Robots Interaction in Smart Space: Object Finding Scenario

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***Abstract*—The demo provides the enhanced version of interaction model of devices in smart space that was presented on 16th FRUCT conference. These devices are robot vehicles constructed with using of the Lego® Mindstorms EV3 construction kit with ultrasonic and gyroscope sensors (Fig. 1). Each vehicle is driven by two independent large motors and controlled by control block with LeJOS installed on the SD-card. WiFi USB-adapter provides local area network connection. For the control block the LeJOS has been chosen because it is provide full functionality OS with JRE Environment. Robots shares information through the Smart-M3-based smart space via using the Java KPICore library.**

Robots have been enhanced by including compass into the set of used sensors. It allows improving navigation in the physical space through adding one more coordinate system concerned with the Earth magnetic field. This improvement helps to collect more data that can be used to increase the search precision of objects around the robots.

After the start command receiving from the smart space, each vehicle rotate at 360 degrees and fetch information about turn angle, azimuth, and distance from the gyroscopic, compass, and ultrasonic sensors correspondingly (action "1" on Fig.1). This information stores for the future processing to separate found objects. The separation algorithm discerns objects by analyzing difference between neighbor distances. All found objects are sorted by the average distance and shared through the smart space. Each robot has subscription to new objects that are appearing in the smart space. When the objects from the other robot appear, they are queried by listening robot and comparing with existing set of its objects. Robots R_1 and R_2 find each other when the sum of the adjacent azimuths α_1 and α_2 to the equal distances between robots is 180° (Fig. 2). These distances should be excluded from the set. If there are more than two equalities, or object placed on the line between robots, then one of the robots should move, for example, to the North and repeat the area scanning. When robots find each other, they can detect the objects O_1 and O_2 by the distances on the intersections of azimuths and select the nearest robot to each object. The nearest robot turns to the angle the object is located in and moves to the object (action "2" on Fig.1).

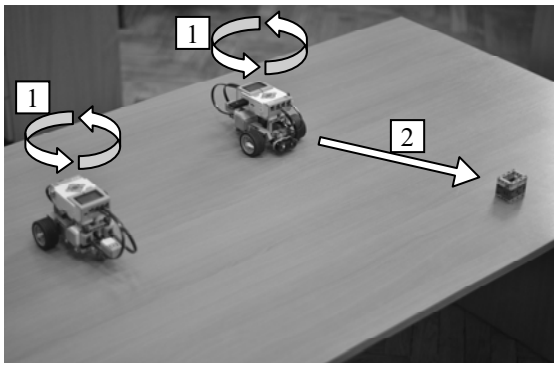

Fig. 1. Interaction model implementation

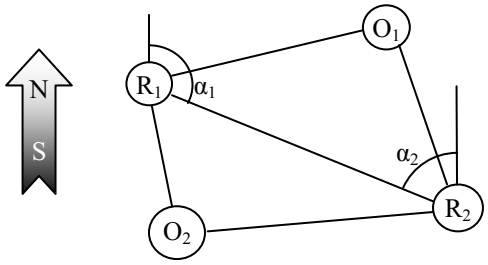

Fig. 2. Scheme of object search

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