VR Operated UAV

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ABSTRACT

Search and rescue operations are challenging due to the limited time available to the locate the subject, the hazards imposed on the rescuer, and the difficulties of the non-local distribution of the full rescue team. Team ARM IT is developing a virtual and augmented reality interface that controls a mounted camera payload on an unmanned aerial vehicle through a head mounted display. This will allow rescuers to manipulate an unmanned aerial vehicle to assist search and rescue missions safely and effectively through telepresence and enhanced situational awareness.
We plan to test our hypotheses by prototyping, testing, and refining individual components of the system through the use of flight simulation software and on-site testing. By providing a realistic sense of the UAV environment enhanced with relevant information, our project will reduce the danger to the rescuers and provide cognitively natural situational awareness.

OUR TEAM

BACKGROUND

- Scenarios requiring search and rescue operations are usually large scale and often dangerous
- Unmanned aerial vehicles (UAVs) allow for more rapid search through an overhead view of the environment
- The use of UAVs reduces the risk to all parties involved

Goal: We hypothesize that a user interface utilizing virtual reality will decrease the operation time of UAVs for SAR operations.

Objectives: We intend to develop a virtual reality interface utilizing stereoscopic video and head tracking to control the camera payload on a UAV. A visual overlay will be implemented to provide the user with data to assist with SAR.

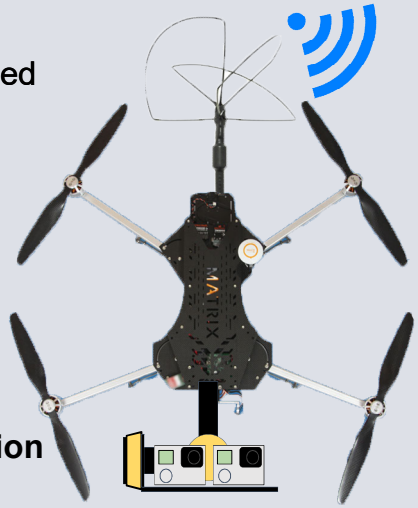
Team ARM IT Website

ACKNOWLEDGEMENTS

Gemstone, IPST, Dr. Deane, UAS Test Site

UAV

- Capture video feed
- Navigation is independent of Oculus

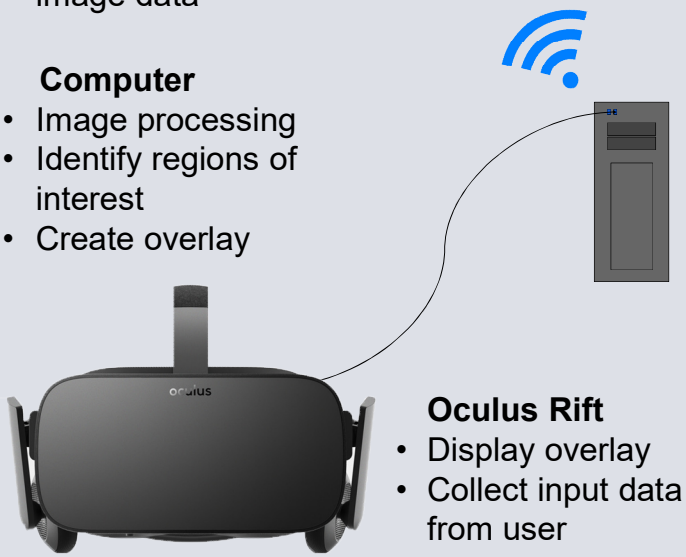


Data Transmission

- Transmit and receive UAV and gimbal signals
- Receive GPS and image data

Computer

- Image processing
- Identify regions of interest
- Create overlay

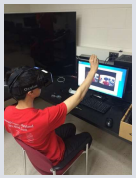


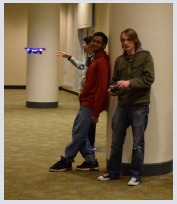
Oculus Rift

- Display overlay
- Collect input data from user

CURRENT PROGRESS

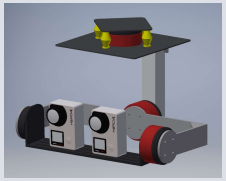
Achieved Stereoscopic Streaming to Oculus
This is an image captured with a stereoscopic (ZED) camera from our lab. Image capture is the first step in image processing and transmission.





Initial flight and ground tests
This is our initial indoor flight test, which showed that the UAV is usable in an indoor environment and can capture footage to aid in the development of image processing software. A secondary ground test was performed to corroborate the flight test results.

Initial Flight Simulator
This is FlightGear, a flight simulation software. We will use FlightGear to test any software or hardware changes to our setup without having to obtain permission to fly. We plan to use FlightGear to test the effectiveness of our system.



Gimbal
This is an initial mockup of a custom gimbal, which will hold and control both GoPro cameras. The gimbal is currently in the development and build phase.

FUTURE PLANS

- Design and integrate a quadcopter into FlightGear flight simulation software
- Integrate flight simulation with Oculus Rift
- Design and build overlays for head mounted display (HMD)
- Develop image processing algorithms to enhance subject tracking capabilities
- Obtain IRB approval and perform subject testing on flight simulation software
- Conduct ongoing flight tests in association with the UAS Test Facility

REFERENCES

oculus vr, "Oculus-Rift-2" http://www.wired.com/wp-content/uploads/2015/06/Oculus-Rift-2-1024x576.jpg | Sierra Hobby, "cloverleafultra1.3", http://www.sierrarc.com/images/cloverleafultra1.3.jpg | GoPro, "sits_pod15", http://shop.gopro.com/accessories/3d-hero-system/AHD3D-001.html. | *Wow Hobbies, "matrix_topview",* http://www.wowhobbies.com/images/matrix_topview.jpg