ROBOTICS SIMULATION ENVIRONMENTS AND SOAR

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Soar Workshop 28

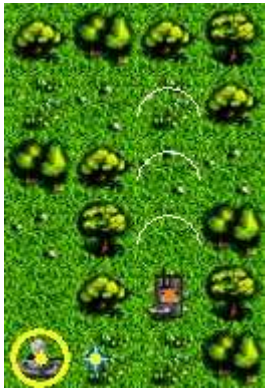
Integrating Soar with Robotics Platforms

- Obstacles to integration:
  - Setup: How do we get Soar to communicate with the robotics control systems?
  - Input: How do we obtain appropriate sensor data and translate it for Soar?
  - Output: How do we take commands from Soar and generate appropriate actions for output?

- Strategy: Use a simulation environment to explore the technical issues

Illustration: Paintball Tanksoar

- Moving "Tanksoar" to robotics domain
  - Paintball gun, obstacles, camera, laser range finder



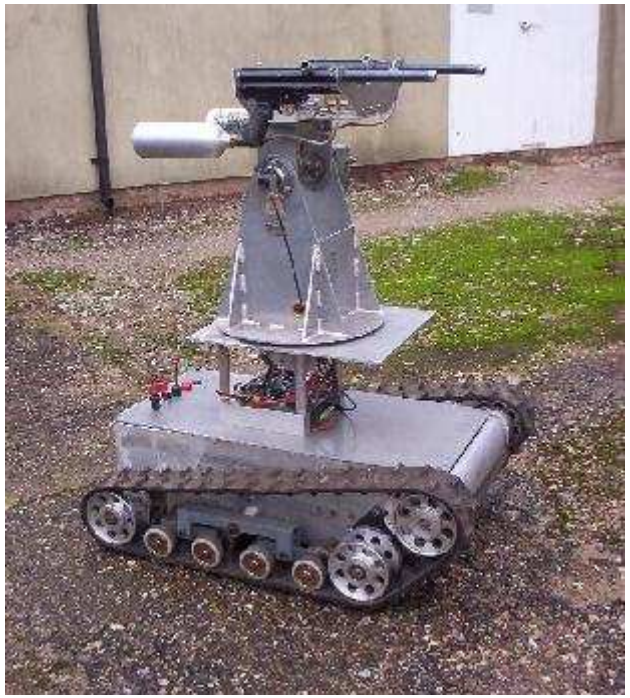


Illustration: Paintball Tanksoar

- Problem: Where's the other tank?
  - Difficult to identify with only range data and camera image
- Possible solution: mark the environment
  - Magenta tanks, nothing else magenta in environment
    - "Easy" for camera to detect
  - RFID tags and sensors

- Another solution: get additional 3D information from environment

Additional 3D Information

- Visual and shape data for world objects
  - Loaded to long-term memory at start-up
- Class and positional information about these objects during runtime as they fall in to the domain of robot's sensors
- Hierarchical organization of the objects in sensor domain

Simulation Environments

- The ideal simulation environment will have
  - Similar interface with real robotics hardware
  - Path for environment to communicate higher-level visual-spatial data

Simulation Environment Comparison

Environment/ Framework	Graphics Engine				Interfaces	Visual-spatial Information	Supported Robotics Platforms	Distribution and Usage	Simulation Maps/ Worlds
Player/ Stage/ Gazebo	Ogre (Gazebo)	N	Y	?	C++, Sockets	Available	Many	Young but built for widely popular Player/Stage	?
Microsoft Robotics Developer Studio	XNA	Y	N	N	C#, Sockets	Obscured	P2DX, Lego NXT, a few others	Young but growing	Few
USARSim	UT2004	Y	Y	?	Unreal Script, C++	Obscured	Many, varied	Used in yearly competitions	Many, varied including land, sea, air

Note that new robots and maps can be created for all environments.

Questions & Discussion

- Questions about these issues and environments
- Suggestions of other environments
- Strategies, experience, other feedback

Resources

- USARSim
  - http://usarsim.sourceforge.net/
- Microsoft Robotics Developer Studio
  - http://msdn.microsoft.com/robotics
- Player, Stage, Gazebo
  - http://playerstage.sourceforge.net/