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A Study on Mobile Robotics in Robotics

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ABSTRACT
Mobile Robot competitions are vital way for distribution of science and engineering to the worldwide public but are also brilliant way of testing and comparing unlike research policies. It is discuss how today's study challenges of Intelligent and Autonomous Mobile Robots are being fingered by the Autonomous Driving competition that takes place in the Portuguese Robotics Open annual mobile robotics competition.

Keyword: *Mobile robot, micro mouse, office navigation, ball collection, robot soccer, RoboCup, robotics research programs, rough terrain, bounding, motion planning, Little Dog, RRT, reachability-guided RRT, transverse linearization.*

INTRODUCTION
Mobile robot competitions are for over 20 years. They have motivated generations of students, researchers and amateurs alike, while overwhelming enormous amount of research subsidy and own time and effort. Oppositions provide a goal together with an objective performance quantity, while widespread media coverage allows participants to present their work to a wider environment. So it is time to take a look back and reflect on the research result of a number of events. In the next sections, we will take a nearer look at three major international mobile robot competitions. In the order of their creation dates these are Micro mouse Contest, AAAI Mobile Robot Competition, and RoboCup Robot Soccer. In robot competitions this is reflected by guessing very strict environments in early competitions, while later competitions take place in more open spaces. Some early robot competitions already played two challenging robots against each other, while multiple robots work together for a common task have only been introduced a few years ago.

Odometry
- Odometry is the broadly used direction finding method for mobile robot locating; it provides good short-term exactness, is low-cost, and allows very high sampling rates, the fundamental idea of odometry is the integration of incremental motion information over time, which leads certainly to the abundant meeting of errors.
- The resulting errors can be categorized into one of two groups:
  - **systematic errors**
  - **non-systematic errors**

Non-systematic errors are those that result from the communication of the floor with the wheels. Typically, when a mobile robot system is installed with a hybrid odometry/landmark navigation.

SYSTEMATIC ERRORS
Measurement of Odometry Errors
One important but infrequently addressed difficulty in mobile robotics is the quantitative measurement of odometry errors. Absence of well-defined calculating actions for the quantification of odometry errors results in the poor standardization of mobile platforms and single reports on odometric correctness in scientific communications

Measurement of Non-Systematic Errors
Borenstein and Feng [1995] both proposed a method for calculating non-systematic errors. This method, called extended UMBmark, can be used for comparison of different robots under similar conditions, though the measurement of non-systematic errors is less useful because it depends strongly on the floor features.

Inertial Navigation

Inertial navigation uses gyroscopes and accelerometers to measure rate of rotation and acceleration. Measurements are integrated once to yield position. Inertial navigation systems have the benefit that they are self-contained, that is, they don't need external references. Inertial sensors are thus mostly unsuitable for accurate positioning over an extended period of time.

Accelerometers

Test results from the use of accelerometers for mobile robot navigation have been generally poor. The University of Michigan it was found that there is a very poor signal-to-noise ratio at lower accelerations. Accelerometers also suffer from extensive drift, and they are sensitive to uneven ground because any disturbance from a perfectly horizontal position will cause the sensor to detect a component of the gravitational acceleration.

Micro mouse Contest

This report from the first "Amazing Micro-Mouse Maze Contest" demonstrates the enormous media interested in the first mobile robot competition. The academic response was also overwhelming. Over 6000 entries followed the announcement of Don Christiansen [5], who originally suggested the contest. The task is for a robot mouse to drive from start to goal in the fastest time. Rules changed somewhat over time, in order to allow exploring the whole maze and then compute the shortest path, while also counting exploration time at a reduced factor.

AAAI Mobile Robot Competition

At the end of the 1980s, the micro mouse contest had outlived itself and the robotics research community was losing interest. The problem was solved and did not provide any new challenges.

RoboCup

The Robot World Cup Initiative (RoboCup) is an attempt to intelligent robotics research by providing a typical problem where wide series of technologies can be integrated. For this purpose, RoboCup chose to use soccer game, and organized an world cup known as The Robot World Cup Soccer Games and Conferences.

