

Robocup Rescue: Artificial Intelligence and Controller for Virtual Robots



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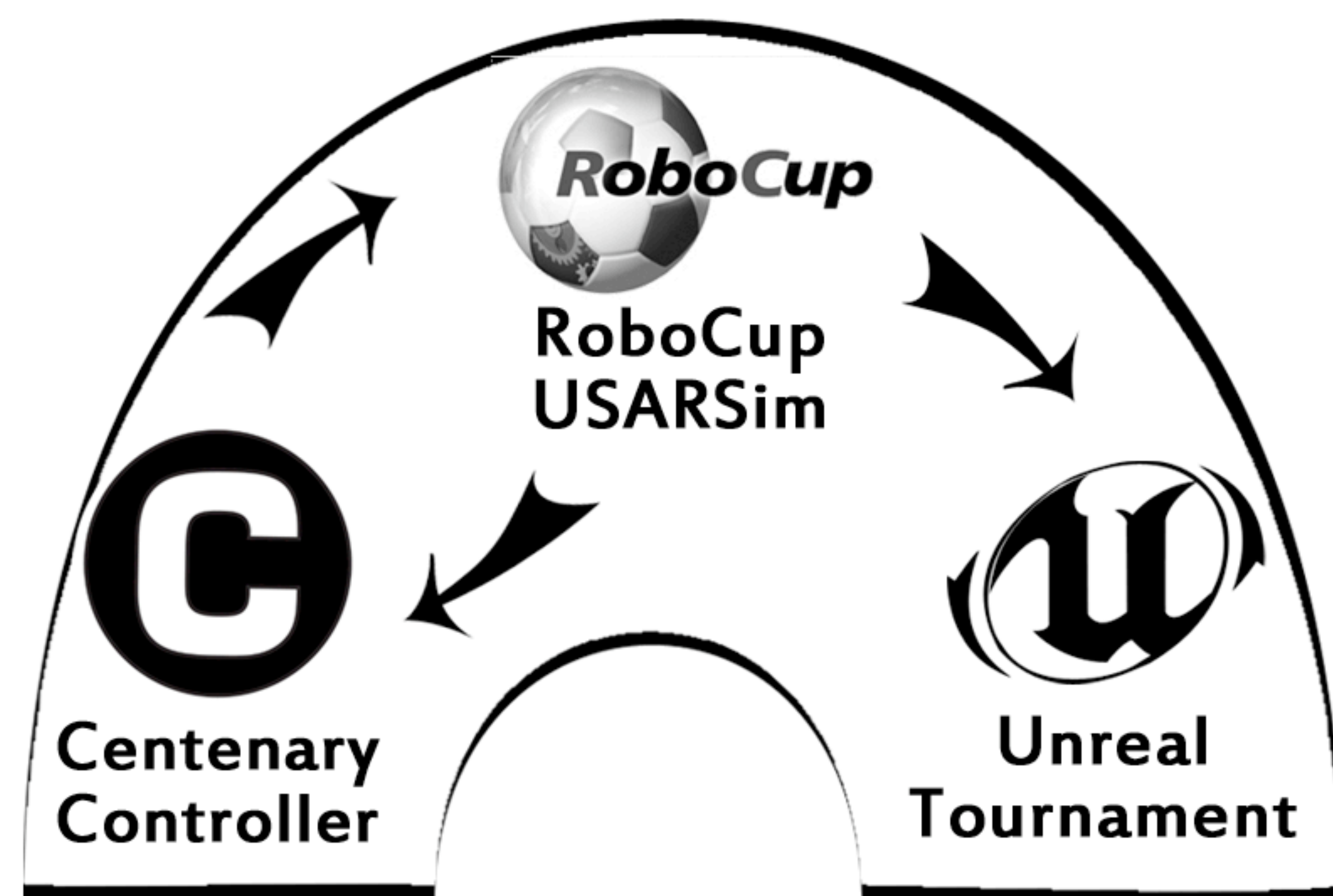
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What is Robocup Rescue?



- Robocup Rescue is an annual competition where teams of robots explore and map a disaster area.
- The competition fosters advances in team-based artificial intelligence.
- The simulated environments in all three competition divisions allow the intelligences to be adapted to real disaster situations.

Virtual Robot Simulation



- The VIRTUAL SIMULATION is a division of the competition built on the Unreal Tournament game's framework. It is a low cost alternative to purchasing a team of physical robots.
- RoboCup USARSim refers to the game modifications that support the robots and their sensors. It feeds data to UT to display the robots in the simulated environment.
- CENTENARY CONTROLLER is the program created during our research that allows the USARSim to communicate with an AI and vice versa. It parses data from the simulator and converts it into information usable by the AI.
- This controller is usable on Mac, PC, and Linux.

The Research

Creating a Java based CONTROLLER & AI



-Version I-

- CONTROLLER allows user to connect to simulator. System and robot commands are typed manually. Supports distance & touch sensors.
- AI has robot stop and turn right when touch sensor registers collision.

