**Pluto Competition**

**Table of Contents:**

The Competition

The Field

The Shipping Container

Points and Penalties

Technical Specifications

Document Submission

Awards

Competition Schedule and Location

**The Competition:**

You as a team are tasked with constructing a remotely operated robot capable of moving shipping containers from the Dock to their individually colored zones. The robot operates on a shipyard on Pluto which receives shipments of supplies and mining equipment that need to be delivered to their destinations. The atmosphere on Pluto does not allow humans or other life forms to oversee this work directly, so the robot must be able to be controlled wirelessly from a distance, seeing only through a camera and sensors placed directly on the robot. No autonomous behavior is necessary, though teams may implement autonomous subroutines to aid in driver control if they wish.

The Dock, where the robot and all shipping containers will be at the beginning of the round, is a hub in the center of the field, with colored pathways branching off from this hub in different directions. Each shipping container will be a unique color, and this color will match the pathway and zone to which it belongs. The driver must recognize this color and, through some means, transport this colored crate through an obstacle course and deliver into its zone of matching color. The container must be completely within the zone to count as Delivered. After delivering the container, the robot must return the way it came and get back to the hub for the zone to count as Completed.

There will be four colored shipping containers and four colored Branches: Red, Blue, Green, and Purple. Each branch will have a unique obstacle:

* The Red Branch has a tunnel which the robot must travel through. There are no lights in the tunnel, so in order to see the bot should be equipped with some sort of lighting.
* The Blue Branch has a slalom, an area requiring high maneuverability to pass through without hitting the walls.
* The Green Branch has a ramp which the robot must climb in order to drop off the container, and must then descend to return to the Dock.
* The Purple Branch is the mystery branch. There is an obstacle that is unknown to teams until the day of the competition, and this branch will be worth the most Points if completed. This unknown obstacle could be new or a combination of obstacles elsewhere on the field. Completing this branch will make teams eligible for the Versatile Design Award.

There are 15 minutes allotted for each Match. 5 minutes of this is transition and setup time. This leaves exactly 10 minutes of time to run the bot and acquire points. Teams that take longer than 5 minutes of setup will start eating into their 10 minute run time unless an extension is granted by the judges due to extenuating circumstances. Match order will be randomly chosen at the start of the competition day. Each team will play three Matches. All three rounds of Matches will be in the same order selected randomly at the start of the day, so all teams have the same amount of time between Matches to conduct repairs or strategize. There will be breaks between each of the three rounds of Matches, described in the schedule at the end of this document. Two fields will be set up so that two teams will compete at once. During the match, one team representative will stay with the bot at the field while the rest of the team will head to the spectator area.

A team’s score for the day will be the sum of the scores for their best two Matches, ignoring the score for their worst match. This rewards consistent robots and does not punish a bad first Match if teams are able to conduct repairs or plan a new strategy that gives them success later in the day.

There are separate Point Totals for each Branch. At any time while working on a Branch, the team representative at the field may announce a Restart, which will move the robot and container back to the Dock and erase all Points and Penalties accrued for that Branch. This will not reset the time, nor will it affect Point Totals of any other Branches. Points and Penalties can be acquired in many ways, which are delineated in a later section.

**The Field:**

Picture with dimensions

Hub and spokes style, dock in middle with four branches coming off

**The Shipping Container:**

The shipping containers are 4” by 4” by 8” blocks of wood painted a single color. There are four such shipping containers colored Red, Blue, Green, and Purple.

Picture with dimensions

**Points and Penalties**

Each Branch is scored separately. The Point Total for a Branch is the amount of Points gained minus the amount of Penalties accrued. A Branch Restart will not affect Point Totals of other Branches.

**Ways to Get Points:**

* **Container Control**: 10 Points for successfully gaining control of one shipping container and moving it out of the dock into the correctly colored Branch. This can include lifting the container onto the bot and driving into its Branch, dragging the container behind the bot, or even using the bot to push the container into its Branch.
* **Surpassing an Obstacle**: each Branch has one or more obstacles, each of which will grant Points upon being passed. These are as follows:
  + 30 Points for surpassing the tunnel in the Red Branch
  + 30 Points for navigating the slalom in the Blue Branch
  + 30 points for making it up the ramp in the Green Branch
  + 50 Points for surpassing the mystery obstacle(s) in the Purple Branch
* **Container Delivery**: 30 points for delivering a container into its colored zone. The container must be completely within the boundaries of the zone to count as Delivered.
* **Branch Completion**: 20 points when the robot returns to the Dock, Completing the Branch.
* **Time Bonus**: when a Branch is Completed, the team will earn a time bonus equal to 1 point for every 15 seconds left on the clock.

