Notes from Problem Solving Presentations

May 26, 2005

1 Argument about Stereoscopic Camera

- Wojciech notes that the robot is not currently equipped with a stereoscopic camera and suggested that it might be useful to add one.
- Ali argues that a robot equipped with a stereoscopic camera is unrealistic and that we should not assume to have this luxury in our simulation.
- Tom initially decides to enable the stereoscopic camera.

2 Some General Techniques - Wojciech's Presnetation

A survey was found that describes the different approaches that have been used in Robotic Mapping: "Robotic Mapping: A Survery", Sebastian Thrun, Carnegie Melon University.

2.1 Occupancy Grid Mapping Approach

Main idea is to setup a grid of blocks and in a probabilistic manner, using a Bayesian filter, constructs the map by filling grids with occupied/vacant markers.

Tom is skeptical about this algorithm saying if the map is big enough the map becomes too inaccurate to be useful.

Piglet, the winner of one of the Alife contests, uses Occupancy Grid Mapping method.

2.2 Landmark Based Approach

Another approach is to identify some landmarks and build a map using the landmarks reference point in a cooridnate system. Also probabilistic and uses Bayesian filter.

Woijciech notes that almost all the approaches use a Bayesian Filter.

3 Argument about Realism-Feasibility Tradeoff - Marc's Presentation

Focus is on two main ideas: Camera abilities and Wheel Friction/Slippage.

3.1 Wheel Friction

Gregory says Webots default value for slippage is not zero, but allows for accurate odometry (provided not too much collisions occur), and hence value is unrealistic.

Ali says his team were able to have the robot return to a particular position very accurately by reversing its actions.

Tom decides to leave the value as it is for now.

3.2 Stereoscopic Camera Revisited

Different points of view:

- Ali: totally against stereoscopic camera. Believes it's unrealisitic and makes the problem too easy.
- Marc: if camera is noisy enough, it would not make the problem too easy. With no stereoscopic camera at all, problem might be too hard to finish in the remaining 2 weeks, and we might all end up doing a random walk algorithm. Ali disagrees. Marc also suggests the possiblity of having a 360° camera.

Tom wants balance between two extremes:

1. 360° stereoscopic camera with no slippage. Problem becomes purely algorithmic.
2. Very limited robot capabilities that makes a random walk work as well as any other algorithm.

4 Path Construction Apprach - Ali's Presentation

Ali presents an approach in which a path is constructed using flags that denote milestones. The robot can always return to any position if needed (to charge, to get out of dead end, etc...). Main problem is that if robot hits an obstacle and stops moving, it is impossible to know for how long it has been stuck with accuracy larger than that of the duration of a cycle (currently 64 ms). In order to improve the accuracy, Ali suggests to decrease that value to 8 ms for his team's robot.

Mark objected on changing precision of cycles because this allows one robot to perform a larger number of computation than others.

Tom suggests 3 options:

- Don't care and hope no one abuses this "loop hole".
- Restrict the allowed computation time within a particular cycle. Nir will check if it is possible to preempt a process that has taken more time than is allowed within one cycle.
- Lose more battery if more computations are made. Nir will also check if that is possible.

5 Avoid Imitating Piglet

Because it is not "illegal" to use code available elsewhere, especially from Piglet, Tom wants to make the problem different enough than the Alife contest to make it insufficient to just borrow code from contest winners. Two suggestions:

1. Solve the stereoscopic camera dilemma by simply doing the exact opposite of what is used in the official Alife contests.
2. The battery life time and the availability of the charges should be increased in order to shift the goal from survival (Alife contest goal) to finding the target. Survival should be a secondary objective.