

HARDWARE VERSION 3 AND 3.01 OBJECT PICKUP TEST

GROUP 4

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Verison 3

Abstract

This test verified that our idea for object collection worked. We had to update the hardware version to make sure that the tower arms do not pop off.

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1 BACKGROUND

1.1 Edit History

Jake Zhu: 2016-10-28, Initial set up

Jake Zhu: 2016-11-15, Added Goal, Procedure and Table

Quentin Norris: 2016-11-16, Filled in Test Report and Conclusion

Jake Zhu: 2016-11-16, Added Action and Distribution and changed Conclusion to bullet points. Also added Abstract.

1.2 Test Information

Tester: Quentin Norris

Author: Jake Zhu, Quentin Norris

Hardware Version: 3 and 3.01

Software Version: acc365e

2 GOAL

To validate the hardware design's capability to grab, lift, and release blocks. This functionality will meet the robot's requirement to be able to manipulate and stack blocks.

3 PROCEDURE

Setup/Assumptions:

1. Robot's hybrid is folded back mid-level
2. Robot can locate the brick and move towards it
3. There is software to change the grabber position, lower the grabber and close the grabber to catch the block.
4. There is software to raise the grabber.
5. There is software to lower the grabber after the brick is put in place.

Test:

1. Upload Main.java onto the brick

2. Place the block flush against the grabber
3. Look at the LCD screen to see what buttons to press for the robot to perform specific actions.
4. Perform the actions of lowering the tower, collecting the block, pinching the block, raising the pinched block, and releasing the block.
5. Note whether the hybrid will grab, raise and release the brick
6. Mark in the table whether each trial is successful or not. For a trial to be completely successful all the actions described above must be done without error.
7. Repeat 9 times

A few notes on the program used to test the grabber and the lifter. There are five options that will display on the LCD screen. These are left arrow, right arrow, enter, bottom arrow, top arrow. They respectively perform the following actions: put grabber arms into collector mode, grab the block, release the block (placing the arms back into travel mode), fully lower the tower from its resting height, and raise the tower to be able to stack one block onto another. The collector mode as described will be used by the software team to collect the block, so it is flush against the grabber. Hence why in the the test portion the block must be placed flush against the grabber. The travel mode is the tower raised all the way up, with the arms flush against the side of the robot.

4 EXPECTED RESULT

We expect the robot to be able to successfully perform the actions of raising the tower, as well as the capturing and releasing the block.

5 TEST REPORT

5.1 Hardware Version 3

Trial	Capture	Raise	Release
1	Successful	Failure	Successful
2	Successful	Failure	Successful
3	Successful	Failure	Successful
4	Successful	Failure	Successful
5	Successful	Failure	Successful

Our first five initial tests with Hardware Version 3 resulted with an unsuccessful raising of the block. This prompted us to stop the tests at trial 5 to figure out what was wrong. We found that the coil mechanism in which the string wraps around to raise the tower as the motor spins is too weak to support the weight of the block and the tower. This has prompted

us to create a new hardware version 3.01 in which the coil mechanism is now a black bar going straight through the motor. This will provide the support necessary to lift the tower.

Despite the tower failure, the capture and release of the block with the grabber were very successful for these five trials.

5.2 Hardware Version 3.01

This hardware version is the same as version 3, except the coil mechanism is just one bar going straight through the motor with an adapter on the side to coil the string.

Trial	Capture	Raise	Release
1	Successful	Successful	Successful
2	Successful	Successful	Successful
3	Successful	Successful	Successful
4	Successful	Successful	Successful
5	Successful	Successful	Successful
6	Successful	Successful	Successful
7	Successful	Successful	Successful
8	Successful	Successful	Successful
9	Successful	Successful	Successful
10	Successful	Successful	Successful

After 10 trials we decided the new coil mechanism was very strong and successful, in addition we tested the grabber functions for capturing and releasing.

6 CONCLUSION

In conclusion our lifter and grabber code works perfectly, in addition the hardware components also perform very well.

6.1 Lifter Angles

A few notes about the rotation angles used for the current height of the tower for Version 3:

- The angle used for the lifter to fully lower the tower to the ground is 725.
- The angle used to fully lift the tower back to its traveling height (and max height) is -725.
- The angle used to raise the tower to stack a second block on top of a first is -450.
- The angle used to raise the tower to stack a third block onto two is -755.

NOTE: For the third block stacking to be effective the physical height of the tower must be altered by the hardware team.

6.2 Collector Angles

- The angle used to set the grabber to the "collector" position is 130.
- The angle used to pinch the block from the collector position is 60.
- The angle used to release the block is -190, this also puts the grabber arms back to traveling position.

7 ACTION

Hardware Version 3.01 was a success. It allowed us to raise the grabber without breaking the top rod. We are planning to change the hardware design to compensate for this. The software team would also want to know the angles.

8 DISTRIBUTION

Hardware Team, Software Team