If a robot is not able to control a shipping container, they may visit each zone without the container and will gain points for surpassing the obstacles and completing the branch, but will not gain the time bonus or container control/delivery.

**Ways to Get Penalties:**

* **Wall Touch**: 1 point will be lost every time the robot touches a wall. This cannot be accrued more than once in a 3-second period, and sustained contact with the wall by a moving robot will accrue another penalty every 3 seconds. A robot that is not moving will not accrue more than one penalty (for the initial wall touch).
* **Breaking the Field**: 5 points will be lost for breaking the field. Anything that required a judge to move things (e.g., walls or obstacles) back into place or use duct tape probably constitutes “breaking the field.”
* **Human Involvement**: For a 10 point penalty, the team representative at the field may touch the robot to fix a sensor, move a tangled wire, or stop it from plowing down a wall. If prolonged touch is necessary to fix something on the bot, only the one penalty will be acquired. The representative may not move the robot from its position before the penalty without judge permission. The representative may not touch the shipping container unless it is in the way of something that needs to be fixed on the robot.
* **Container Interference**: if the shipping container falls out of the field or is otherwise inaccessible by the robot (not just inconvenient), the team representative may ask the judge to move the container to a reachable position near the robot for a 5 point penalty.

**Technical Specifications:**

Idk what to put here, copy from mercury and get noah’s info on network stuff

**Document Submission:**

Teams will be required to submit a photo of their robot before the competition so that we will be able to identify robots with their team names. We want this photo to be as up-to-date as possible, so feel free to submit it as late as the week leading up to the competition.

Teams must also submit a name for their robot, which they will do with their registration form. The registration form and payment must be submitted by Saturday, March 21st, 2020.

More added here

**Awards:**

* Ranked Awards: Final scores for each team will be the sum of their two best matches. These scores are used to determine ranked awards. Trophies will be given for teams ranked:
  + 1st place
  + 2nd place
  + 3rd place
* A trophy will also be given to the team winning the Versatile Design Award. This is a judges’ choice award given to the team with the most well-rounded and capable design. Ideally robots with “versatile design” are capable of controlling the container better than other teams, and will be able to complete any of the four Branches. Teams must complete the Purple (Mystery) Branch to be eligible for this award, unless no teams manage to complete this Branch.

**Schedule and Location:**

The Pluto Robotics Competition will take place on Saturday, April 18th, 2020. All times listed are in Central Standard Time. This schedule is rough and subject to changes if matches take longer than predicted. If this happens, the judges may decide to hold lunch before Match 2 instead of after it.

The competition will be hosted entirely in the ExxonMobil Lawrence G. Rawl Engineering Practice Facility (REPF) on the University of Oklahoma campus. The address and location details can be found below. Check-in will occur in the lobby after entering the north-west corner of the building. REPF 200 (second floor) will be the main competition venue. The lounge outside REPF 200 will be the main place for teams to set their belongings and setup work stations. Bench Lab 2 is our main lab in the basement and will serve as the driver room.

|  |  |  |
| --- | --- | --- |
| **Time** |  | **Location** |
| 8:00 AM – 9:00 AM | Check-in and open practice | REPF Lobby and REPF 200 |
| 9:00 AM – 9:15 AM | Opening Ceremony | REPF 200 |
| 9:15 AM – 9:30 AM | Driver setup | Bench Lab 2 (REPF Basement) |
| 9:45 AM – 11:00 AM | Match 1 | REPF 200 |
| 11:15 AM – 12:30 PM | Match 2 | REPF 200 |
| 12:30 PM – 1:30 PM | Lunch (teams on their own) | Campus Corner (north of campus) |
| 1:30 PM – 2:45 PM | Match 3 | REPF 200 |
| 3:00 PM – 3:30 PM | Closing Ceremony and Awards | REPF 200 |

The REPF address is as follows:

ExxonMobil Lawrence G. Rawl Engineering Practice Facility

850 S Jenkins Ave

Norman, OK 73019

Map with REPF, parking, and campus corner labeled