Harris Search & Rescue Robot

Team Members

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Client: Harris Corporation

Current Milestone Tasks

Task	Completion %	Tyler	Milton	Devin	To do
Define Software Interfaces	90%	25%	40%	25%	Assign keys to each possible input button
Define Software/Hardware Interfaces	0%	0%	0%	0%	Obtain hardware
Revise Software Requirements	100%	0%	30%	70%	
Improve Simulation Env't	80%	60%	10%	10%	Make the physics more realistic, add more rocks and obstacles
Skeletonize the System	50%	30%	10%	10%	Add more methods, implement the defined internal interfaces

Define Software Interfaces

We have defined the behavior and protocols of the interfaces between the modules. Several of the interfaces, such as the audio transmission, will use existing data streaming protocols over ports using the networking layer. Other interfaces, such as those between and Controller and Admin modules, are more flexible and use JSON strings to create messages.

Define Software/Hardware Interfaces

As the team has still not received hardware components, and the interfaces that we will be using are still unknown, we have been unable to write software to control the hardware. This task will be performed once we know the specifics of the hardware components we will be controlling.

Revise Software Requirements

Based on the feedback received from PDR, we know that the Software Requirements need to be updated to include source requirements from the A-Spec, and use language consistent with the "shall" statements included in the A-Spec. The requirements also need to be more specific.

Improve Simulation Environment

The simulation environment, along with the pre-existing simple unit tests, now includes a variable terrain field and rocks of various sizes. Also, there is now an area that partially simulates an underground field. With its update, the simulation now gives a more realistic feel to what the robot will be experiencing when searching for survivors. The environment will continue to be updated, and will feature low ceilings, tight spaces, more rocks, etc, in order to more accurately simulate a rubble pile.

Skeletonize the system

The system submodules have been created and organized according to their location (on the workstation versus on the robot). The interfaces have yet to be implemented, however they have been defined more than expected, so implementing them will be more efficient.

Team Members

Each of the team members, in addition to the actions specified below, participated in various discussions with team members from other departments about requirement and hardware considerations. This includes conducting research into possible components and capabilities of existing systems.

Tyler Culp

Tyler worked on the simulation environment, and assisted with defining the software interfaces. The simulation environment now includes variable

terrain, ground texture, rocks of various sizes, as well as the already existing simple tests.

Devin Martinez

Devin worked on revising the software requirements to match the general language of the A-Spec sheet as well as tracing each of the defined software requirements back to their respective requirement listed in the A-Spec. He also helped define the software interfaces.

Milton Stafford

Milton worked on creating documentation for the Software modules and their interfaces. This includes descriptions of each module and their interactions with adjacent modules, as well as a specification document outlining the syntax of messaging within our modules. This corresponds to the communication and protocols used by modules.

Milestone 5 Tasks

Task	Tyler	Milton	Devin
Build and test the control software	20%	40%	40%
Build and test the transmission software	20%	40%	40%
Make minor improvements to the simulation environment	60%	20%	20%
Complete Senior Design Showcase poster	33%	33%	33%
Additional Work	33%	33%	33%

Build and Test Control Software

Once we know the interfaces of the hardware components, we will write the software to physically control the robot. We will abstract the hardware interfaces into their own methods to make the rest of the process easier. For testing the control software, we will attempt to have the robot perform all possible actions in sequence, and verify that the

proper actions occur at the proper times. We will start by learning how to control the robot's motors using the Raspberry Pi's GPIO pins.

Build and Test Transmission Software

Ensure that the modules can communicate via the given transceivers so that they can stream audiovisual data and send and receive messages. Additionally, we will be determining the maximum possible throughput of the streams. In the event that the robot is unable to transmit at the specified/required resolution and refresh rate, we will attempt to find the best balance to come as close to satisfying the requirements as possible. Once we determine the type of network we will be using (possibly wi-fi), we will develop or identify the software that will manage the data transmission.

Improve Simulation Environment

Minor improvements will be made to the simulation environment. We will add additionally rocks and obstacles, and attempt to make the physics for the model robot more realistic. The simulation will continue to develop into an environment resembling a rubble or debris pile as per the concept of operations. The robot may also be given a flashlight, for use in the underground area. A ceiling will be added, along with additional variably-sized rocks and walls, in order to create tight spaces that the robot will have difficulty navigating.

Senior Design Showcase Poster

We will work with the other departments to create a poster for the senior design showcase. This poster will most likely primarily focus on the hardware and approach aspects of the project, but it may also include the software configuration items. We will strive for readability and concise language while accurately portraying the work and outcome of the team's endeavors.

Additional Work

We have decided that the robot will not simply inform the workstation of its location, but it will provide the raw gyroscope, accelerometer, and magnetometer values. This way, the workstation will be able to determine the robot's orientation as well as location, and the processing will no longer be performed on the robot side. Additionally, we will research possible methods for communicating the robot's location, such as setting off an alarm or using a handheld signal detector to locate the direction of the video feed.

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: _____