**Tic Tac Toe with OpenCV**

**and Dobot Magician**

CSCI-C458 Intelligent Robots

Semester Project

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Motivation: The purpose of this project ties together the study and manipulation of effectors with computer vision. This way we can help other students study how to programmatically move and play with Dobot.

Project Goals:

* Draw ‘O’ and ‘X’ on a piece of paper with Dobot
* Process the camera picture to get player’s move
* Process the current state to find the best move

Intended Approach: We set up the game environment (board) and an internal representation of the game board, with respect to the vision sensor. We then define general offset values from each vertex *inside* each cell as the four coordinates necessary to create an ‘X’ in each game cell.

We create the definition of Tic-Tac-Toe with the appropriate start state and end states. To progress the state of the game, we have implemented game logic using a search algorithm. The algorithm compares a heuristic value that represents the outcome of the game as the program simulates each possible move from the current state. To update the internal state of the game board for the non-robotic (human) player, we use a vision sensor that takes a picture of the board. The pictures are compared and the area that has the highest difference is given as the players action.

Test Bed: We use Dobot Magician with an ink pen effector to draw the ‘X’ token on the game board as our robotic player. We use a vision sensor to take in the board state. From there we communicate between the state given by the sensor, internal game logic, and Dobot.

Evaluation: We test that A.I. robotic player recognizes a draw state, win state, and loss state and makes no farther moves. We will also be using mistakes made per game, were a mistake is defined as A.I. robotic player does not immediately win or does not stop the human player from wining.

Milestones:

* + Find vertices of game board: Week of February 27th
  + Create ‘X’ token: Week of March 3rd
  + Create TTT Game Environment: Week of March 10th
  + Implement Search Algorithm: Week of March 17th
  + State differencing Implementation: Week of 17th
  + Motion Detection Implementation: Week of 24th
  + Project Presentation: April 19th