altitude of the entire flight etc.

11) Now our Flight Plan is ready for the execution, to save this plan in your local computer storage. Click the “Save File ” option present in the mid- right of the

screen. It will save the file , providing the name user provide, with the file extention of .waypoint .

12) To upload the entire plan on the drone flight controller(Pixhawk in our case), connect the pixhawk with the type b data USB connecter to your computer where you are running Mission planner.
13) Hit “Connect” button present on the upper right corner of the screen and give the system around 5-10 seconds to establish the connection between the drone and the computer.
14) After getting connected go the “Plan” section and click on the “Load File” option present in the mid- right, above the “Save File” option. And choose the file which you named earlier and click on it.
15) This will show the last plan you created on te map simulation present on the screen.
16) Click on the “Write” option present below “Save File”.
17) You can click on “Read” option to find out the plan already present in the pixhawk.
18) After “Write” option, give your drone some time to finish uploading the plan. And after that, your drone is ready to get Armed and fly the route which you planned for it.

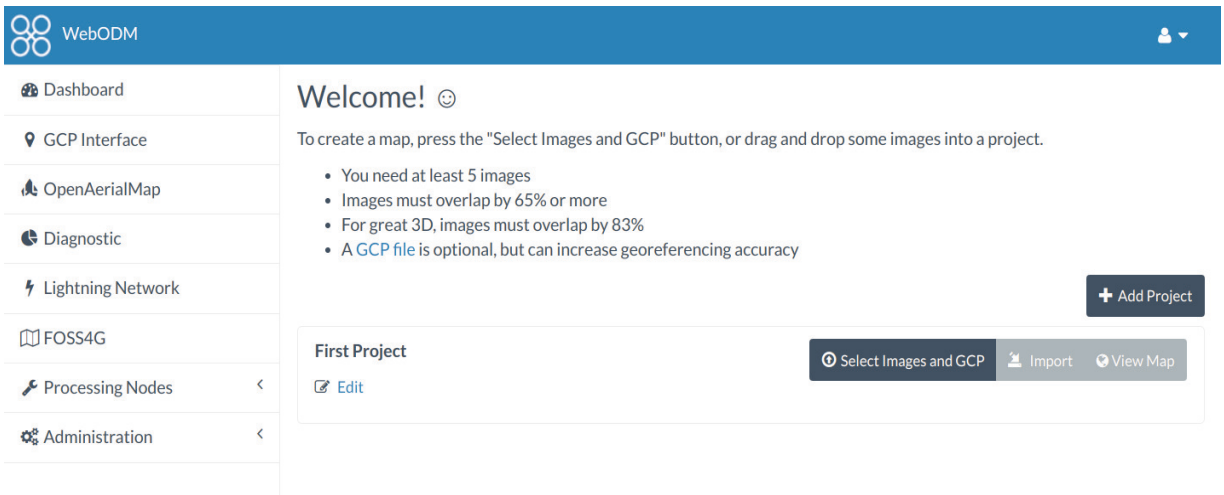
For Creating Orthomosaic map:

The last step is creating a Orthomosaic map, which serves as the output of our Project.

A) Using WEBODM:

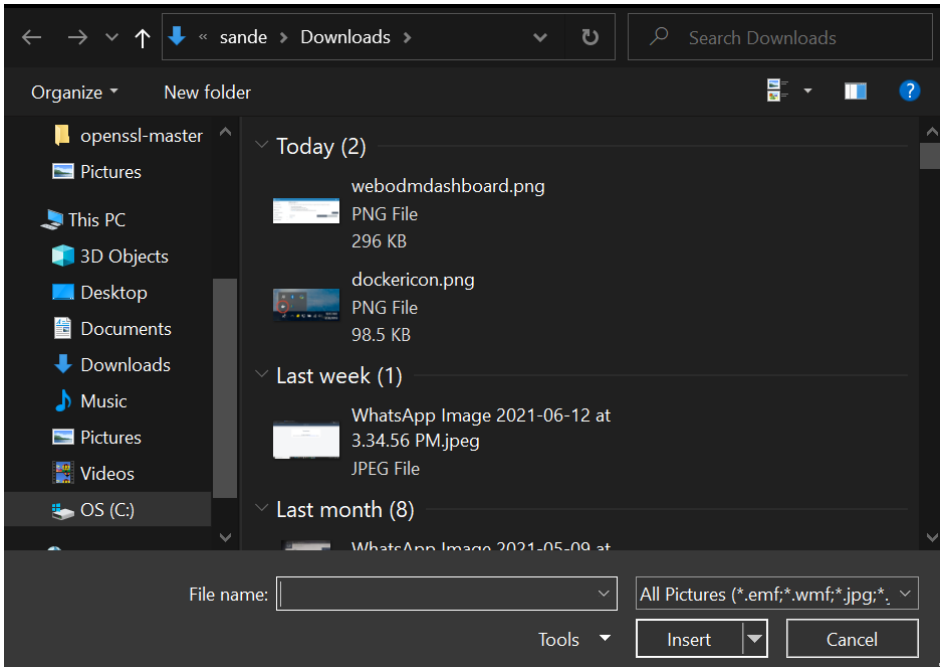
1) Switch on the PC where WEBODM is installed.
2) Click on the Docker

