[Capstone Category]

Project Name	**Drones for Humanity**
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Wildfires burn millions of acres of land each year, costing nations billions of dollars. Since wildfires mostly occur is dense forest areas or extremely remote locations, it is nearly impossible for firefighters or park rangers to notice them. Drones for Humanity aims to help humanitarian efforts that are too challenging for humans to handle alone, specifically fighting wildfires. An Unmanned Aerial Vehicle (UAV) that can locate these wildfires while they are still small, will allow first responders to extinguish them before they become too large to contain. Countless lives and natural resources could be saved as a result. By creating an UAV that can survey a region and communicate its findings, large scale wildfire occurrences can be significantly decreased. The “Pink Panther” fixed-wing aircraft is capable of autonomously surveying large areas to detect small fires, drop a payload if needed, and report its findings back to the operator.

Through the use of a Pixhawk flight controller, the “Pink Panther” is autonomously controlled using a preprogrammed flight path. Once the UAV reaches its desired location, it will begin flying in a survey pattern over its selected area and will scan the ground below for fire. The biggest challenge for this system is creating a reliable and cost-effective way to detect fires. Thermal imaging cameras are the obvious route but due to their significant price, they were an unrealistic tool. Instead, the team opted for a standard camera paired with a neural network in an onboard Raspberry Pi to detect fires. After extensively training the system to detect fires, the program can pinpoint the location of a fire, pixel by pixel, with high accuracy. The location of these fires is reported back to the system operator over a wireless data connection in conjunction with the Pixhawk. The Raspberry Pi also saves a log of all scans and indicates which images and pixels contain a fire. Another major challenge was determining what would be a viable, droppable payload for this system. Due to the limitations of the design, a fire retardant would be too heavy and take up too much space to be worthwhile. The next consideration was a fire spread detection system which would incorporate droppable thermometers which would report the temperature measured and their location. This proved to be too complex to create within the available timeframe so the team opted for a sample payload to prove the airframe could support it. Future work on this project would seek to improve the fire detection system with a thermal imaging system as well as increasing the mass of a droppable payload to make aerial fire retardation or spread detection more viable.

The utilization of a fleet of these UAVs will allow operators to scan entire forests with ease and help to prevent catastrophic wildfires from occurring.