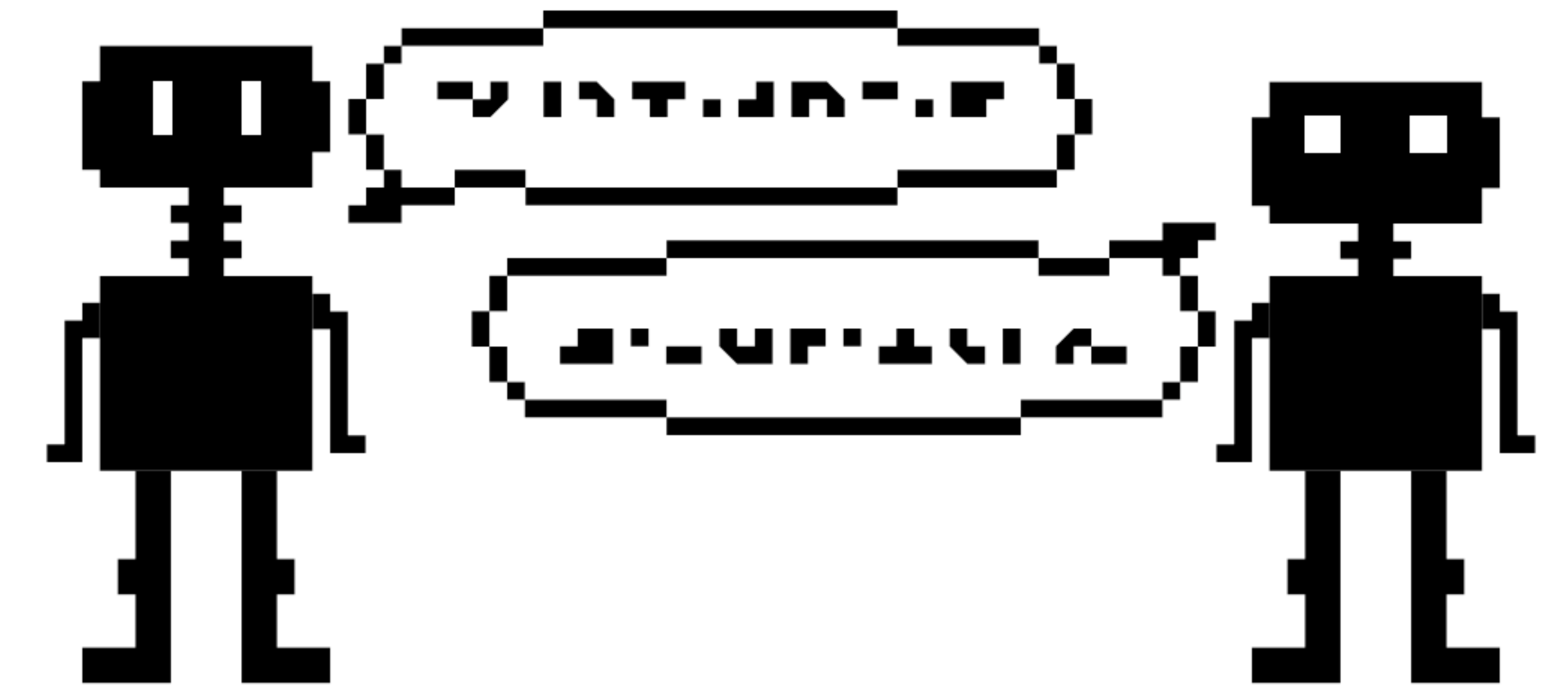
-Version II-

- CONTROLLER becomes menu based. Has simulator connection and robot launch options. Stores the location of possible disaster victims and creates a map using data from sensors.
- AI: robot uses distance laser to stop before colliding. Chooses direction to turn based on distance to furthest object.

-Version III-

- CONTROLLER launches and tracks info for multiple robots. Data for robots stored separately from each other.
- AI: robots track visited locations and move toward unexplored areas. Check width of halls to ensure robots can pass.

Results and Conclusions



- Ongoing improvements:
 - +Enable communication between robots
 - +Utilize information sent by other robots
 - +Combine robots' maps into a single map
 - +Create metrics to determine the presence of victims
 - +Ensure compatibility with all possible robot sensors
 - +Implement easy to use robot controls for users
 - +Add support for different models of robots
 - +Improve AI to ensure robots explore different areas

Once complete, Centenary Controller will be freely available to the Robocup Rescue community. It offers greater ease of use than existing controllers and will hopefully aid researchers, students, and amateurs in developing advanced team based AI's. More focus can be placed on constructing teams and utilizing different sensor sets to gain a more accurate picture of a disaster area, and less on struggling with software.

The AI accompanying Centenary Controller is still fairly simplistic, but creating more robust tools in the controller allows for a greater range of reactions. Using sensors in tandem allows for new possibilities such as recognizing glass walls and mapping on uneven terrain. Eventually the focus will shift to managing robot communications and ensuring robots stay within range or move into range to report periodically.

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