Communication Model for Cooperative Robotics Simulator

Project Overview

Version 1.0

1. Background

Cooperative Robotics Simulator is a research project in Computing and Information Sciences department at Kansas State University (KSU). The objective of Cooperative Robotics Simulator is to perform simulations of many heterogeneous types of robots all working within a single, virtual environment. The main components of this project are Robot Simulator, Environment Control Panel and Environment Simulator.

Robot simulator consists of three parts: a robot hardware simulator, a robot control program, which will be user supplied, and an environment-based robot object. Robot control program can work with various robot hardware simulators via standard API. The robot hardware simulator will interface to the environment via requests for data from its sensor or requests for action from its actuators. The environment-based robots will be responsible for controlling the individual sensors, based on robot hardware simulator requests, and providing the appropriate data to the sensors,

Environment control panel will be a standalone system that connects to the environment simulator to monitor and control the current simulation

The environment simulator is the central component in the system. The environment simulator is responsible for keeping track of the actual state of the environment, including each robot. The environment simulator receives requests from simulated robots to read sensors, initiate actuators, and to send and receive communication.
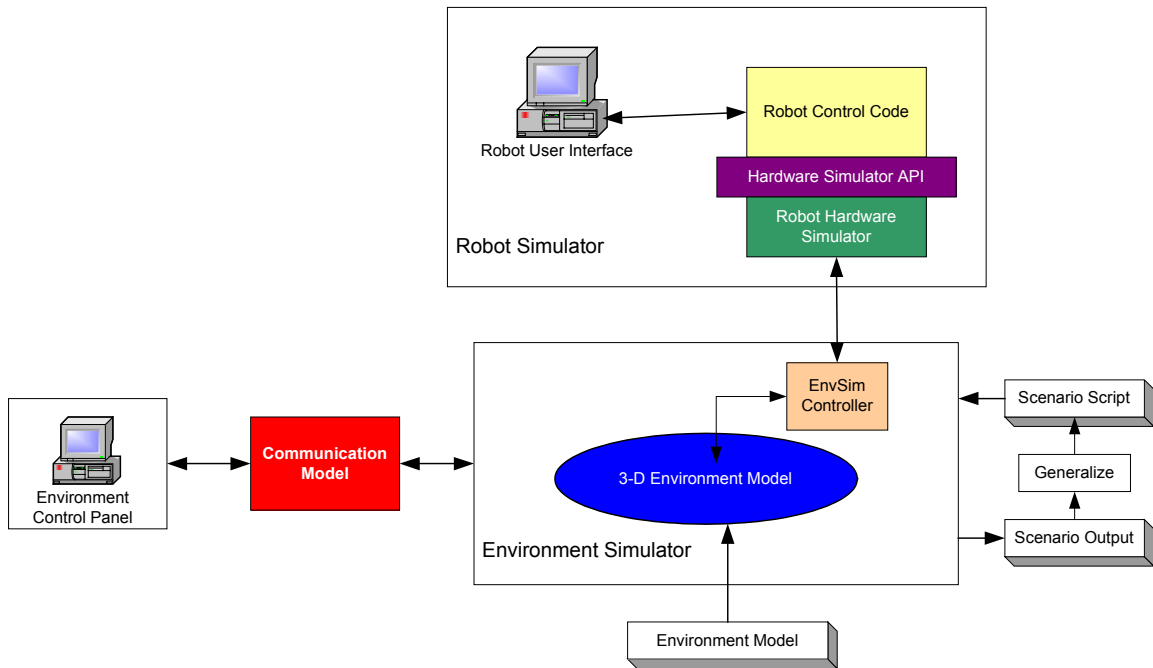
Figure 1. Cooperative Robots Simulator

2. Project Overview

The main focus of this MSE project is to provide basic communication between robot simulators. The Communication Model will be responsible for handling message passing between simulated robots. It will take requests to send messages to other robots and pass them to the correct robot depending on what method of communication. There are two types of communications; broadcast and point-to-point communication. Broadcast and point-to-point communication with appropriate delays will be developed to provide a fundamental communication between simulated robots. Furthermore, point-to-point communication will be extended by include range restriction to support wireless communication. Communication model will also provide an interface to environment control panel to simulate broken links, delay time and range limit for each robot.

3. Goal

Develop communication capability in Cooperative Robotics Simulator in order to provide a basic communication between simulated robots.

4. Features

1. Provide broadcast and point-to-point communication.
2. Allow simulated robots to choose method of communication between broadcast and point-to-point communication
3. Allow environment control panel to start up or shutdown link between robot simulators.
4. Allow environment control panel to set delay time.
5. Allow environment control panel to set range limit for point-to-point communication.

5. Constraints

1. This project will support capable of running in distributed manner, or on a single machine.
2. This project will be developed in Java using standard libraries. It should run in all JDK compliant platforms.

6. Reference

- "Cooperative Robotics Simulator" project overview description
  http://www.cis.ksu.edu/~sdeloach/CRSimulator/downloads/Cooperative%20Robotic%20Simulator.pdf