Robotics Capstone Design – Team G- Autonomous Self-Balancing Unicycle
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Spring Quarter Deliverables

Week	Deliverable	Details	Due Date
2	First Balance Test	Robot is able to balance forwards and backwards (with training wheels on)	March 15
3	Read Motor Controller	Be able to read feedback from the RoboteQ	March 22
4	Wi-Fi Bridge Working	Add wireless connection to robot	March 29
6	Second Balance Test	Robot is able to balance side-to-side (with forward-backward direction held in place)	April 19
9	Final Balance Test	Forward-backward and side-to-side controllers implemented in parallel (ROBOT NOT REQUIRED TO BALANCE)	May 10
10	Documentation	Final Documentation will be assembled for release	May 15
10	Final Product		May 15
-	NI Student Design Entry	Project submitted to NI Student Design Competition (includes technical paper)	May 31

First Balance Test: The robot will be fully assembled and the code will be downloaded to the cRIO via Ethernet connection. Once removed, the robot is will be enabled by disabling the emergency stop on the robot. The team will then let go of the robot and it will balance on its own in one direction. For this test, the training wheels will still be attached, limiting all side-to-side influence and allowing the test to occur strictly in a 1-dimensional case.

Read Motor Controller: The RoboteQ motor controller utilizes Hall Effect sensors to provide feedback about the operation of the motor back to the controlling unit. Currently, the cRIO only sends commands to the RoboteQ, but we would like to utilize the feedback in order to more accurately determine the effort that is used. For this deliverable, there will be an additional component on the front panel of the main VI that displays the returned values from the RoboteQ.

Wi-Fi Bridge Working: One of the additions that our client recommended during our final meeting of the winter term was to add a Wi-Fi connection to the robot so that we can deploy to the cRIO wirelessly and also monitor feedback (via the RoboteQ). This milestone will allow us to stop connecting to the cRIO via Ethernet and better make adjustments during later testing.

Second Balance Test: This test will balance solely in the remaining direction, as it was previously negated due to the training wheels attached to the robot. For this test, the training wheels will be removed and the bottom wheel will be propped in the front and back to rule out forwards and backwards motion. This may not be enough to fully restrict the trial to a 1-dimensional case, and alternatives will be ready in the event that it is not sufficient. The code will be downloaded to the cRIO via the Wi-Fi bridge, and data from the Hall Effect sensors will be observed in real-time.

Final Balance Test: The final balancing test will be to implement two controllers simultaneously, one in each direction. It is possible that the robot will be able to balance in each direction individually, but be unable to balance with both controllers running simultaneously due to complexities that the directions create when they interact with each other. Regardless, the goal is to have two independently working algorithms running at the same time so that if another group continues on with the project, they can get right to work on designing more complex controllers.

Documentation: The final documentation will consist of the following documents:

- Usage Manual – This manual will explain step by step how easily assemble and disassemble the robot, how to enable the power to the system using the key, some tips on how to get the optimum performance out of the robot, and instructions to activate the robot's controllers. The manual will also contain a list of parts used and supplier contact information in case replacement parts are required as well as any recommended maintenance information.
- Controller Manual – This manual will consist of documentation for the robot's software. It will include commented code with detailed explanations on how the code works, and suggestions for future improvements should a team continue the project in the future.
- Diagrams and Drawings – A detailed wiring diagram will also be included as well as mechanical schematics consisting of multiple views of the robot's current state.

Final Product: The final product will be an easily transported unicycle robot that has control algorithms for two directions implemented. The product will be delivered as specified by the client. The product will also come with all of the documentation stated in the previous section.