VarastoRobo – Master

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Introduction

The aim of this project was to make an autonomous storage management system, in which multiple devices work in co-operation to transport ordered packages to a drop-off point. In addition a drone was to function as surveillance system for the premises.

Objectives

This part of VarastoRobo -project was to design a specification for communication between devices used in the storage system and to create software, for coordinating all devices.

Methods

Design of the communication specification was done considering transferred information, ease of implementation and code reuse on master server.
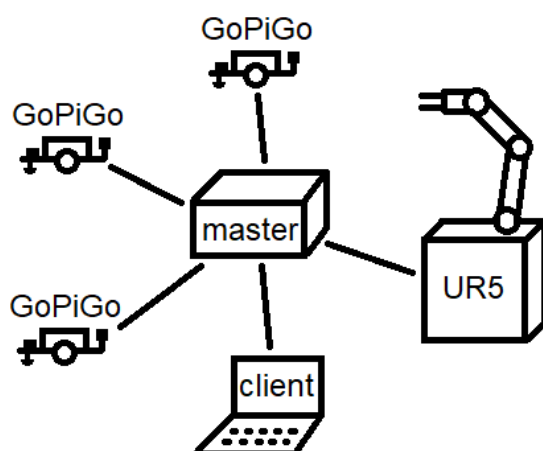

Figure 1. communication between devices

ID00BQ11 Product Design and Implementation

ECTS Credits: 15

Date of Publication: 2019, December

Instructors: Eero Nousiainen

To make devices work in co-operation, "master server" software was created to control all devices in the system. The master server is center of point of communication between different parts of the system, as seen in figure 1.

The system uses both TCP and UDP for messaging. UDP is used for broadcasting to all devices in local network and TCP connection are used for one to one communication between the master server and other devices. The master server is single threaded, because it needs only little processing power, but communication between devices is done in parallel using asynchronous IO.
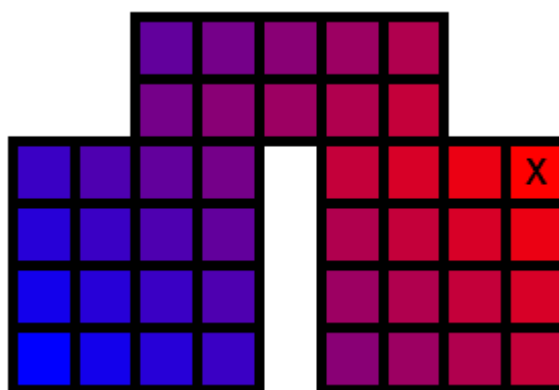

Figure 2. distance grid to target (x)

The master server creates paths for GoPiGos for transporting items form the storage to a user.

The master server transforms data that represents different parts of the system to grid of open cells and this grid is then transformed to distances to desired location, as seen in figure 2. These distance grids are used to create the paths of GoPiGos as lists of directions. GoPiGos are assigned different priorities for deciding how, devices drive around each other.

Cross-platform JSON parser library was also created for reading configurations of the master server and to be later used in other projects.

Results

Shared communication specification was written and used as the basis for communication between devices, and master server software was written. The system worked as planned.

Conclusions

The development team learned valuable lessons working with much bigger team than in any previous projects. Experience working with asynchronous IO using sockets was gained with using then on the master server. JSON language's syntax was learned while creating parser for it and, it's practical use while using it for configuring the master server. Also writing the communication specification was interesting experience.