Human Swarm Interaction: Data Collection

# Introduction

The human swarm interaction project collected data from 31 participants who interacted with the simulated environment. This report presents the experiment design, procedure, and some preliminary observations and results.

# Method

## Materials and setup

The data collection uses a custom game environment which simulates a wildfire evacuation scenario. The game features a map of a town divided into small sectors. Within the game, participants take on the role of an operator tasked with evacuating a town threatened by an encroaching wildfire. To help them with this responsibility, operators have access to a spokesperson and a swarm of aerial drones. In addition, operators may also assign a transport vehicle to retrieve residents from their respective locations. Operators must contend with different tasks under pressure from the wildfire and can use the spokesperson to handle certain elements of the job. These elements include assigning the spokesperson to negotiate with residents in regards to persuading them to leave and allowing the spokesperson to handle the low-level execution of various actions. For example, the operator can request some number of drones to search a specified region, and the spokesperson will handle the individual assignment of drones and how they search the area. The interaction between operator and spokesperson (and by extension, all other elements of the simulation) is done via natural language. [description of the game] [description of spokesperson]

The game is controlled in real time by two controllers (“wizards”): one wizard controls the speech of the spokesperson agent and the town residents, while the other wizard inputs instructions to the game environment using a graphical interface.

In the experiment room, the participant is seated in front of a large TV display (model/specs) showing the live game environment; there is a small table between the participant and the TV where the participant can put a sheet with written instructions. A web camera (model/specs) on top of the monitor records the participant’s face and upper body, and a head-mounted microphone (model/specs) records their voice. To the right of the main display is a smaller monitor (model/specs) showing the virtual spokesperson. The speakers for the spokesperson and residents are located just beneath the secondary monitor. (where are the speakers?) Next to the small monitor, on a table with a separate chair, is a laptop computer (model/specs) used for inputting questionnaire data. Behind the participant’s right shoulder is a video camera which transmits a live audio and video feed of the interaction to the control room; this feed is not recorded.

The control room has two large TV displays (model/specs) side by side on a table. The display on the right has the controller’s view of the game, with the graphical interface for inputting parameters. The display on the left shows the live feed from the experiment room. The game-controlling wizard sits in front of the right-hand display, and uses a keyboard and mouse to control the game environment. The character-controlling wizard sits in front of the left-hand display, and controls the characters using a separate laptop computer (model/specs).

## Participants

A total of 31 participants were recruited for the study through Craigslist (<http://craigslist.org/>). Participants were all adults, English speakers, with normal or corrected vision and hearing. We did not collect any demographic data on the participants. Participants were paid $30 for their effort.

## Procedure

Participants started by giving informed consent, then filled out pre-interaction questionnaires on the laptop computer. Participants then moved to sit in front of the main display, were given oral instructions and watched a short tutorial video, and were fitted with the microphone. After clarifying any remaining questions regarding the simulation, the participants then engaged in the game of trying to save residents from an oncoming wildfire. Interaction was verbal, mostly between the participant and the virtual spokesperson, and occasionally with town residents. When all the residents had either been saved or died, the experimenter entered the room, stopped the game, and the participant moved back to the side table and filled a questionnaire about the interaction. The process repeated itself for a second game, followed by a second post-interaction questionnaire. After this final questionnaire, the experimenter came in for a debrief and answered any questions participants had about the experiment. Participants were thanked, paid, and escorted out.

## Measures taken

The primary data are audio and video recordings of the participants’ communication with the characters in the environment. Audio and video were recorded continuously by the microphone and web camera, and saved in XXX format.

Time-stamped logs from the wizard control system and from the game environment were also saved; these will be aligned with the recordings to produce a full picture of the interaction.

Participants filled out several questionnaires. Two questionnaires were taken before the interaction: GZ Spatial Orientation (ref), and mini-IPIP (?) (ref), and four (?) questionnaires were taken after each interaction: NASA TLX (ref), one-item mental effort (ref), and an internally developed questionnaire about rapport and character perception.

# Results

# Discussion