Sky Survey Manual

Setup:

Install python (we are using Python 3.x.x)
Set path. This lets you use pip from command prompt:
https://pythonpoint.net/how-to-set-python-path-in-windows-10/

Enter these commands in command prompt to install libraries
- pip install opencv
- pip install imutils
- pip install numpy

Instructions on how to set up environment

Be sure to keep the videos in the same folder as scripts.

Instructions on how to do areas

1. When you run the main program you will be asked to enter the filename of the video. This filename will be something like “DJI_613.mp4”.
2. After you have done that, a GUI will appear showing a picture of a road and some cars. You will be asked to draw four areas. The first two should be the entry and exit points and the third should be the area for the road. The area for the entry and exit points should be inside the area for the road touching (or near) the edges. An example is shown below.

To draw an area on the GUI, press the mouse down and draw until you decide to release the mouse button. Once you release the mouse button, you will have drawn your area.

3. Once you have finished drawing your areas you will be asked if you are happy with the areas that you just drew. If you are happy with them, press “y” and the video will begin from start to finish. If you are not happy with the areas that you have drawn, simply type “n” and then you will be allowed to draw your areas again.

Instruction on how to change settings and what they do

The openCV ui options are not very accommodating so it may require further explanation.

You should see:
One settings panel with six sliders;
A delta window;
A threshold window; and
A tracking window.

Windows

The tracking window displays the original video frame with moving cars highlighted with a green rectangle.

The Delta window shows a black and white frame. Moving objects are drawn in white.

The Threshold window is similar to the delta window, but it only displays the strongest movement (the brightest areas of delta).

The settings window allows you to adjust variables which affect what is shown in the other windows.

Settings

Blur

This is the amount of gaussian blur applied to the frame. This eliminates video grain and reduces detail which might cause false positives. Be aware that gaussian blur is processor intense, so it might slow things down at higher values.
If there are too many non-car elements being drawn on the delta frame, try increasing this value.
If cars are bleeding into each other too much, decrease this value.

Buffer

This is the frame buffer. Movement is detected by comparing the current frame to the previous frame. You can see this in the delta window.
If you cannot see the cars well in the delta window increase this value.
Be aware that it will amplify all movement including movement you might not want to track.
At higher values objects will squash and stretch.

Threshold

Threshold eliminates faint movement from the delta frame.
If there are too many non-car elements appearing on the thresh frame, but delta frame shows cars clearly, decrease this value.
If the cars are clear on the delta frame, but not visible on the thresh frame, decrease this value.

Fill

This fills in gaps between nearby shapes.
If the cars in your threshold window are too fragmented, increase this value.
This will also fill gaps between shapes that are not cars.

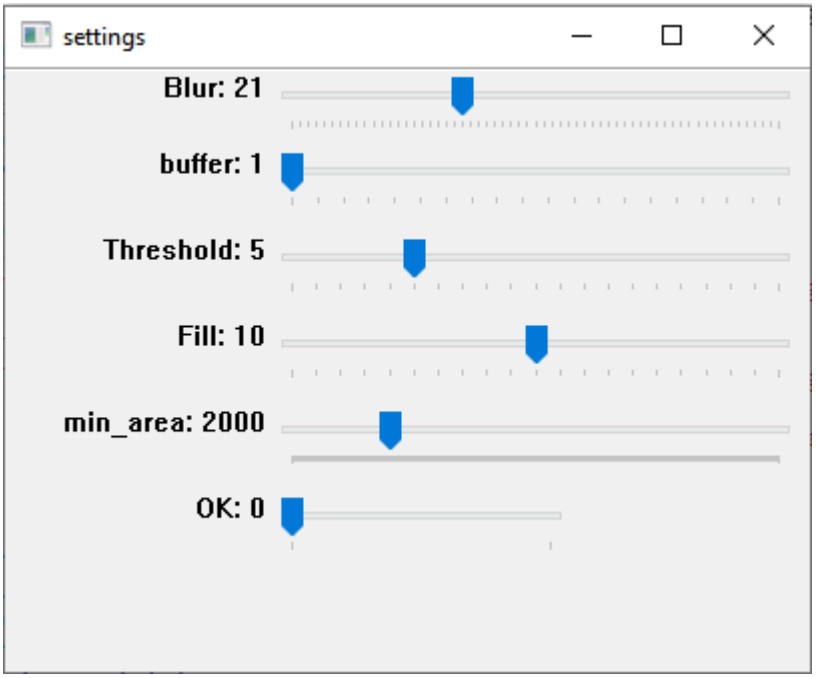
Min Area

This is the minimum area of detected contours that we should consider a car.
If cars are identified well in the threshold window but not highlighted in the tracking window decrease Min Area.
If small artifacts you don't want to track are being highlighted in the tracking window, increase Min Area.

OK

It seems like the button function of OpenCV for python is not implemented.
When you are done change the OK value to 1.

Optimal settings configurations



Drone camera settings

These are settings that we found worked.

- ISO as low as possible, (preferably 100 for lowest noise).
- Focus: infinity. Aperture f2.8.

- Camera angle as low as possible while still being able to frame 300m or desired length of street.
- Keep the street as straight as possible to avoid bends which can distort calculated speed results.
- Codec: H.265
- Filetype: .MP4, 4k @ 30fps.

Video Captions

Sky survey is able to automate reading some metadata (coordinates, time and date video was shot) from .SRT files. This relies on the captions created by the drone and depends on the way DJI drones record this data. This is optional and the program will run without it.
Go into 'advanced camera settings' and turn on 'video caption'.

Database

Setting up

Create a database with these details:

- user="user",
- password="password",
- database="trafficproj"

Run sql files genTable_streets.sql and the genTable_events.sql in MySQL Workbench.

Adding Data

Once you have run the tracking program and generated some json data, run json_to_db.py it will write that data to the database.