Project title: Frontal Polymerization: UAV positioning and navigation  
Advisers: Prof. Grace Gao 

Project description  

We are in an age of Unmanned Aerial Vehicles (UAVs). The scale of the revolution in the use of small, civilian UAVs has caught many by surprise. When FAA made the registration of each small UAS (consumer drones) mandatory, over 181,000 drone owners registered within weeks. At CES 2017, the figure stood at 670,000. It is estimated to be over 1,100,000 by the end of 2017.

Reliable and accurate positioning of UAVs is critical. The Global Positioning System (GPS), providing absolute position information, is a significant component of many autonomous navigation systems. GPS operates via satellite signal reception and is thus susceptible to satellite and signal propagation errors. In urban environments where many UAVs and self-driving cars are operated, GPS signals can be blocked or reflected by buildings. Reflected signals arrive at a GPS receiver with some delay compared to the direct signal. This multipath effect causes incorrect positioning, resulting in potentially catastrophic failures of the autonomous platforms.

This project involves 1) navigational signal processing to calculate UAV positions; 2) quantifying and modeling sensor signal uncertainties; 3) quantifying and characterizing UAV positioning uncertainties; and 4) UAV flight testing, verification and validation.

A quardrotor UAV designed and built in Prof. Gao’s lab

Student background and expected research activities  
We are looking for students with background of signal processing, dynamics and control and programming.  
Experience in flying a UAV would be a plus.

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