

# Athletic Filming with a UAV

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## ABSTRACT

The market and potential applications of drones is currently undefined. The technology is in its infancy and federal regulations have hampered the growth and development of the technology. This paper presents one area where drone based cameras can provide new approach (Athletics Filming) and outlines the design of one potential use in this area.

## PROBLEM

The problem at hand is that there is no easy way to film athletic events or practices from an aerial viewpoint without running an extremely elaborate and expensive cable system for the cameras to move across the field on. The problem with using stationary cameras is that there will be aspects of the game missed, which could have been captured if better camera angles were possible.

## TESTING

To evaluate the stability of the gimbal, we turn to the Hufnagel-Stanley equation;

$$H(u, v) = e^{-k(u^2+v^2)^{5/6}}$$

A MATLAB program will allow us to perform frame by frame analysis of footage from the gimbal and calculate the turbulence not removed by the gimbal.



## GIMBAL

In order to reduce cost, the team decided to design and build a camera gimbal instead of purchasing one. The gimbal has 3 Quannum 2208 brushless gimbal motors and a EvvGC brushless gimbal controller.

## DESIGN

The design was developed with 3 main fundamentals in mind. The first was selecting the right vehicle and if it can transport the camera. The second being the ability to stabilize the camera for filming during flights. The final fundamental is the ability to communicate with the aerial vehicle from the ground.

## CONSTRAINTS

- 3DR X8 Octa-copter has 800 gram carrying capacity
- 15 minutes of battery life
- Record and stream video to base station
- Comply with FAA regulations
- Be able to operate in a wide temperature range (0 -100° F)

