

Renton Robotics
CTE Summer STEM Camp
Competition
2017

Held at Hazen High School
June 30, 2017

Robot Ninja Challenge

The Game:

The robot will navigate four different challenges in this game. Each challenge is designed to give the robot points for accomplishing different tasks. At each challenge, there are tasks with different degrees of difficulty. The more difficult the task the more points awarded. Each robot build team will need to decide their strategy for accomplishing each challenge. Remember you have four days to build the robot.

Match

Four robots are placed at the starting line at the start of the match. There are four challenges. The Autonomous Challenge lasts 30 seconds. After a pause for scoring, the three teleop challenges run back-to-back, with a run time of 4.5 minutes. There is an end game warning at 30 seconds before the end of the match.

Two of the robots are on the red alliance and two of the robots are on the blue alliance. However, the alliance idea is different than you may have experienced in the past. For the first 3 challenges, each robot is scored individually. The points gained in the fourth challenge are awarded to both robots in an alliance. An individual robot's score is the sum of the point gained in the first 3 challenges plus the alliance points gained in the fourth challenge.

Challenges

1 Autonomous Challenge. In this challenge, the robot is under program control only. The drivers cannot control the robot. There are three levels to this challenge.

The first level is Follow Line. In this level, the robot must follow a line from the start of the course to the end. Accomplishing the line following will give the robot 10 points and 1 golf ball.

The second level is Press Beacon Button. There will be a beacon located on the wall of the course. The robot must be able to navigate to the beacon and press one of the buttons on it to complete this challenge. The robot may or may not use the line in the line following level to help navigate to the beacon. If the beacon is pressed the robot will get 20 points and 2 golf balls.

The third level is Knock Over Stick, which will release three golf balls. Again, the robot may or may not use the line in the line following level to help navigate to the stick. The robot will get 30 points for knocking over the stick. In addition, the robot can keep any of the golf balls it can catch when the stick is knocked over.

At the end of the Autonomous period, the robot will be awarded the points it has earned. The golf ball it has earned will be placed on the robot for use in later challenges. The Autonomous period will last for 30 seconds.

2 Terrain Navigation Challenge. There are four levels to this challenge.

The first level is Grip Tape Mountain. The robot will need to drive up and down both sides of the mountain to receive 10 points.

The second level is Fixed Debris Field. The debris will be pieces of wood at different heights and the robot must be able to navigate over and not around the debris to receive 20 points.

The third level is Drive Over Teeter-Totter. To receive 30 points, the robot must be on the teeter totter from start to finish. It cannot drive off the side of the teeter totter.

The fourth level is Narrow Bridge. The bridge has a starting slope, an ending slope and two tracks with nothing in between the two tracks. The robot must stay on the tracks to get 40 points. If the robot falls off the track, and cannot drive or if the robot gets caught on the track and cannot drive the match is over for the robot. If the robot falls off the track and is still able to drive, the robot can continue the match, but does not receive any points or golf balls for Narrow Bridge challenge.

The second challenge has a series of two terrain challenges. A robot can pick one level for the first terrain and a different level for the second terrain.

3 Collection Challenge. This challenge has three levels.

The first level is Pick Up Balls and has four golf balls on the floor at the beginning of the match. Robots can pick up one or more of these golf balls on a first-come-first-serve basis.

The second level is Open Door. When the door is opened, the robot can access the area to pick up any of the four golf balls found on the floor. The robot is awarded 10 points for going through the door to get the golf balls. Multiple robots can get points for going through the door, but the second and following robot may not have any golf balls to pick up. The game is a first-come-first-serve basis for the golf balls

The third level is Move Lever. Moving the lever will cause eight golf balls to drop. These balls may be caught by the robot or they can hit the ground and be picked up by any robot. The robot is awarded 20 points for moving the lever to cause the golf balls to fall. Only one robot per match can receive the 20 points.

4 Scoring Challenge. In challenges 1, 2 and 3 the robot receives points and/or golf balls that belong to each individual robot. In the scoring challenge, the alliance gets the points. For example, if robot A and B are in an alliance and robot A scores 10 points and robot B scores 5 point, each robot will receive 15 points. At the start of a match, the alliance partners and alliance color are known.

During the scoring challenge, the red alliance receives points for balls in the red goals and the blue alliance receives points for balls in the blue goals. As before there are different levels to the scoring challenge.

The first level is Push Ball into Cubby. The alliance will get 10 points for each golf ball pushed into a cubby. The cubby will have three walls. Golf balls can be placed in the cubby by rolling them. There is no need to lift the balls.

The second level is Score in Low Goal. The alliance will get 20 points for each golf ball in the low goal. The low goal will be a bucket with about three-inch-high walls on it. It will be necessary to dump or shoot the balls to get them into the bucket.

