ROBOT IDENTIFICATION AND TRACKING RESEARCH PROJECT

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Introduction
When working with multiple robots, there are many issues that arise. These include communication with the robots, identifying the locations of robots within a group, or team, and distinguishing robots from each other.

Background
The goal of this project is to develop an overhead camera system capable of identifying and tracking the positions of a group of robots. The purpose of this study is to give us the ability to identify each robot within the team.

Approach
The first approach that was taken was to place a bi-colored marker on each robot. This solved three issues for us: (1) it gave us a unique marker for each robot, (2) it gave us the ability to identify the location of the robot, and (3) it provided us with data necessary to calculate the direction of the robot. After implementing this approach, however, we realized that we had created a new problem. Due to the limited number of colors that are distinguishable by our overhead cameras, we would not be able to use this method for distinguishing individuals in large teams of robots. After doing some research we found Professor Jacky Baltes' work where he developed a solution for the same issues that we have without the use of multiple colored makers.

Experiments
We began to implement Baltes’ algorithm, which utilized the Hough transform; but after a few tests we realized that this algorithm was extremely demanding on our CPU. After some more testing and brainstorming, we found that we could implement a more efficient algorithm, which uses edge detection and a binary image.

Results
At this point, we have met most of our goals. We are currently able to track multiple robots, calculate their orientations, and identify individual robots within the team.

Conclusion
We plan to continue to expand on our project to the point where we will be able to produce our results with six cameras, and have our data displayed in a graphical interface for use by a human operator who will participate as a member of our human/multi-robot team.

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