

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants
in Research Projects Involving Human Subjects

- **Title of Project: Multi-Robot Multi-Human Teaming in Search & Rescue**

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I. Purpose of this Research Project

Wilderness searches usually involve multiple agencies and may exceed 100 personnel working over days. In typical searches, a human assigns tasks to searchers based on a computed probability of area, the probability that a lost person resides in a given area. As time elapses, this area grows geometrically, favoring for quick resolution. This project seeks to redefine lost person search-and-rescue (SAR) by enabling teams of human searchers and unmanned aerial robots to collaborate towards improving search outcomes and reducing human effort.

Comparing to the typical searches, SAR would greatly benefit from teams of autonomous unmanned aerial vehicles (UAVs) that enable to augment human abilities. However, how information would flow between UAVs and humans is a very complex problem: the role of UAV team could be remote-controlled researcher or be a autonomous searcher itself. This project seeks to study the balance of collaboration and autonomy in multi-robot multi-human search teams.

We will perform the experiments recruiting students and SAR professionals to assess the design of our engineering solutions presented on tablet computers which can recommend search actions for the mission, display mission status, communicate with other human searchers, and control unmanned aerial robots.

We plan to publish the results in conference proceedings and academic journals. We will also present our results to the SAR community who would then consider whether and how to adopt unmanned aerial vehicles in their operations.

There will be no exclusion criteria in terms of age, gender and ethnicity. Participants must have normal or corrected-to-normal vision.

II. Procedures

Upon participants' arrival, we will greet the participants and explain the study procedure. Then, we will explain the consent form, participants' risk, and their right to withdraw. We will ask the

participants to read the consent form carefully and will encourage participants to ask questions before signing the consent form. The signed consent forms will be kept in locked file cabinet.

One of the research team members carrying out the experiment will obtain consent from participants. One of the Principal Investigators (Dr. Lau, Dr. R. Williams, Dr. N. Abaid, and Dr. McClure) of this sponsored project will oversee this process.

The consent will take place where the experiments occur, either on VT campus at the UAV facility, or in national parks where SAR field exercises are typically conducted.

Our research will involve typical SAR planning and assignment exercises in a computer simulation. There will be four experimental conditions. In each condition, the participants will be given one of the four visualizations of the lost person (LP) model to aid participants in completing the SAR exercises. In the SAR exercises, we will ask participants to complete a typical SAR assignment task (i.e., assigning several search teams to search different areas in the computer simulation) until the lost person is located or time exceed the maximum. The map is approximately 8000 acres, and divided into multiple cells. There are several search teams that need to be assigned. Each team has the same resources for mission (i.e., same number of search teams).

The following data will be collected for each phase of our research:

- 1) The participant inputs/interactions with the tablet computers will be logged to collect responses to the task assignment exercises and identify usability issues associated with the interface design and completion time of assigned SAR tasks.
- 2) The eye tracking data will be collected to identify important areas of interface and visual attention.
- 3) The participant will provide demographic information and subjective ratings through questionnaires

III. Risks

If participating in our study, participants will experience minimal risk, as they will be asked to interact with a common computer to complete administrative SAR tasks that would otherwise be completed on papers.

The research team will test the experimental protocol as extensive as possible to minimize any potential risks. Participants should experience minimal risk working with tablet computers and they may discontinue the task at any time.

IV. Benefits

There will be both direct and indirect benefits to the VT students and SAR professionals/volunteers. For the VT students, they will be exposed to general SAR knowledge as well as research on visualization and user interface design. The experiment might pique their interest to volunteer in SAR and research. Their direct benefit will be the monetary compensation.

The SAR professionals and volunteers will be exposed to the latest research and potential applications in modeling and visualization. Our research products may be directly adopted for their operations if useful. They can also provide input to improve our research products for their subsequent adoption.

The experimental data can help with the understanding of the visualization of lost-person model that can ultimately yield the best search outcome and efficient guidance for the process. This can reduce time to completing a search, reducing the number of reported lost person that has never been found. This research can also mitigate the effect of declining number of volunteers in SAR across the US.

No promise or guarantee of benefits has been made to encourage you to participate.

V. Extent of Anonymity and Confidentiality

Participants will be assigned a study ID code based on the sequence of participation.

Only the consent forms will include both names and study ID codes. The consent forms will be stored in a locked cabinet at our VACSE Lab, located at Whittemore 529. The research team members will have access to them.

All collected data will be stored in a hard disk drive with security protection.

Only research team members listed in the protocol submitted to the VT IRB will have access to study data.

In accordance with the Data Protection Act, the data will be kept securely during the period of analysis of results. After this time, the data will be kept securely on a password protected computer for seven years following analysis of results. Access to electronic files will be revoked from all researchers, and all data files will be retained for three years after publication of the final project.

The Virginia Tech (VT) Institutional Review Board (IRB) may view the study's data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research.

Note: in some situations, it may be necessary for an investigator to break confidentiality. If a researcher has reason to suspect that a child is abused or neglected, or that a person poses a threat of harm to others or him/herself, the researcher is required by Virginia State law to notify the appropriate authorities. If applicable to this study, the conditions under which the investigator must break confidentiality must be described.

VI. Compensation

Compensation for this study will be \$10 per hour of participation.

VII. Freedom to Withdraw

It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.

Please note that there may be circumstances under which the investigator may determine that a subject should not continue as a subject.

Should you withdraw or otherwise discontinue participation, you will be compensated for the portion of the project completed in accordance with the Compensation section of this document.

VIII. Questions or Concerns

Should you have any questions about this study, you may contact one of the research investigators whose contact information is included at the beginning of this document.

Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the Virginia Tech Institutional Review Board at irb@vt.edu or (540) 231-3732.

IX. Subject's Consent

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date _____
Subject signature

Subject printed name

(Note: each subject must be provided a copy of this form. In addition, the IRB office may stamp its approval on the consent document(s) you submit and return the stamped version to you for use in consenting subjects; therefore, ensure each consent document you submit is ready to be read and signed by subjects.)