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1-1-2015

**"Human Analysts are Limited in Number They Scan Imagery using
Methodical Searches that are very Slow have a Finite Operational
Lifespan and are Costly to Train"**

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Recommended Citation

Gholston, Sampson, "Human Analysts are Limited in Number They Scan Imagery using Methodical Searches that are very Slow have a Finite Operational Lifespan and are Costly to Train" (2015). *Summer Community of Scholars (RCEU and HCR) Project Proposals*. 340.
<https://louis.uah.edu/rceu-proposals/340>

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A Research or Creative Experience for Undergraduates (RCEU) Proposal

Faculty Mentor:

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Project Summary

Human analysts are limited in number, they scan imagery using methodical searches that are very slow, have a finite operational lifespan, and are costly to train. Regardless, demand for analysts is high and increasing due to large volumes of imagery from intelligence, surveillance, and reconnaissance sensors and platforms. This trend makes it nearly impossible for the Department of Defense to keep pace with the analysis of the images and data from this massive data collection. Consequently, there is a critical need for novel approaches/techniques that enhance analysts' ability to perform at high levels for extended periods of time. This program will leverage emerging research in human-computer interaction to enhance image analysis efficiency, target detection performance, reduce fatigue, and improve vigilance.

The objective of this effort is to augment the cognitive capabilities of the human analyst or operator to detect a target or visually search for information within a large collection of visual information. This program will explore novel approaches to human-computer interaction to experiment with a system capable of improving image analysis efficiency and human target detection. We are developing working prototypes and experiment with ways to efficiently visualize and manipulate large amounts of visual media. For example, recent human performance modeling has shown that the use of zoomable user interface in combination with a touchscreen monitor and voice input could decrease an analyst's time by more than 50%. By exploring these techniques, we hope to reduce the time required by analysts to search for targets and accelerates the user's actions and understanding.

Student Duties

The student will be introduced to the basic work flow and requirements of an intelligence analysts in order to support human-computer interaction experiments. The student will also be introduced to the basics of Human Factors, Cognitive Psychology, User Interface and Experience Design, and Human-in-the-loop experimentation. Based on the skills and interest of the

student, the following efforts could be pursued by the student:

- Experimental design and data collection for human-computer interaction studies involving eye-tracking and EEG equipment
- Computer programming for user interfaces prototypes involving touch screens, voice input, and data visualizations
- User interface design integrating graphic design
- Data analysis of human performance data including eye-tracking and possible EEG data for cognitive workload

Based on the student's interest area, they could help run a human-computer interaction experiment, analyze the results, and prepare a report to be presented at a local or national conference. If the interest is in computer programming of User Interfaces, new techniques, data visualizations, and ways to interact with the data can be explored, coded, and evaluated to also be presented at an appropriate professional meeting or conference.

Mentor Supervision and Interaction

UAH has a collaborative laboratory with the Army Research Laboratory to develop new technology and run human-computer interaction experiments. The student will be working in this lab that is comprised several different majors including Computer Science, Computer Engineering, Systems and Industrial Engineering, and Psychology. This lab is located in Technology Hall room N125 and operated by the Department of Industrial and Systems Engineering and Engineering Management. The student will also interact on at least a weekly basis with Dr. Jeff Hansberger from the Army Research Laboratory whose expertise is in Cognitive Psychology and Human Computer Interaction and is currently running experiments in the laboratory. Dr. Hansberger has conducting several experiments in the lab and works for the Army Research Lab, which donated all the equipment for the lab to create an environment for industry, faculty, and student projects in the fields on systems engineering and human factors. The student will also interact with Dr. Gholston at least twice a week for advising and project support. Dr. Gholston and Dr. Hansberger will work together under the foundations of the lab to direct the student's project and ensure a valuable learning experience for the student whose work will add to the functionality of the lab.