**Future Test Plans and Measure of Success for Subsystems**

To verify the overall operation of the robot, the subsystems must be verified first. To measure the performance of subsystems, we prepared future test plans and measure of success for subsystems.

**Communication and Telecontroller Subsystem**

* Robot to Telecontroller Range Test: The quality of sent data is measured for every 5 meters, starting from 10 meters. In indoor conditions if more than 60% of the visual data transferred to the telecontroller, then at this step the communication test is satisfied. The range more than 30 meter is satisfactory, and more than 40 meters is perfect score.
* Robot to Telecontroller Delay Test: At 30-meter indoor range the delay of the video input is measured. Between robot and telecontroller, delay less than 0.2 sec is satisfactory and less than 0.1 sec is perfect score.
* Robot to Telecontroller Data Quality Test: At 30-meter indoor range the quality of the video input is measured. Between robot and telecontroller, transfer of more than 60% of visual data is satisfactory and 80% is perfect score.
* Telecontroller to Robot Range Test: The quality of sent data is measured for every 5 meters, starting from 10 meters. In indoor conditions if more than 90% of the commands transferred to the robot, then at this step the communication test is satisfied. The range more than 30 meter is satisfactory, and more than 40 meters is perfect score.
* Telecontroller to Robot Delay Test: At 30-meter indoor range the delay of the commands is measured. Between robot and telecontroller, delay less than 0.2 sec is satisfactory and less than 0.1 sec is perfect score.
* Telecontroller to Robot Data Quality Test: At 30-meter indoor range the quality of the commands is measured. Between robot and telecontroller, transfer of more than 80% of commands is satisfactory and 90% is perfect score.

**Motion Subsystem**

All the motion subsystem tests are done with a fixed environment. For the test the telecontroller is located 2 meters across the robot since performance of communication module is not our concern in this test.

* Straight movement precision test: Under forward and backward movement instructions the distances robot traveled are measured and these measurements are compared with expected values. The 20% or less error is satisfactory and less than %5 error is perfect score.
* Straight movement speed test: For the forward and backward direction movement, speed of the robot is measured, and these measurements are compared with expected values. The 30% or less error is satisfactory and less than %15 error is perfect score.
* Fixed center rotation test: The robots ability to fixed center rotation is measured. For a 180° turn the robot expected to preserve its center at same spot. Dislocation less than 5cm is satisfactory and 1 cm is perfect score.
* Rotation precision test: Under fixed center clockwise and counterclockwise rotation instructions the rotation angle of robot is measured, and these measurements are compared with expected values. The 20% or less error is satisfactory and less than %5 error is perfect score.
* Rotation speed test: For the fixed center clockwise and counterclockwise rotation, angular speed of the robot is measured, and these measurements are compared with expected values. The 30% or less error is satisfactory and less than %15 error is perfect score.

**Shooting subsystem**

All the shooting subsystem tests are done with a fixed environment. For the test the telecontroller is located 2 meters across the robot since performance of communication module is not our concern in this test. The ball is located 1cm front of the shooting subsystem with 60° - 90° - 120° angle with central plane of robot.

* Shooting direction test: For 10 successive tests, number of shots going in opponent’s goal is counted. More than 7 successful shot is satisfactory and more than 9 successful shot is perfect score.
* Shooting force precision test: For 10 successive tests, the distance ball travels is measured. The measurement and expected data is compared. Error less than 40% is satisfactory and less than 20% is perfect score.

**Detection Subsystem**

All the detection subsystem tests are done with a fixed environment. For the test the telecontroller is located 5 meters across the robot since performance of communication module is not our concern in this test.

* Data quality: For 10 second of data transmission, the ratio of successful visual data transfer is measured. If all the important elements are visible, the test is successful.
* Data frame rate: For 20 seconds of data transmission, the frame rate is measured. Frame rate higher than 10fps is satisfactory and 20 fps is perfect score.

**Power Subsystem**

Power subsystem test are run separately on robot and telecontroller. For both the measure of success is same.

* No operation battery life test: When all units are on and under no operation condition the duration of batteries are measured. If the battery stays longer than 3 hour it is satisfactory, if stays longer than 5 hour it is perfect score.
* Active operation battery life test: When all units are on and under control of teleoperator the duration of batteries are measured. If the battery stays longer than 1 hour it is satisfactory, if stays longer than 1.5 hour it is perfect score.