What your project was

Description

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.

Deliverables

Initial:

1.) Automatic Balance

2.) Return to home function

3.) Dynamic Motion

4.) Follow mode

5.) "Cocktail Service"

Final:

1.) Dragon Board Setup

2.) Motor/Sensor testing

3.) Design Geometry and Dynamics

4.) Auto-Balance

5.) Forward Movement

6.) Turning

Actual project deliverables you have:

1.) Dragon Board Setup

2.) Motor/Sensor testing

3.) Design Geometry and Dynamics

4.) Auto-Balance

Timeline:

Overall, I would say that I did not stick to my timeline very well. This was due to the constant setbacks with the software and hardware of the dragon board. Such as, learning how to navigate through a Linux system, I2C issues, and PWM issues. I would not recommend the using the dragon board unless the users has had experience with Linux prior to using the processor, as this slowed down the project significantly.

What you accomplished

Documentation, papers, presentation, and notebooks:

The documentation for this course can be found on the course website. This includes documentation for the projects and any paperwork not related to the projects. Such as, the professional practice paper, ethical discussions, and the paper/presentations. The notebook is the only documentation not on the website, it will be handed in at the end of the semester.

Project continuation:

I would say that this project should be continued, as it provides a good challenge both physically and electronically. The recommendation that I have for this project is two have larger team size, as it would be beneficial to have someone work on each aspect of the robot, such as the physics, the hardware and the software. The project is challenging but definitely provides a good way to test the skills and knowledge of the students working on it.

Next steps for completion:

The next steps for completion would be to design a chassis that can fit well on top of the ball and orientate the motors so that they are properly spaced and have a good grip on the surface of the ball. Once the robot is on the ball the code would need to optimize to ensure the balance of the robot. After the robot is balancing on its own then turning and navigation come into play, possibly using the pixy camera to help navigation.

What can be demonstrated:

For this project the demonstration would involve the control of the servo motors based on the position of the accelerometer. This was done with an Arduino, since the dragon board issues kept on compounding.