

Navigation of simulated mobile robots in the Webots environment

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According to some scientific forecasts robotics can be as important branch of life within reasonable time as it was the automotive industry in the 20th century.

To facilitate the spreading of the discipline engineers research new robot hardwares, while informaticians create new robot controlling softwares. The latter task cannot be imagined without reliable robot simulator environments. These tools may link up powerful algorithms and real-world tasks.

A well-known representant of these programs is Webots, a threedimensional mobile robot simulator. With the use of this tool controller programs using various guidance principles can be developed in C programming language.

This environment was originally implemented for a two-wheel 5 cm diameter mobile robot equipped with 8 infra-red sensors to detect obstacles and light sources, the Khepera. Actual version of Webots are capable of modelling any type of two-wheel differential steering robots using infra-red sensors, color video cameras, and touch sensors.

One of the most important goals of the mobile robot research is the emergence of the ability to efficiently navigate in complex, cluttered, and unknown environments. Various algorithms can be used to support the learning of the environment and the creation of a cognitive map.

The method of navigation strongly depends on the choice of the navigation paradigm. In the last decade two different approaches have been investigated: metrical and topological navigation.

Using metrical navigation the exploring robot creates a metric map of its environment as it would be a "view from above". During topological navigation the robot learns spatial relations of the surrounding objects and models them as a graph.

The author presents the Webots mobile robot simulator and its applicability to handle machine-learning methods in the self-localization and navigation domain. Advantages and disadvantages of metrical and topological navigation paradigms will also be explained.