Aibo Cooperative Soccer Project

Team “Top Dog”
Jack Liu
Bryan Knight
David Elrod
Project Theme

- To create an architecture for communicating plays and instructions to Aibo robots
- Allow a team of robots to work cooperatively to achieve a goal (e.g., scoring a goal)
Programming Language

- Tekkotsu architecture
  - Built on top of OPEN-R
  - Easier to use
  - Written by CMU
Original Project Goal

- Program the Aibos to lead pass the ball to each other
- Not seen in Robocup soccer
Localization

- Aibo checks both sides for boundary markers using IR sensors.
- Aibo scans for landmarks at the sides by moving the head and sensing distance.
- Angle and distance can be used to determine relative positioning.
- Note: must have pre-set knowledge of how big each zone is.
Use a finite state machine implementation so that the Aibos are able to keep track of their surroundings, each other, and the ball and respond with the correct behavior when an important event occurs.
Problems

- Localization on field
- Complexity of game
- Passing ball much harder than first anticipated
- Directed focus on perfecting a strong and accurate kick
Revised Project Goal

- Pass ball back and forth between two Aibos
Behavior Modules

- Track and walk to ball
- Encircle ball until it sees target
- Find target using color segmentation
- Kick ball
- Wireless communication
Track and Walk to Ball

- AKA Chase Ball
- Aibo walks around looking for ball
- Once found, head targets center of ball
- Aibo moves where the head points to
- Stops when reaches ball
Encircle Ball

- Circle around ball until sees target
Vision Segmentation

- Process of declaring which colors for Aibo to recognize
  - Take picture of raw image
  - Use color trainer tool to map out colors in images
  - Apply to Aibo behaviors
Kick Ball

- Cornerstone behavior
  - Set of positions
  - Static transition time between positions
- Uses head to kick
  - Head moves from right to left.
- Makes or breaks passing
Wireless Communication

- Transfer information between each Aibo
- Socket programming
- Aibo1: “I kicked ball, now you get it and kick it back to me”
- Aibo2: “Ok, I will wait until ball comes to me and I will kick it back”
One Aibo begins by finding the ball, then positions itself to kick the ball to the second one. After kicking the ball, it sends a message to the second Aibo, and waits to receive a message from the second.

This means that one Aibo should be waiting patiently while the other one goes through all four behaviors.
Future Work

- Get wireless working
- Formulate a localization process
- Dynamic Kick
Questions?