RoboCupRescue Interleague Mapping Challenge

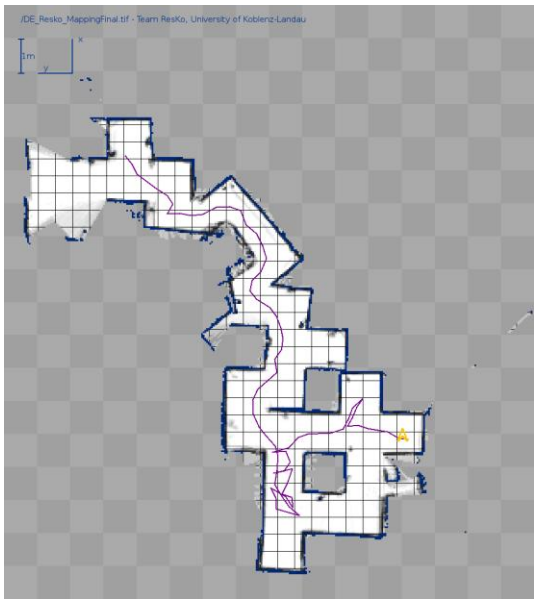
Platform-independent Evaluation of Mapping Algorithms Using Recorded Sensor-Data

RoboCupRescue Robot League, RoboCupRescue Virtual Robot Competition and @Home League

http://www.nist.gov/mel/isd/ms/mapping_challenge.cfm

VERSION: 2010.01

Examples scenarios for gathering sensor data. Real Robot League (random maze – above) and Virtual Robot Competition (USARSim – below).



Example for a geo-referenced map created in the random maze.

Purpose

The purpose of this challenge is to evaluate the performance of mapping algorithms independent of most of the factors that usually also influence the map quality in the RoboCup Leagues like, quality and quantity of sensors, stability of the robot-platform, computation restrictions, autonomy or path-planning. By using exactly the same, recorded, sensor data and providing exactly the same computation environment (virtual machine) only the quality and attributes of the mapping algorithm influence the produced map. Teams that already can run their mapping algorithm on recorded data should be able to participate by investing only a minimum amount of time.

Apparatus

- Teams participating provide an image (.vdi) that can be run by the judges in a VirtualBox virtual machine (VM).
- This image contains the mapping algorithm (as binary executable) as well as the environment to execute the mapping program (operating system).
- The VM will have access to two Gigabytes of memory and two CPUs.
- There are certain restrictions on the size (3 GiB for images that have to be downloaded via the Internet) and the setup of the VM – see the rules document on the webpage for details.
- The mapping program provided by the teams generates a geo-referenced map (.gtiff) (see rules for more information)

Sensor Data

- Sensor Data will be provided to the mapping algorithm in a defined, binary format (see http://www.nist.gov/mel/isd/ms/mapping_challenge.cfm).
- C++ header files and an example program for reading the recorded sensor data are provided.
- Sensors used this year are IMU and LRF.
- The data will come from different sources:
  - Robots driving through the random maze
  - Hand-held “sensor on a sick” through the random maze (low noise)
  - Potentially data from a USARSim run and from @Home

Procedure

- Any teams present at RoboCup 2010 in Singapore send an E-Mail to s.schwertfeger@jacobs-university.de to get further instructions.
- The judges will start a teams VM and sequentially run the mapping algorithm with all data sets generating a number of maps.
- This will be repeated for all teams.
- Teams have no way of interacting with the VM or the mapping program – the VM will have no connection to the internet.

Winner

- All maps generated will be collected and judged by:
  - A semi-automatic scoring metric using the fiducial approach (50%)
  - Expert judges (50%)
- The fiducial approach works by finding landmarks (parts of barrels) in the maps and using those to determine coverage, global accuracy, local consistency and other values which are used together to generate a score.