

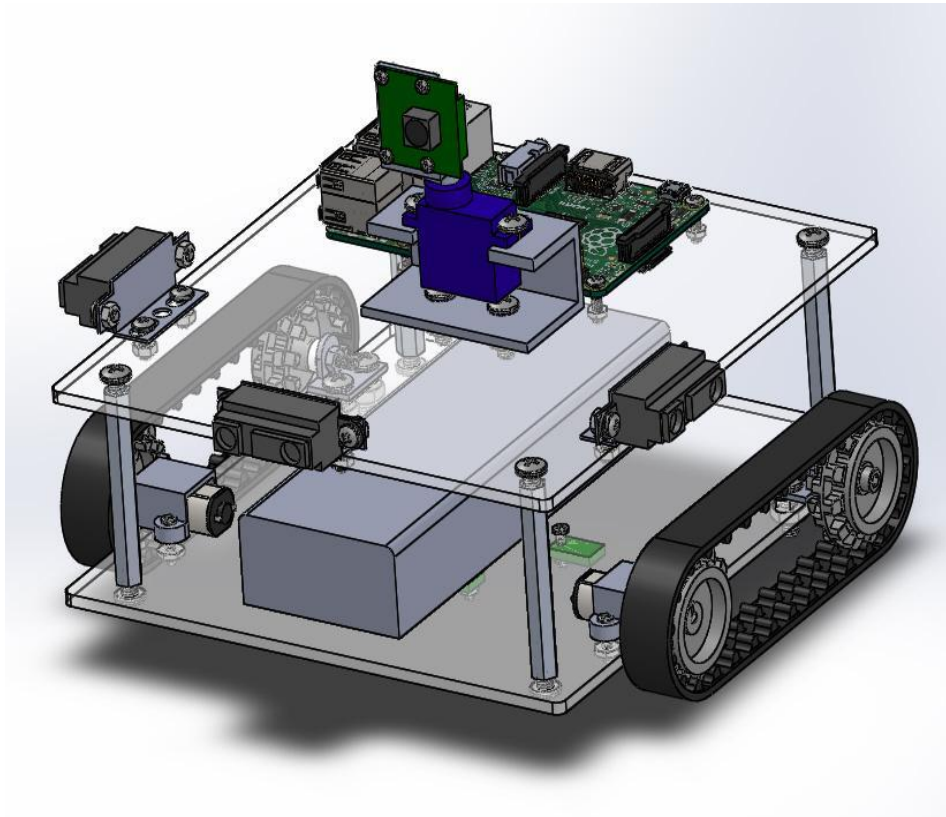
IEEE R5 Robotics Competition 2015

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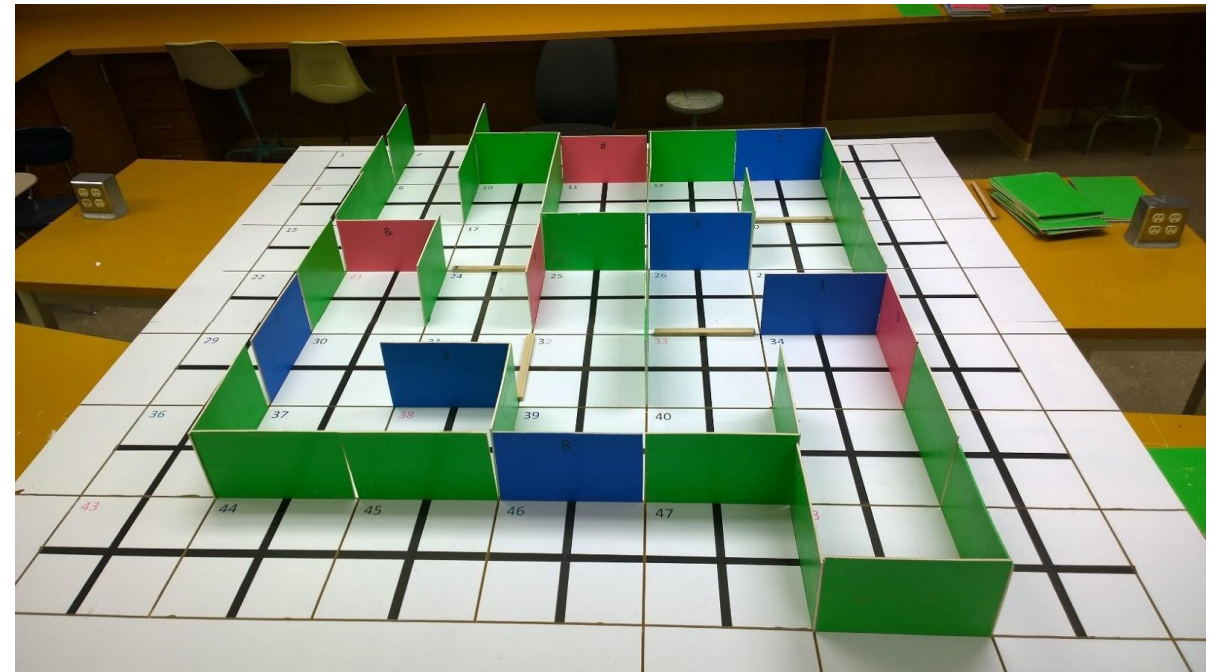
Advisor: Capt. Dave Giurintano

