The Stair Climb

Introduction

The climb up the stairs of Hogwarts can be very tricky. As soon as you think you know which path to take, the stairs can move and send you in a very different direction. Do not fear the stairs if you can move up quickly but keep an eye on the edges. Many a student has had to rely on their broomstick to save them from falling.

The Course

The stairs are made to progressively challenge even the most experienced robot building wizard. At the bottom is a ball for your robot to pick up and carry if you feel it is up to the challenge. The stairs start very mild for enough time to build momentum. The stairs then take a sudden change to become steeper but relatively stable grade. It will take a brave robot to climb this far. As soon as you think you are in the clear, the stairs change again, this time in a very nasty way. The grade becomes steeper and ridges prove to be extremely challenging. The ridges are of varying sizes so choice in wheel diameters and clearance may separate the real wizards from the first year students. At the top of the stairs is a landing with a goal post for the ball your bot is carrying. The landing is narrow so watch your step not to go to far or you may hurt yourself.

The Challenge

The Annual castle quitch tournament is being held today and to get ready for the game, the young wizards build robots to carry a ball from the bottom of the stairs to the hoop on the top landing. Each robot will get five tries and will earn points individually based on how well do. The sum of the five runs will then be compared to the other participating wizards to decide the very best stair climbing quitch playing champion. The maximum points will be awarded for picking up a ping pong ball and carrying it up the staircase and then throwing the ball through one of the holes in the backboard. Points will also be awarded for just climbing up as far as you can. If your robot leaves
the staircase, the distance achieved will determine the points awarded. The further breakdowns of the rules are as follows:
Points will be awarded on the following basis:

5 points  Picking up the ball.
1 point or  Climbing first level of stairs.
2 points  Climbing first level of stairs with the ball.
4 points or  Climbing second level of stairs.
8 points  Climbing second level of stairs with the ball.
10 points or  Reaching top landing of the stairs.
20 points  Reaching the top landing of the stairs with the ball.
50 points  For a goal by throwing the ball through the target.

If during a run your robot falls off the course or becomes stuck, then the run is over and will have to be returned to the starting position. If the course is completed by making it to the top landing, then the robot will be brought back to the start or has the option of driving back down the stairs for fun, but no additional points.
Building a Practice Course

Excellence comes after serious study and patience. In order to practice for this event the following instructions will help you build your own practice stairs.

Ball Starting Point

16 inches from one side of the course a strip of Black Electrical tape 6 inches long will be stretched away from the course, at the end of which will be the ping ball to be picked up by the robot.

Frame

The first thing needed is a structure. Since the load on the structure is not that great the form used is a simple box frame with a runner. The actual stairs are placed on the runner that supports the slope. The materials used to build the frame were four, 6 ft length 1 x 4 of poor quality but fairly strait and minimal knots. Two pieces were cut to provide the two outer legs. Another piece was cut to provide the top piece and the short stabilizing leg. The last piece was left whole to be used as the runner. For additional support, three simple 90-degree angle brackets were used to stabilize the legs.

Form

The stairs were made from galvanized ¾ square rabbit fencing mesh. A roll of 6ft was used and can be bought at most hardware stores. This wire mesh is thicker than chicken wire and care should be used when bending the wire.
The mesh is draped over the frame and secured by finishing nails or staples. The edges of the mesh are then formed by bending the wire down and in to form a tubular edge. This tubular edge gives the edge some support. Another detail feature of the edge bending is to give the course a tapered up feature to narrow at the top and to flatten out at the bottom.

Surface

The surface of the course was achieved with duct tape. A standard size roll is about the needed requirement. Run the tape lengthwise down the stairs in a smooth manner but does not have to be perfect. Watch the edges were the grade of the surface changes because the tape will want to lift off the course, causing air bubbles. Be sure to also cover the edges of the wire mesh with tape to prevent accidental cuts caused from the sharp edges and possible exposed nails or staples.

Back Wall

A back wall was placed so that the robots would not fall over the ledge. This backing also contains holes, which are used to score the additional points. The wall is a simple form poster board that is secured to the back legs.

Content of Supplies

4 6’ 1x4 wood boards fairly straight. About $1.00 each
3 90-degree angle brackets for frame support. Light weight About $2.50 – 4.00 for set of 4.
1 roll 6’ x 3’ galvanized ¾” square mesh fencing. About $10 at Lowes or other building/hardware suppliers.
1 roll duct tape
1 foam poster board approximately 3’x 5’

Nails, screws, gloves, and hammers as needed.
The total cost of the project should not exceed $25.