Project Proposal: Ball Balancing Robot

The Ball Balancing Robot is a robot that will be placed on top of a sphere, in this case a basketball, and be able to navigate autonomously, while balancing on the sphere. The system will act as reverse pendulum and use a camera to help navigate an area. Along with a camera, various sensors, such as accelerometers, gyroscopes, and tilt sensors, will act as a negative feedback system to support the motion and stabilization of the robot. This robot will be able to act as a “cocktail waitress” by navigating a room, while offering drinks that can be held on top of the robot. The robot will be stable enough to automatically balance itself while keeping the load be carried safe. Another function for this robot is to be able to return to a designated location after it has traveled through the area. This function will allow the robot to return to base to resupply the desired load. A secondary function for this robot would be a following mode, where the robot uses its camera to follow a specific target, allowing the robot to act as an attendant. Since the robot will be navigating on a spherical object, it will have the capabilities for dynamic motion, allowing it to move seamlessly through crowed spaces.

My team and I will be able to successfully complete this task by using our knowledge of circuitry, robotics, and programming. The milestones for this project are as followed: microprocessor initialization, sensor testing, chassis design, auto-balancing, forward motion, turning, and final implementation of system. Currently my team and I are working on a reverse pendulum motion using an accelerometer/ tilt sensor. This test will allow us to test motion similar to the way a Segway moves. For example, as mass at the top of the system is leaned forward, the accelerometer will acquire a reading, which will tell the motors to move forward, allowing the system to catch up to the mass above it.

Deliverables

1.) Automatic Balance

2.) Return to home function

3.) Dynamic Motion

4.) Follow mode

5.) "Cocktail Service"

Milestones

1.) Dragon Board Setup

2.) Motor/Sensor testing

3.) Auto-Balance

4.) Forward Movement

5.) Turning

6.) PIXY Camera

7.) Final Implementation

Work Breakdown Structure

1.) Auto-balance

-get sensors working (green)

-design chassis to fit sphere (yellow)

-program (yellow)

2.) Forward Movement and turning

-complete inverted pendulum test (green)

-research and implement 3-wheel movement on the sphere (yellow)

3.) Navigation using Pixy camera

-setup pixy camera (yellow)

-implement with dragon board and sensors (red)

4.) Follow mode

-Pixy object recognition (green)

-combine with movement (yellow)

5.) Return home mode

-back track motion (red)

6.) Final Implementation

-combine all modes and movement (red)