GLOBAL POSIONING SYSTEM (GPS)

- The Global Positioning System (GPS) is a revolutionary technology for outdoor navigation.
- GPS was developed as a Joint Services Program by the Department of Defence.
- The system comprises 24 satellites (including three spares) which transmit encoded RF signals. Using advanced trilateration methods, ground-based receivers can compute their position by measuring the travel time of the satellites' RF signals, which include information about the satellites' momentary location.
- This intentional degradation in positional accuracy to around 100 meters (328 ft) worst case is termed selective availability (SA)

Fractional Availability of Signals:

- The dynamic test was found by driving an instrumented van over different types of territory.
- The various routes were chosen so that the GPS receivers would be subjected to a wide variety of obstructions.
- Large trucks, underpasses highway signs, buildings, foliage, as well as small canyons were found on the interstate and rural highway driving routes.

AUTONOMOUS DRIVING COMPETITION RULES

The Autonomous Driving competition aims at promoting developments in devices, techniques and systems usable for vehicle autonomous driving either in restricted areas or, hopefully in the future, larger public spaces, such as pathways, roads and parks. Therefore, the challenge comprises a path with an 8-shaped configuration simulating a road, which, for the last version of the competition, defines a two-way street about 1.5 m wide.

Background

The problem of fast movement over tough terrain has been an active research topic in robotics, beginning with the seminal work by Raibert in the 1980s). The research can be roughly divided into two categories. The first category uses knowledge of the robot mand environment within a motion planning framework.

Little Dog Model

An essential component of any model based planning approach is adequately accurate identification of the system dynamics. Obtaining an accurate dynamic model for Little Dog is challenging owing to subtleties in the ground interactions and the dominant effects of motor saturations and transmission dynamics.

Motion Planning Algorithm

Here we can formulate the problem of finding a feasible trajectory from an initial condition of the robot to a goal region defined by a desired location of the COM.

Reach ability-guided RRT Overview

Sample based planning methods such as the RRT can be very fast for certain applications. However, such algorithms depend on a distance metric to determine distance from which would invalidate the use of a proper Euclidean distance metric that assumes a smooth continuous space of actions. The idea of Reachability can be an exclusively powerful concept for sample based planning in the background of macro actions, as the accessible region does not have to be native to its parent node.

Simulation Results

It is presented three modifications to the standard implementation of the RRT to plan bounding motions with Little Dog: (1) a simple motion primitive; (2) reach ability guidance; and (3) task-space biasing. Each of these components could be implemented separately, but they worked particularly well when combined.

CONCLUSION

Mobile robotics is a big opportunity for robotics research. They create student interest and inspire them to work dedicated on their projects. Competitions create media interest and may even generate additional funds from external sources. The practical solutions students find for all the small problems on their way to a competition will teach them more skills than a lecture ever can. So it is actually a good idea to participate in a robot competition, provided that the individual research goals are covered by the particular event.

REFERENCE

1. Farrell, J. L., 1976, “Integrated Aircraft Navigation.” Academic Press, New York, NY, ISBN 0-12-249750-3.
2. Feng, L., Fainman, Y., and Koren, Y., 1992, “Estimate of Absolute Position of Mobile Systems by Opto-electronic Processor,” IEEE Transactions on Man, Machine and Cybernetics, Vol. 22, No. 5, pp. 954-963.
3. Fleury, S. and Baron, T., 1992, “Absolute External Mobile Robot Localization Using a Single Image.” Proceedings of the 1992 SPIE Conference on Mobile Robots, Boston, MA, Nov. 18-20, pp. 131-143.
4. Fukui, I., 1981, “TV Image Processing to Determine the Position of a Robot Vehicle.” Pattern Recognition, Vol. 14, pp. 101-109.
5. Getting, I. A., 1993, “The Global Positioning System,” IEE Spectrum, December, pp. 36-47.
6. Gothard, B. M., Etersky, R. D., and Ewing, R. E., 1993, “Lessons Learned on a Low-Cost Global Navigation System for the Surrogate Semi-Autonomous Vehicle.” SPIE Proceedings, Vol. 2058, Mobile Robots VIII, pp. 258-269.
7. Gould, L., 1990, “Is Off-Wire Guidance Alive or Dead?” Managing Automation, May, pp. 38-40.
8. Roger Allan, The amazing micro mice: see how they won, IEEE Spectrum, Sep. 1979, vol. 16, no. 9, pp. 62-65
9. John Billingsley, micro mouse - Mighty mice battle in Europe, Practical Computing, Dec. 1982, pp. 130-131
10. T. Bräunl, B. Graf, Robot Soccer with Local Vision, Pacific Rim International Conference on Artificial Intelligence, Singapore, Nov. 1998, pp. 14-23