

# Harris Search & Rescue Robot

## Team Members

Tyler Culp                    [tculp2012@my.fit.edu](mailto:tculp2012@my.fit.edu)  
Milton Stafford            [mstafford2012@my.fit.edu](mailto:mstafford2012@my.fit.edu)  
Devin Martinez            [dmartinez2012@my.fit.edu](mailto:dmartinez2012@my.fit.edu)  
Faculty Sponsor: Philip Chan      [pkc@cs.fit.edu](mailto:pkc@cs.fit.edu)  
Client: Harris Corporation

## Current Milestone Tasks

Task	Completion %	Tyler	Milton	Devin	To do
Build and Test the Control Software	70%	15%	0%	55%	Continue adding functionality, and calibrate the motors
Build and Test the Transmission Software	45%	15%	15%	15%	Get ad-hoc networking working with the pi, as well as the audio streaming.
Make Improvements to the Simulation Environment	100%	100%	0%	0%	
Complete Senior Design Showcase poster	100%	33%	33%	33%	
Finish the Software Interface Documents	100%	0%	100%	0%	

## Build and Test the Control Software

The team has build the base software that is used to remotely control the robot. It primarily consists of a GUI that monitors keypresses and sends predefined command values to the robot over a socket. The robot then performs the required action, such as stop, move forward, increase speed, etc. The robot also send status information back to the operator, such as its current speed value and its temperature. These communications are

send over UDP, as in this situation connectivity will likely be inconsistent and unreliable. Thus we have decided that for these discrete events, sending datagrams was the preferred option. However, the largest downside to this method of sending data over sockets is that it requires the robot and the operator to be on an ad-hoc network.

## **Build and Test the Transmission Software**

The team has encountered unexpected difficulties with the transmission software. In order to support our current method of communication with the robot, network connectivity is required. We have attempted to set up an ad-hoc network between a laptop and the robot's Raspberry Pi in a number of different ways, all of which have been unsuccessful. We are able to stream the video output from the camera to the operator, but we have not yet successfully streamed audio.

## **Make Improvements to the Simulation Environment**

The newest model of the robot has been imported into the simulation. In addition, a new underground area has been created, along with many more rocks and tight spaces that should prove difficult for the robot to navigate through. The camera has also been re-positioned in order to make it easier to control the robot while underground.

## **Complete Senior Design Showcase Poster**

The team's senior design showcase poster has been completed. However, due to the large hardware focus of the project, our part of the team had little to do with the poster besides providing input on format, readability, etc. The poster was submitted to be printed before the deadline, it contained a diagram for the SW/HW interfaces, a mockup of the robot and a description of its purpose.

## **Finish the Software Interface Documents**

The team has completed the software interface documents, which show the types of data that will be passed between the internal software modules. The data is split into two types, messages and streams: messages are created using JSON and streams are handled over socket connections. However, since the software has been developed they have changed slightly and will likely change more until the software is completed.

## Team Members

Each team member, in addition to the items listed, below, assisted with designing the Senior Design showcase poster, as well as performing work on the CDR (Critical Design Review) presentation for Harris, and presenting.

### **Tyler Culp**

Tyler worked on the simulation environment, and assisted with the control and transmission software. He also worked on testing the control and transmission software, more specifically getting information back from the pi such as current speed and pi temperature.

### **Devin Martinez**

Devin primarily worked on the control software with the electrical engineer on the team, as well as testing the control software. He worked with the electrical engineer to determine what pins would be used for the wheels and camera mount. He also worked on getting key presses and releases from the keyboard in order to make controlling the motors easier.

### **Milton Stafford**

Milton updated the software specification and interface documents after the initial software pieces were created, which led to small changes in the design of the software. He also added the updated information to the CDR Presentation.

## Milestone 6 Tasks

<b>Task</b>	Tyler	Milton	Devin
Complete and Test the Control Software	40%	20%	40%
Complete and Test the Transmission Software	40%	20%	40%
Implement Two-Way Audio Streaming	20%	60%	20%

Finalize the Simulation Environment for Showcase	80%	10%	10%
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## Complete and Test the Control Software

While we can control the motors remotely, we have not yet calibrated the software to account for differences in the hardware components. This is due to the fact that the hardware has still not been completely built yet, so we have been unable to test the software on the complete system. Additionally, while the existing code can theoretically control the camera, this has also not been tested. We will be work on finishing the control system as soon as the hardware is complete. In the meantime, we will continue to develop the program in such a way that it should only take minor revisions to get it working correctly with the physical system.

## Complete and Test Transmission Software

We will continue to work on creating an ad-hoc network between a laptop and the robot. Also, we will work on getting the video streaming to be a more streamlined process, as well as making it compatible with the control program. As it is now, the received video is displayed on the screen in such a way that it can interfere with the operation of other GUI-based programs, such as the control system. We will look into ways of displaying the video stream differently.

## Implement Two-Way Audio Streaming

We will be working on getting the audio-streaming functionality of the system operational. We may be able to integrate the audio stream with the video stream, but it is likely that we will have to handle them completely separately, possibly on separate wireless interfaces on the robot. We will be able to use the built in systems on the controller's end, but getting the audio input from a microphone on the robot may prove to be a challenge. To do so, we plan to use some software available via the Ubuntu Software Center which can handle the pipelining of audio from standard microphone input to a socket and from a socket to output on a speaker. With that pipeline in place, we then only need to introduce a variable delay on the audio for the operator to control so that it is in sync with the video.

## Finalize the Simulation Environment for Showcase

We will make any alterations to the simulation environment that our sponsor or the team determines is necessary for the simulation to be shown at the Senior Design Showcase.



# Sponsor Feedback

## Faculty Sponsor Approval

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# Sponsor Evaluation

Tyler Culp	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Milton Stafford	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Devin Martinez	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Signature: \_\_\_\_\_ Date: \_\_\_\_\_