ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Distributed Computing

Prof. R. Wattenhofer

Ants: Robust Mobile Finite State Machines

This document describes the subject and the general time schedule of the Master thesis of *David Stolz* in the spring term 2013. Adaptations or changes can be agreed upon by the advisors.

Motivation and Informal Description

"They operate without any central control. Their collective behavior arises from local interactions." The last quote is arguably the mantra of distributed computing, however, in this case, "they" are not nodes in a distributed system; rather, this quote is taken from a biology paper that studies social insect colonies . Understanding the behavior of insect colonies from a distributed computing perspective will hopefully prove to be a big step for both disciplines.

In this project we consider a variant of the *ANTS* (Ants Nearby Treasure Search) problem, initially introduced by Feinerman et al. [1], where agents are modelled as mobile finite state machines [2]. The objective of the ANTS problem is to locate a treasure in the infinite integer grid as fast as possible.

The goal of this thesis is to develop robust algorithms within the ANTS problem that are guaranteed to work also if the agents do not operate in a perfect environment, such that agents can fail (i.e. die), their movements and sensor readings are not 100% accurate, and, last but not least, agents have to deal with malicious "colleagues", which try to hamper the other agents progress.

Supervisor

- Tobias Langner: tobias.langner@tik.ee.ethz.ch, ETZ G61.4

References

[1] O. Feinerman, A. Korman, Z. Lotker, and J. Sereni. Collaborative Search on the Plane Without Communication. In *Proceedings of the 31st ACM Symposium on Principles of Distributed Computing (PODC)*, pages 77–86, 2012.

[2] Y. Emek, T. Langner, J. Uitto, and R. Wattenhofer. Ants: Mobile finite state machines. Under Submission, 2013.