Swarm Robotics in Strategic War Gaming

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I. INTRODUCTION

The field of swarm robotics [1] is fascinating in that it breaks away from traditional research. Instead of optimizing the intelligence of a single robot, it maximizes the performance of a group - swarm - of rather limited robots. Applying these ideas to gaming immediately brings to mind current-generation strategy video games, where the player usually controls groups of units - squads - instead of the individual units. Here these individuals are rather unintelligent robots, capable of little more than navigating and using their weapons. However, clever control of the squads of autonomous robots by the game players can make for intense, strategic matches thus creating a revolutionary dynamic war game.

II. SWARM ROBOTICS WAR GAME

Figure 1 presents the gaming interactions between the players and the squads. The player has access to the game interface which processes player input (e.g. robot, squad and game configuration, chat sessions, strategic squad commands) and visualizes the battlefield.

The Game Logic controls the player-squad communication, game rules and the realization of the player commands by the strategic intelligence. Through the use of the ActiveMQ [2] eventing system it processes events generated by the players, robots and game rules resulting in a dynamic real-time control of the squads.

The strategic intelligence as the 'brain' of the squad interprets orders, gathers informa-
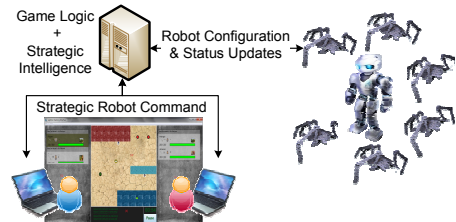

Figure 1. Players with strategic control over squads.

tion from robot sensors and decides which sequence of robot actions has to be performed to execute the orders. It consists of the following behavioral layers with growing priority: squad behavior, robot behavior and reflex. *Squad behaviors*, initiated by player commands, are sequences of actions performed by a squad of robots. *Robot behaviors* consist of basic individual commands such as `goto(x,y)`, `pickup(object)` and are the result of squad behaviors. *Reflexes* include collision avoidance and staying within map boundaries. A robot acts as a Web service with semantically enriched capabilities. This way the strategic intelligence is able to divide and assign commands depending on the dynamically discovered robot capabilities.

III. CONCLUSIONS

Swarm gaming was executed using Lego Mindstorms NXT robots. These simple and cheap robots, cooperating in teams, introduce a first step towards a new kind of gaming experience combining traditional computer gaming and cutting-edge robot technologies.

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REFERENCES

[1] http://www.swarm-robotics.org/.
[2] http://activemq.apache.org/.