Digital image stabilization technique for fixed camera on small size drone

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The problem

most drones have built-in gimbals and stabilizers

Low cost drones often have shaky footage especially in non ideal conditions such as wind

Common techniques

Warp stabilizer (most common technique premiere pro)

Not good for shallow depth of field

-Works by warping pixels in localized areas

1. Subspace warp
2. Position
3. Position scale rotation
4. perspective

Drone specifications

Eachine E520 Quadcopter

- Fixed camera no stabilizer

Cost: $89.99

WiFi Distance: 50-70m

Flying Time: 15-17mins

Camera specifications

Camera: 5G WiFi 4K HD, FOV: 120° Wide Angle

Pixel: 4K--Picture/Video: 3840*2160 (Saved on Mobile Phone)

4K--Picture/Video: 2560*1440 (Saved on SD Card)

-not sure if actually shoots in 4K

Experimental setup

Several test flights with different lighting

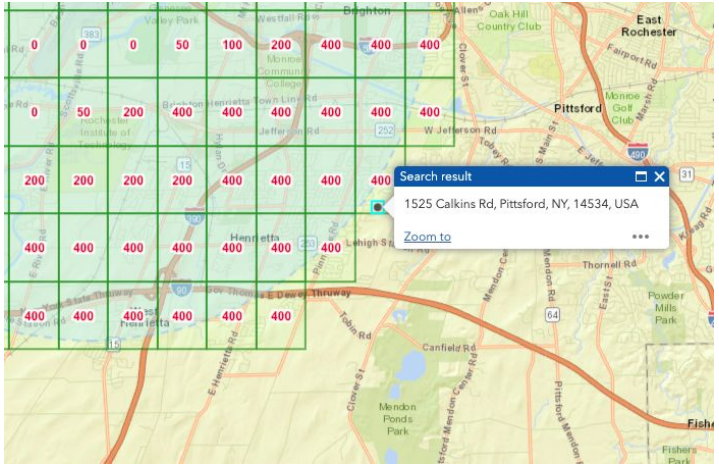
Conditions

Flight path:

-automatic 5 foot hover climb to ~20ft

- full 360 spin

- horizontal straight line scan



Tinker nature park

Map from Visualize it: See FAA UAS Data on a Map Federal Aviation Administration (ARCGIS)

Paper and initial steps

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E. Mingkhwan and W. Khawsuk, "Digital image stabilization technique for fixed camera on small size drone," 2017 Third Asian Conference on Defence Technology (ACDT), Phuket, Thailand, 2017, pp. 12-19, doi: 10.1109/ACDT.2017.7886149.

Implementation

Speed-Up Robust Feature(SURF)

1. match 2 pictures,one obtained from the current image frame and another from the previous (or reference)
2. locate common keypoints between the current and reference frames and associating them together. (surf part)
3. translate and rotate the current imageframe so that keypoints remain in the same position or as close as possible to those of the reference frame

Questions?

“How To STABILIZE SHAKY FOOTAGE (NOT With Warp Stabilizer).” YouTube, YouTube, 10 Jan. 2018, www.youtube.com/watch?v=cm1kU9EI_tA&t=85s.

ArcGIS Web Application, www.arcgis.com/apps/webappviewer/index.html?id=9c2e4406710048e19806ebf6a06754ad.