Progress Report to Manager

The ball balancing robot is a project with the goals of having a robot being able to balance and navigate while on top of a ball. My team and I left our project off with the completion of the research and testing aspect of the project. Last semester the team accomplished setting up the dragon board and getting familiar with the UNIX operating system that is implemented on the board. The dragon board is now capable of interpreting python and outing putting proper signals to the digital I/Os. Once the dragon board was functional with python the team was able to test the motors, H-Bridge circuit and tilt sensors. The tilt sensors allow the dragon board to read information based on the position of the tilt sensors. So for example, if the tilt sensor is tilted forward the dragon board will send a signal to the H-Bridge circuit, which will drive the motors forward. If the sensor is tilted back, then the motors will drive in reverse. This concept is the basics of the negative feedback loop system that will control the robot. Essentially, the readings of the sensors on the robot will give feedback info to the dragon boards, which will then outpour the proper signals to control the robot based on the information from the sensors. In the final design the tilt sensor will be replaced with an IMU unit, which consists of a gyroscope, accelerometer, and magnetometer. The final design for the robot will consist of three motors to control the direction of the ball for balance and movement. After doing some research the team figured out the directions the motors need to move for six important movements the robot will need to make. These movement are forward, backward, left, right, rotate clockwise, and rotate counter-clockwise. The last part the team completed was designing a general idea for the chassis. The chassis will consist of three tiers, the motor mounts and two tiers for carrying the electronics. The next step for the chassis is to get proper measurements for the motor mounts and dimensions of the ball that will be used. Ideally, we would want the chassis to be 3D-Printed, as this would be the easiest and fastest solution. But, if we

need to we can fabricate it out of various material to make the chassis the right size and durable enough for its processes.

From this point the team is planning on building the chassis and ordering the necessary components. This will allow the team to start assembling the robot, testing the motors and sensors, and start developing the code to go along with the intended goals of the robot. Some of the parts that need to be ordered are the motors, IMU, Omni-directional wheels, batteries. These are the key component that need to work with dragon board to properly control the robot. Once the parts are ordered and received in the first step would be to assemble the robot and make sure each component works individually. Once this is complete the next goal would be to get the robot to balance on the ball without any intentions of movement. This is a vital stage in the project because without the capabilities of balance the robot will not be able to function in any other way, since the movement relies on proper balance. After the balancing aspect is successfully completed then the team can test and develop the different degrees of movement. The next step after the movement and balance is to implement the pixy camera into the design of the robot. This will allow the robot to optimally navigate on its own. The pixy will be the main navigation tool for the robot, but we may need to implement a couple of IR distance sensors to maximize the robots object avoidance capabilities. One of the main goals for the pixy camera is to unlock its potential to use object recognition. This will allow the robot to perform certain tasks when it sees a certain object, color, or graphic. This capability of the pixy camera will also allow the team to implement a “following mode.” For example, if the robot sees a certain image, it can be programmed to follow this image, thus creating a robot that follows a person. This function could have many applicable uses in the real world, such as carrying a load and following its target to deliver the package. Overall, the team is making progress towards the final goals that they were proposed for this project.