Sponsors

Project Overview



Prototype Design



R5conferences.org

Specifications

- Reflectance Sensors with 3/8" clearance can recognize the difference between black and white with some calibration
- Proximity Sensors can recognize distinguish wall distance from 2" to 6" away
- Camera can recognize characters with 80% accuracy given a max 25 degree angle deviation from center
- Power the robot for a consecutive 30 minutes under load
- Executes turns with a minimum 0.5" clearance
- Clear a 0.5" speed bump without deviating 25 degrees from center of maze square
- Finish the maze within the time limits: 3, 4, or 5 minutes depending on maze size
- Algorithm Optimized for maximum competition score

Sensor Test

- Specification:
 - Reflectance Sensors with 3/8" clearance can recognize the difference between black and white with some calibration
 - Proximity Sensors can recognize distinguish wall distance from 2" to 6" away
- Testing Method:
 - Objects of various colors placed 3/8" in front of reflectance sensors and voltage measured and recorded
 - Objects placed 2" to 6" from the proximity sensors and output voltage recorded
 - Success: Sensors output voltage that is a monotonic function of the different properties being tested
- Instrument and Equipment:
 - QTR-1A Reflectance Sensor
 - QTR-3A Reflectance Sensor
 - SHARP GP2Y0A41Sk0F Proximity Sensor
 - Multimeter
 - Power Supply
- Testing Schedule:
 - Week of March 8th – 14th

Character Recognition Test

- Specification:
 - Camera can recognize characters with 80% accuracy given a max 25 degree angle deviation from center
- Testing Method:
 - Set the camera on top of the servo motor, vary the servo angle from 0 to 25 degrees in both directions, and test for character recognition
 - Success: Characters can be recognized with 80% accuracy from an angle 25 degrees off center
- Instruments and Equipment:
 - Raspberry Pi Camera Module
 - Raspberry Pi B+
 - Servo Motor
 - Character Stickers from Competition Committee
- Testing Schedule:
 - Week of March 8th– 14th

Battery Life Test

- Specification:
 - Power the robot for a consecutive 30 minutes under load
- Test Method:
 - Robot will be run in a circle continuously turning right after every two squares until power is depleted and time will be recorded
 - Success: Over 30 minutes run time
- Instrument and Equipment:
 - Integrated Robot with NiMH battery attached
 - Test Maze
 - Stop Watch
- Testing Schedule:
 - Week of March 15th – 21st

Turning Clearance Test

- Specification:
 - Executes turns with a minimum 0.5" clearance
- Test Method:
 - Align the robot in the center of a square, place a square boundary 0.5" away from walls, execute a 90 and 180 degree turn, and observe if the robot passes over the set boundaries
 - Success: Robot is able to execute turns while meeting a minimum 0.5" clearance
- Instrument and Equipment:
 - Robot
 - Electrical tape boundary
 - Measuring tape
- Testing Schedule:
 - March 8th – 21st

Speed Bump Test

- Specifications:
 - Clear a 0.5" speed bump without deviating 25 degrees from center of maze square
- Test Method:
 - Have the robot run a path over a half inch block and measure deviation angle after it overcomes the block
 - Success: The robot can clear the block without deviating more than 25 degrees from the center of the maze square
- Instruments and Equipment:
 - Robot
 - Test Maze
 - 0.5" Block
 - Protractor
- Testing Schedule:
 - March 8th – 21st

Maze Completion Test

- Specification:
 - Finish the maze within the time limits: 3, 4, or 5 minutes depending on maze size
 - Algorithm Optimized for maximum competition score
- Test Method:
 - Run the robot through a series of 5"x5", 6"x6", and 7"x7" maze scenarios under various obstacles and algorithms
 - Success: Robot is able to complete every maze in at least the time allotted. Further success results from algorithms that improve upon past scores.
- Instrumentation and Equipment:
 - Robot
 - Test Maze
 - Stop Watch
- Testing Schedule:
 - March 21st – April 10th