Logistics League
RoboCup 2012

FESTO

Sponsored league as part of RoboCup German Open 2012
Magdeburg March 29th – April 1st and
RoboCup WC 2012 Mexico City from 18th till 24th June 2012

After two successful years of demonstration 2012 will bring forth the first world champion. With the continued goal to approach an industrial application in a challenge for university students, the Logistics League has been added to the approved RoboCup portfolio.

Our visionary Objective

The steady increase in worldwide transport tasks asks for improved autonomous solutions.
Following the RoboCup spirit this league's goal is to enable scientific work in order to achieve a flexible solution of material and informational flow within industrial production using self-organising Robots. This next evolution of Automated Guided Vehicles calls for new technologies to overcome present non-feasibilities.

The RoboCup approach provides an excellent platform to implement, test, and evaluate robots' abilities and performance in an environment which can be adapted to the progress of results.

The Competition Approach

At present, the competition envisages a kind of hardware-in-the-loop simulation method, i.e. there is a flexible simulated production hall with integrated real mobile robot systems having the task to create an efficient material flow to provide a high rate of product deliveries in due time.

The 5.6 times 5.6 meter large competition area provides the fictional production hall for each team. With incoming goods departments and delivery zone the surrounded production machines will be used to solve the task. The simulated environment will put the competitors to the task with out-of-order machines and varying production times.

The Challenge

- **Autonomous Guided Vehicles** reacting in a flexible yet precise way to an unknown production environment, solving a broad variety of tasks without in-game administration in a way that bears resemblance to Artificial Intelligence.

- Developing is done on the common mobile robotics platform Robotino® to focus on the task to create innovative intelligent multi agent solutions. But the system is open for any specific improvement or extension of provided sensor technology.

- Contributions will be necessary from all experts of **Robotics, Computer Science and Logistics**. Just like in the real world, a project based challenge will ask for this **interdisciplinary engagement**.

Robotino® based
AGV-Simulation on
University level

Sponsored by Festo

Competition Environment

The Competition

Two teams running against the clock and each other. Each team consists of three Robotinos®. The objective is to produce and to deliver more finished products to the correct commissioning station than the opponent team.

During the 15 minute match, no interaction between the teams and their robots is possible. Therefore artificial multi-agent systems must be developed such that the robots can share gathered information with their fellow robots and follow a common strategy

- to identify the locations of the different production machines,
- to run a full production cycle by mounting the resources, transporting them to the right machine, supplying the correct materials to complete the work order and eventually deliver the finished product to the correct loading zone and cleaning up the workspace.
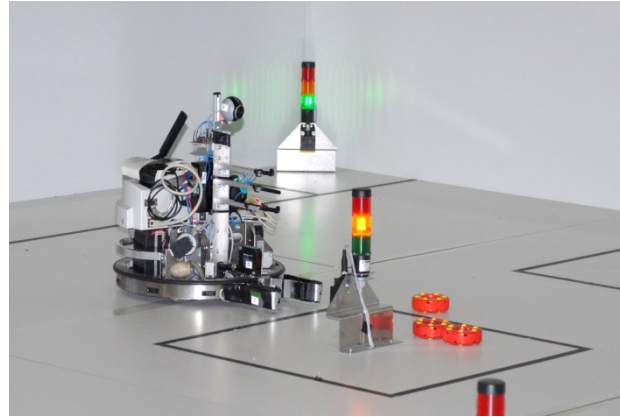
At the present competition level production machines will be simulated by RFID read-/write-devices and materials are simulated by RFID tags characterized by well defined part numbers.

The information about the status of the machines as ready for next order, in processing, waiting for material, processing finished or out of order, will be visualized by the signal lamp attached to the machine and must be correctly interpreted by the robots.

Transportation of the material will be done on pallets. To simplify things, pallets can only carry one material. Pallets are realized as pucks. They can easily be handled by Robotino®.

The Rules

Processing of the final product requires some supplying materials which must be also produced and delivered on time. This means that the robot team must create an efficient work schedule for producing the right subcomponents and delivering them to the different machines on time.

2012 features a fully polished set of rules that encourages sustainability and flexibility even further, enabling more complex approaches to the task.

Distributed throughout the factory are 13 machines. Ten of the machines represent the three staged production cycle, divided into:

- **4 M1** processing the raw material S0 to S1
- **3 M2** that consume another S0 to process S1 into S2
- **3 M3** that incorporate S0, S1 and S2 into one product.

Finally, the Product has to be delivered to the correct one of the three possible **Delivery Gates.**

This educational model will continue to challenge the participating teams, increasing difficulty and complexity of the task, eventually adapting and improving the industrial process.

Do not hesitate to ask for further information.