3) After some time, you will receive the notification of docker started running succesfully. Open any web-browser present on the device and enter the local host ip- address. "https://localhost8000/"
4) It will direct you to the Home-page of the WEBODM platform, which looks like it is given in the image below:

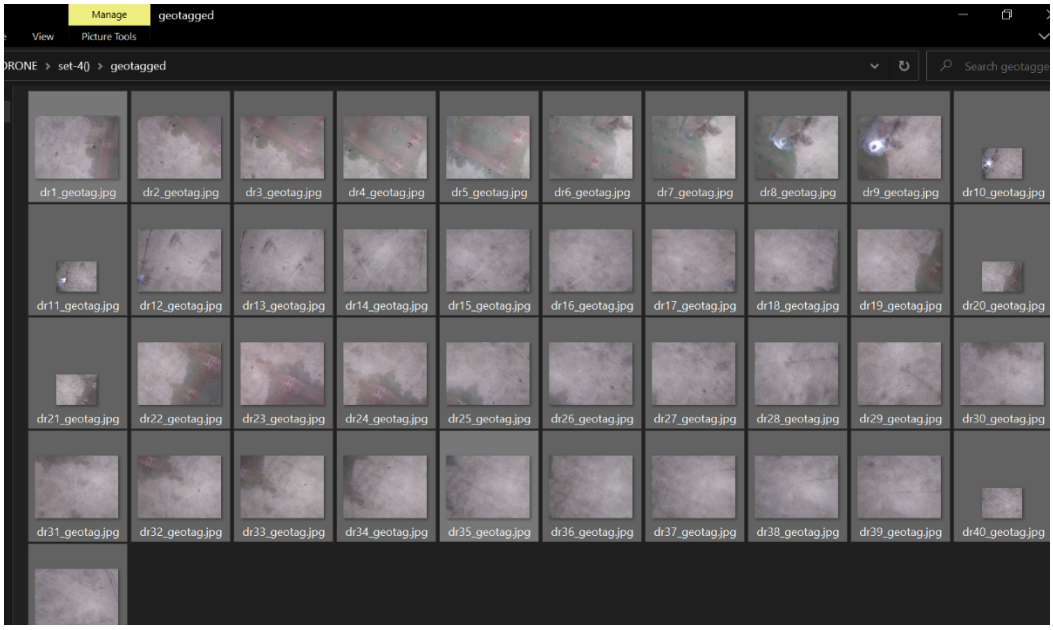


5) Click on the "Select Images and GCP" option present on the home-page or Dashboard on the screen.

6) It will open a dialog box, searching inside the local memory of the device and you are asked to navigate it to the location where your Geo-tagged images or the data-set is present.



7) Navigate to the location and select all the images present in your dataset.



8) Press insert, and all the images will be uploaded to the main-frame of the WEBODM under the name of new project.

9) AYou can change the name of the project by a single left on the already allocated name of the project.

10) After all images are uploaded, there will be numerous options available which we tune into to get the best ouput from our dataset.

11) Resize the images to 1024 x 720 pix, which will resize the image resolution of all the images to a specific pixels. Through this the processing of all the images as a group becomes easier.

12) Choose the number of cores to be "-1", which means it will utilize the maximum number of Processing cores present on our machine to bring the result faster than normal.

13) Choose the orthomosaic map , from the drop-down menu because our dataset is designed for the purpose of orthomosaic map and not for other things such as 3-d Model, Vegetation Index etc.

14) After setting all the parameter click on "Start Processing". [The processing takes few minutes completely based on the size of data. Dataset with 73 images and size 221 MB took 17 minutes and 15 seconds to complete.]

15) Once the processing is done , click on " View Orthomosaic" option, and it will direct you to a different screen loading the orthomosaic map in the free space of the screen with the various options to perform any kind of operation on it.

16) Upper right corner will have the option "Measurnments and Area", Click on that to get a custom cursor which could be used on the orthomosaic map.

17) Click on the map from where you wish to find the area of the bounded region.

18) Using the same cursor, make a dotted boundary around the region whose area you wish to calculate.

NOTE: More the number of dots covering the boundaries of the region, higher the accuracy of the result we get.

19) fter covering the entire region, A floating drop box will display the values such as Lenth , Area in Sq meters.
20) This is the final output which we receive giving us the area we require.