Literature Review on maze exploration in the IEEE Micromouse Competition

# Abstract

The IEEE Micromouse is a competition for independent robot exploration and navigation. The goal is to find a path to the centre of the 16x16 cell grid map. The positions of the walls are unknown at the start of the competition. The robot has a total time of ten minutes in the maze. The robot has to first explore the maze to find a path to the centre and return to the start. After that the robot can do speed runs to the centre, as the winning robot will be the one with the fastest run time. To this run time a fraction of the exploration time is added. With this in mind a fast exploration and navigation for the fastest route is the challenge for the AI of the robot.(University of California 2015). The IEEE Micromouse Competition is an annual event since 1979 in at least the UK, the USA, Japan, Taiwan and Singapore. A new version of Micromouse called the Half Size Micromouse has been introduced for 30th All Japan Micromouse competition 2009. This new competition doubled the map grid size to 32x32 with each cell being reduced to half the size.(Foundation 2015)

As autonomous robots become more available in consumer products (Lawnmowers, vacuum cleaners, etc.), this competition shows the state of the art of exploration and navigation in small robots in unknown territory. With the constraints of size and cost the computing power of these robots is limited. As an example for the lower end the robot of Juing-Huei of Lunghwa Univ. of Sci. & Technol., Taoyuan, Taiwan is 16 bit fix point 40MHZ CPU and 8KB f memory(Juing-Huei *et al.* 2014) and at the top end Min7 from Ng Beng Kiat from Ngee Ann Polytechnic, Singapre with a ARM3 72MHZ CPU and 64KB of memory(Kiat 2015).

Robots are gaining more and more entry in our daily lives. Be it as autonomous vacuum cleaners or lawn mowers. These robots have to work in an environment which is at least partly unknown. So exploration in unknown territory becomes more and more important and fastest path navigation also as the battery energy is small, Lithium Polymer 150mAh for Min7.

This review looks first at the papers dealing with multiple basic algorithms for the Micromouse competition, then moves on to papers dealing with improving algorithms and then papers to present new algorithms for the Micromouse competition.

# Basic Algorithms

## Wall Followers

The left and right wall followers are mentioned in a few papers. The wall followers were used and won in the first completion in 1979. After this the rules were changed to make it impossible for stupid wall followers to find the goal.(Micromouse-online 2015)

# References

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