Opportunity and Significance

Our client designed a new robotic arm and wanted to demonstrate the physical capabilities in an interactive manner. In addition, they would like to demo it to students to inspire interest in robotics and software engineering.

Technical Objectives

1. Read checkboard state with object detection
2. Modify opensource AI
3. Feed board states into AI
4. Manipulate e.Do Robot to move pieces via ROS

We have created the foundation and system architecture to allow the e.Do robot to play AI driven board games. By making minor modifications, the current system can be easily adapted to play a number of other games by calling the same APIs in addition to checkers. Another milestone would be improving the accuracy of the object detection and manipulation to reduce dependence on human adjustments.

Technical Approach, Accomplishments and Results

We decided to break this project into 3 components: Image Detection, Manipulation, and AI. For image detection, we used OpenCV to detect the circles and squares of the checkerboard to determine the current board state. For the manipulation, we published messages to ROS topics to execute movements on the robot. For AI, we made major modifications to an opensource AI called Cobra-Draughts. The main changes included allowing it accept our own board state inputs and output the results of it’s move in an acceptable manner. We also had to fix many bugs to ensure the AI always made legal moves. After all three parts were completed, we developed a main script to integrate them all together.

Related Work and State of Practice

This is a new project that our team is working on from scratch.

Next Steps for Development and Test

This project is primarily to demonstrate the physical capabilities of the e.Do Robot Hardware and to illustrate an interesting software application.

Commercialization Plan & Partners

COMAU Robotics

This product is for educational purposes only.

References

https://github.com/THeK3nger/Cobra-Draughts
http://www.ros.org/
https://doc.opencv.org/4.0.0/