

USAR-Robot Evaluation

Project specification

Group members:

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Revision history:

2012-02-03	0.1	Wrote substantial parts of the document. Researched the subject further.
2012-02-03	1.0	Text finished and finalized formatting of the document.
2012-02-08	1.1	Rewrote and rephrased certain sections to better match expectations.
2012-02-15	1.2	Finalized document and added more references to robot UI-resources.

Introduction

The subject in question is Urban Search And Rescue (USAR) robot simulation. It revolves around the use of robots to aid in search and rescue missions around the world. In increasingly hostile environments, having the ability to utilize robots instead of humans could significantly increase the survival rate when disastrous events occur. Being able to design and implement a user friendly and easy-to-use interface through which these robots can be controlled could - if done well - make the technology accessible for more people.

There are many great advantages of using robots in USAR. These include, but are not limited to, reduced latency to enter hazardous zones, ability to augment field of vision and equip sensor-enhancing equipment such as infrared cameras and radiation detectors as well as being able to navigate areas inaccessible to humans.

Overall, familiarizing with, and gaining experience in, the Unity3D software could be of substantial use later in life and could be applied when being part of other projects. It is also exciting to try something that no one in the group has had any previous experience with. Striving to make interfaces usable and accessible to many has been an interest within the group for quite some time and it is definitely something that can be applied in other areas of computer science as well.

Problem statement

As of today, the human-robot interaction barrier is one of the main problems when it comes to why robots are not widely used in USAR. By being able to, through user-driven-design, design and implement an interface that is easy to use, we are sure to get feedback from many users, including inexperienced ones. Our goal is to do this using Unity3D or USARsim. The main difficulty of this project will be to get a grasp of the different environments that will be used and later use them to implement an interface that captures the essence of usability and simplicity.

Approach

Before commencing with the learning phase of the project, a comparison between Unity3D and USARsim will be conducted to make sure the best tool is used for the implementation and design of the robot. However, it is important that this comparison is kept short and does not in fact consume a lot of time due to it not being a part of the actual project itself. Information gathered thus far indicates that Unity3D will be the better choice since it is a more widely used, all-round solution. This, however, could be subject to change. Furthermore it is also worth noting that the actual report writing process will be conducted throughout the entire progress of the project.

Once the comparison between the two development tools has been conducted the actual learning phase will begin. During this phase the information gathered relevant to the chosen development tool will be put to use as various tutorials and guides will be processed in order to learn how to best make proper use of it. This will most likely involve beginning with minor, more trivial exercises and then continuously increasing the difficulty gradually as the phase progresses.

The learning phase will in turn be followed by the so called implementation phase. It is during this phase that most of the actual programming takes place. The purpose of this phase is to create and implement the actual robots and their interfaces. This is like to take some time and several prototypes might have to be made.

When the robots and their interfaces have been implemented successfully it will be time to evaluate them in order to determine which of the designs that is the best. These evaluations will be conducted by the means of user testing. The initial plan is to test users by having them run a course, trying to get to certain points within a certain time while avoiding different types of obstacles.

References

A preliminary list of potential references can be found below. The list mainly consists of tutorials of varying types. Some are text based whereas others are so called video tutorials. Utilizing a mixture of several different tutorials during the learning phase has been deemed most likely to grant successful results considering the current lack of experience regarding Unity-projects within the group.

Relevant information regarding Unity3D

<http://unity3d.com>
<http://unity3d.com/unity/licenses>
<http://www.cs.cmu.edu/~illah/CLASSDOCS/Week4Class1USaRabxpdf.pdf>

Unity3D Tutorials

<http://www.youtube.com/watch?v=21zuMIsy2GM>
<http://www.virtualgamelab.com/unity-resources.html>
http://walkerboystudio.com/html/unity_training___free___html
<http://docs.unity3d.com/Documentation/Manual/UnityBasics.html>
<http://docs.unity3d.com/Documentation/Manual/index.html>
<http://www.digitaltutors.com/11/training.php?pid=572>
<http://www.unity3dstudent.com/>
<http://active.tutsplus.com/tutorials/unity/getting-started-with-unity/>
<http://wiki.unity3d.com/index.php/Tutorials>
<http://www.burgzergarcade.com/hack-slash-rpg-unity3d-game-engine-tutorial>
<http://dl.dropbox.com/u/31764591/Unity/Demo/Tutorials/WebPlayer.html>

Relevant information regarding robot interfaces

<http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA451379>
http://www.google.se/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDQQFjAA&url=http%3A%2F%2Fciteseerx.ist.psu.edu%2Fviewdoc%2Fdownload%3Fdoi%3D10.1.1.114.3950%26rep%3Drep1%26type%3Dpdf&ei=tz8ZUdKFN-rw4QSFniFW&usq=AFQjCNGlKqAm6tY4wv_uW7iNXdxck4uxGA
<http://www.tekkotsu.org/media/uno-final.pdf>
http://raybot.cse.unsw.edu.au/hri2006_20060107.pdf
http://cdn.intechopen.com/pdfs/8629/InTech-Improving_human_robot_interaction_through_interface_evolution.pdf

Time plan

The time plan is attached as an appendix.

Month	January			February				March				April				May			
Week	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Miscellaneous									EXAMS			EASTER							EXAMS
Robot/Unity3D				Learning phase				Design and implementation			User testing		Revise implemenation						#win
Meeting				1		2		Halfway	3		4								#profit
Essay								First draft						Final draft					
Other			Specification											Conference/Review					
Deadlines				Spec				Half					Essay		Review			Essay	
	The aim is to continuously keep the essay updated as we progress as well as producing weekly summaries of our progress.																		