The third level is Score in High Goal. The high goal is also a bucket but the side of the bucket are over 18 inches high. It will be necessary to lift the balls to dump them into the bucket. Each ball placed in the high goal will be worth 30 points.

Match Ending

The match is over for each robot when they park in the end of match parking stall, or the match time ends. Each of the parking stalls are marked with a value. The parking in the first stall is worth 40 points; parking in the second stall is worth 30 points, the third stall is 20 points and the fourth stall is 10 points. Robots cannot “fight for” nor block parking stalls.

The alliance score is the sum of all points the two alliance partners obtain. For example, if one robot pushes five balls into the cubby and the alliance partner puts two ball in the high goal the alliance will receive 110 points. (50 points for the cubby and 60 points for the high goal.) In addition, the alliance will receive the sum of the parking stall points.

Competition Day

Competition Day will start with a robot inspection. The inspection will look for two things. First the robot must be within the 18-inch by 18-inch by 18-inch requirement. Second, the robot phones must be set up and able to communicate with each other. After a robot has passed inspection, the robot can compete in the matches.

Each robot will compete in 5 matches where their opponents and alliance partners are randomly selected.

The competition day plan is for the busses to arrive at Hazen at 8:00 AM. Setup and robot inspection happens from 8:00 to 9:00. The matches start at 9:00 AM. The matches will continue until 11:30. Lunch is from 11:30 to noon. Matches will resume at noon and continue until 1:15. At 1:30 the awards ceremony will start. The awards identified below will be handed out. Clean up will start at 2:15. Students need to be ready to get back on the bus at 3:00.

Set-up

The field is not the 12-foot by 12-foot field we have used in the past. The field will be the upper and lower floors in the commons area at Hazen. The upper floor will contain challenges 1 and 2. Challenges 3 and 4 will be on the lower floor. The robot will need to drive down a ramp to get from the upper floor to the lower one.

At the start of a match each robot must fit inside an 18-inch by 18-inch by 18-inch cube. After the match starts the robot can expand to any size.

Each challenge will have the following space defined for the challenge:

Challenge 1 - Autonomous Challenge

The autonomous challenge will be an area 12 feet long and 8 feet wide. This area will be marked out on the floor using painters tape on two sides. The start and finish lines will be marked using painters tape. The other two sides are the 12 foot sides. Each of these sides will be panels from the FTC field. These panels are about 12 feet long and about 1 foot high. We will need to build something to hold up both of these panels.

Down the center of the field are four strips of black electrical tape. The electrical tape is 20 inches apart and centered between the two 12 foot side panels.

A beacon is located 4 feet from the starting line on each of the 12 foot long side panels. These beacons are the two button beacons used in this year's FTC competition. Having two beacons means two of the four robots in a match can try for the beacon without having to interfere with each other.

The Knock Over Sticks is located 8 feet from the starting line on both sides of the field and positioned touching the 12 foot side panels. The stick will be 20 inches long. The lower end of the stick is an 1/8 inch deep pocket on the base of the stick holder. The stick holder will be made out of 1/2 inch material. Therefore, the robot must either drive onto the 1/2 inch material or have an "arm" to knock the stick over. The bottom of the stick will be 1 inch from the edge of the stick holder base. The stick will be a piece of 1/2 inch dowel.

The stick will be straight up and down. The base of the stick will be held in place by the pocket in the base. The top of the stick will be held in place by the weight of the three golf balls.

The three golf balls will be held in a holder that is 15 degrees off vertical and pointing toward the center of the field.

Challenge 2 - Terrain Navigation Challenge

This challenge has four levels.

The first level is a Grip Tape Mountain Challenge. This mountain is made from an 1/8 inch piece of plywood. The total length of the mountain surface is 96 inches. At the

highest point, the mountain is 12 inches from the floor. The shape of the mountain is the nature curvature of a piece of plywood touching the floor on both ends and the middle is 12 inches from the floor. The surface of the plywood is covered in Grip tape.

The second level is a Fixed Debris field. This field is 24 inches by 24 inches. The debris is made from 4 by 4 posts cut at different heights. 12 of the debris will be cut to 1/4 inch. 12 will be cut to 1/2 inch and 12 will be cut to 3/4 inch. All 36 of these will be mounted on a 1/2 inch sheet of plywood. On the entry and exit sides of the debris field there will be a small ramp which runs the full length of the debris field. The ramp is 3 and 1/2 inches deep and 3/4 inches high. On the sides of the debris field are two walls that are 9 inches high and 31 inches long. These walls prevent the robot from going off the sides of the debris field.

The third level is a Teeter-Totter. The Teeter-Totter is 72 inches long and 24 inches wide. In the middle the Teeter-Totter is 12 inches from the floor. The surface of the Teeter-Totter will be unfinished 1/2 inch plywood.

