Background

The Sony robot dog Aibo is becoming increasingly popular as a platform for research and education in artificial intelligence. Self-localization and mapping (SLAM) is an important field in AI research if robots are to be made truly autonomous in the future. To try and implement SLAM on a publicly available robot is an interesting challenge.

Objective

The aim of this study is to investigate the possibilities of a simple autonomous agent to explore and navigate an unknown environment. The problem is relaxed to have Aibo explore and navigate an office environment of which it has a certain knowledge about the features of prospective landmarks. The first goal is to get Aibo to walk around recognizing landmarks in the environment. The second is to explore and map it. If these goals are successfully accomplished a further goal is to have Aibo navigate the office environment using landmarks and the map.

Methodology

To begin with, much of the project time will be spent on searching for relevant articles and other sources of information concerning computer vision, feature detection and self-localization. We will then concentrate on testing different image manipulation- and edge/feature detection algorithms using images from Aibos camera. Then, once we have seen what can be extracted reliably from the camera images, decisions about methods of exploration, self-localization and map-making will be made.
Draft Workplan

The project will consist of the following phases:

1. Acquaintance with the Sony robot and current software
2. Broadening the knowledge of C++ and the development tools
3. Solving the problems of landmark detection from images
4. Designing and implementing the necessary behaviors for walking around the environment recognizing landmarks, possibly reusing previous walk designs
5. Solving the problem of local low-level navigation
6. Solving problems of exploration and map-making
7. Implementation and integration of the overall architecture
8. Possible extensions

A more detailed workplan will be produced during the execution of the project.