The fourth level is a Narrow Bridge. The bridge will consist of a starting slope and an ending slope. Both slopes are 36 inches long and 24 inches wide. At the highest point, the slopes are 12 inches off the ground. The slopes are made of unfinished plywood. The bridge is made of two tracks with nothing between the tracks. The tracks are 3 and 1/2 inches wide and 48 inches long. There are no side rails on the edges of the bridge.

Between Challenge 2 and Challenge 3 there is a stairs ramp. The robot will need to drive down this ramp to get to Challenge 3. The ramp starts on the top step and continues downward at a 25 degree angle. The ramp is about 36 inches wide. It will only cover half of the stairs in the Hazen Common area.

Challenge 3 - Collection Challenge

There are three levels to this challenge. For the first level, the golf balls are located in a 24 inch by 24 inch area on the playing floor. The area is marked off using painters tape. There are no barriers to keep the golf balls in this area.

The second level requires the robot to Open a door. The door opening is 24 inches wide and 24 inches tall. It is connected to the floor using double sided tape. The door opening contains a door which must be opened to get to the golf balls behind the door. The door is spring loaded and must be pushed to open it. After the robot opens the door and drives into the area behind it the door will close. It is spring loaded to stay closed. There is an enclosed area behind the door containing the 4 golf balls. The enclosed area is 36 inches by 36 inches and is 1 and 1/2 inches high. After picking up the balls, the robot must exit through the door.

The third level requires the robot to move a lever to get the golf balls. The lever is 12 inches off the floor and must be moved at least 2 inches upward to get the golf balls to drop. When the lever is moved 2 inches, the 8 golf balls will roll down a ramp that is 20 inches from the floor and on a 15 degree angle. The golf ball will roll down the ramp in

single file. The golf balls can either be caught by the robot or be picked up by any robot on the field.

Challenge 4 - Scoring

There are three scoring levels in this challenge. In the first level, golf balls can be pushed into a ball cubby. The cubby is 36 inches by 36 inches. It has three sides and each side is 3 and 1/2 inches high. The three sides of the cubby are connected to the floor using double sided tape.

The second level is scoring in a low goal. The low goal is made from the bottom portion of a bucket. The edges of the bucket are cut off at 3 and 1/2 inches from the floor. The bucket is connected to the floor using double sided tape.

The third level is scoring in the high goal. The high goal is a complete bucket. The edges of the bucket are about 15 inches from the floor. The bucket is connected to the floor using double sided tape.

General Rules

This game is designed to be scoring type of game. It is not defined to be a defensive type of game. This means that players must not prevent a robot from scoring points. In other words, you cannot build a defensive only type of robot. Failure to comply with this rule after given a warning can result in the removal of your robot from the match.

It is realized that two or more robots may be trying to get to the same challenge or challenge level. This can result in robots bumping into each other as they try to accomplish the same challenge. The momentary bumping into each other is not considered preventing a robot from scoring. However, the repeated bumping or the parking of a robot in front of a challenge is considered prevent a robot from scoring point. Robots which do this will first be warned and then removed from the match.

Awards

The following awards will be given out at the end of the competition.

- Best Engineering Design Notebook:
 - Criteria for success:
 - Successfully completing an Engineering Design Notebook that clearly documents all of the work that your team completed throughout the summer camp. This may include design ideas and the engineering design process, daily logs of your goals and progress, documents and description of the steps taken in programming, use of CAD.
 - Going “over and above” in creating an organizational structure in your notebook, including a theme for your team, a logo, color scheme.
 - Ability to explain the different components of your Engineering Design Notebook.
- Best use of a 3-D printed part
 - Criteria for success:
 - Successfully using a 3-D Printed part as a functional component on your robot.
 - Ability to explain the process that went into designing the 3-D printed part and its use documented in the Engineering Notebook.
- Most Creative Design
 - Criteria for success:
 - Successfully implementing a creative design, strategy, or use of materials
 - Ability to explain the process that your team went through to decide on and implement this creative design, strategy, or use of materials. This may also include a creative approach to the program of the robot.
- Gracious Professionalism Award:
 - Criteria for success
 - Demonstrating an attitude and actions of helpfulness towards students from other teams, volunteers, and mentors during the competition.
 - Demonstrating a professional approach to the competition.
- Team Spirit Award
 - Criteria for success:
 - Successfully creating and implementing a theme for your team. This may include a team name, logo, color scheme, chant, and other ways of creating a team persona.
- Competition Winner
 - Criteria for success:
 - Being on the 1st place alliance in the competition (based on total point score).
- Competition Runner-Up
 - Criteria for success:
 - Being on the 2nd place alliance in the competition (based on total point score).