RoboRage “Arena” Competition Rules
OVERVIEW

The University of Tennessee, Knoxville’s Tech CarniVOL and University of Tennessee ASME presents RoboRage, a tournament-style robotics competition that encourages head-to-head conflict among competitor robots. In our second annual competition, “Arena”, competitors are charged with activating their own team’s pillars for as long as possible, and deactivating opponent’s pillars. Prove that you’re the best by outlasting your opponents – especially if it involves pushing and shoving them out of the arena!

THE PLAYING FIELD

The arena is an 8’ x 8’ plywood octagonal playing surface, raised approximately 4 inches off the ground, with no walls, to allow competitors the ability to push their opponents off the arena. The main gameplay consists of capturing pillars by pressing the switches shown below, which are located 8 inches above the playing surface, ± ¾ inch. These standard rocker switches (identical to what modern homes often have) are positioned horizontally. They are approximately 1.25 inches tall by 2.5 inches wide and are turned on and off by pressing the right and left half, respectively. Each pillar has an indication light at the top to display whether the pillar is activated or deactivated. Two to four teams will participate simultaneously in each round. Robots will begin the round on their team’s respective ramp. Two to four ramps will be provided to assist reentering the arena. A robot that is forced out of the playing field may choose to reenter using the provided ramps or by climbing any edge.
Various brackets, hinges, springs, fasteners, and other small components or adhesives may be used to help construct the arena and pillars. The playing field will be constructed such that interactions between these components and robots will be minimal.

All surfaces (including the plywood arena and ramps, and the PVC Pillars) are subject to any of the following process: Sanding, Painting, and/or Gluing (especially the PVC).

Competition organizers will construct the playing field as closely as possible to the provided specifications, but some discrepancy should be expected.

Selected playing field approximate dimensions are provided below (inches). Note that this figure depicts two out of four possible ramps.
Standard rocker light switch dimensions are provided below. Note that the switches will be mounted horizontally as shown.

Pillar switches will face towards the center of the Arena (+-30 degrees). A standard household rocker light switch will be mounted horizontally 8 inches above the Arena floor (± ¾ in) on each pillar. The rocker switches are approximately 1.25 inches “tall” and 2.5 inches “wide”, 1.25 inches for each of two halves. It is operated by pressing either the right side or left side, activating or deactivating the pillar, respectively.
SCORING

Each team is assigned a specific number of pillars designated by color. The number and location of pillars assigned will depend on the number of teams participating in a round. The figures below depict overhead views of possible pillar assignments and arena configurations.

Four Teams (“Orange Team”, “Blue Team”, “Green Team”, “Red Team”)
Two Teams (“Orange Team”, “Blue Team”)

At the beginning of the round, all pillars are deactivated with their switches in the “OFF” position. Teams must activate their assigned pillars by flipping the switches to the “ON” position. Activating a pillar turns on an indicator light at the top of the pillar and initiates the accumulation of points. Activating multiple pillars increases the rate of score accumulation as provided by the table below:

<table>
<thead>
<tr>
<th>Number of Active Pillars</th>
<th>Points Accumulated per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

“Unassigned” pillars (which only occur during a 3-team round) do not generate points for any team. Note that an assigned pillar generates points for its respective team when active, regardless of the robot that activates the pillar, intentionally or unintentionally. For example, if Blue Team’s robot accidentally activates one of Orange Team’s pillars, Orange team will still accumulate points for that pillar, as long as the switch remains on.
Teams can slow their opponent’s accumulation of points by deactivating pillars. When a switch is turned from the “ON” to the “OFF” position, the indicator light goes off, and the pillar ceases to generate points for its assigned team.

Participating in robot combat does not directly earn points. Teams are encouraged to use robot combat to disrupt their opponent’s efforts to activate pillars, or to defend their own active pillars from being deactivated.

An example scoresheet is provided on the next page which notes pillar activation and de-activations that take place at various times throughout the round. This example is based upon a hypothetical 90 second round between two teams, and is analyzed at a resolution of 5 seconds. Actual rounds may last anywhere between 3 and 5 minutes, and score tracking will be done at a resolution of 1 second or less. **Actual scorekeeping will be performed electronically by an Arduino microcontroller that actively monitors the pillar activation statuses, and round time.** A score sheet of the type shown below would only be used in the case of a system malfunction, and would be filled out by reviewing a video of the competition round.
The team with the most points at the end of the round wins, and advances in the tournament bracket.
GAME RULES

All robots will be impounded one hour before the start of competition for safety and rule compliance inspections.

Teams whose robots are found to have minor non-compliances will have an opportunity to make corrections before competition. Judges will observe the activity to ensure that only the specified non-compliance is addressed. No other work on the robot may be conducted.

Teams will be able to access their robots 5 minutes before the beginning of their round to prepare the robot for competition. This includes activity such as installing batteries, powering on, and testing functionality. A judge will oversee preparation activity to ensure no safety or rule violations occur.

Teams may choose one of two starting positions for their robot at the beginning of the round. Option 1 is to place the robot directly on the team’s assigned starting ramp. It is not permissible for any feature of the robot to contact the Arena surface, or otherwise extend past the starting ramp into the space directly above the arena. Similarly, no robot features may extend beyond the vertical planes defined by the left and right edges of the starting ramps. Option 2 is to place the robot on the ground at the base of the starting ramp. The robot must be placed such that it makes contact with the base of the ramp, and no features of the robot may extend beyond the vertical planes on the left and right edges of the starting ramp. The figure below supplements this description.
Once the round begins, competitors are not permitted to make contact with their robots under any circumstance. If a competitor makes contact with their robot, they forfeit the round. If the robot becomes incapacitated (i.e. damaged beyond functionality or flipped over), teams may request that a competition judge removes the robot from either the arena, ramps, or immediate surroundings, and return it to the team. The robot may then be repaired or reoriented. Repairs must take place away from the arena. Once repairs are complete, the robot must be returned to a judge. The judge will then place the robot in the team’s assigned starting zone to rejoin the round. The judge will always return the robot to Starting Zone Option 2. Team members may not place the robot into the starting zone to rejoin a round. The competition clock does not stop for repairing or reorienting a robot, and other robots participating in the round may continue their activity.

Competitors may carry out any strategy to capture pillars or prevent their opponent(s) from capturing pillars. Permissible robot combat activity is limited to pushing, ramming, and lifting as a means of knocking the opponent robot off of the arena or flipping the opponent robot and rendering it immobile. Also note, any strategy that affects or damages the switches (beyond changing their states between on and off) or other field components is not allowed. An example of such an illegal strategy is taping or gluing the switches.

A team may only interfere with their competitors by means of robot interaction. Jamming wireless connections between a competitor’s controller transmitter and robot receiver is an example of unacceptable interference.

Robots entered in this competition are subject to being damaged by another competitor's robot. No reimbursement will be made to repair a damaged robot.

Intentional destruction of the playing field, including ramps, the main arena floor, and pillars is unacceptable and may lead to disqualification. Normal wear and tear is expected.
Safety glasses must be worn by anyone working on robots, closely observing work on robots, or standing near the course before or during competition rounds.

Unsportsmanlike conduct may result in penalties or disqualification as deemed appropriate by judges.

Additional rules and clarifications may be added on the official Q&A forum in the weeks leading up to competition.

The organizers of the competition are not responsible for any injuries or destruction of property that may occur during or in preparation for this competition, such as injuries sustained during robot fabrication. Always follow safe practices when working with fabrication machinery and electrical components.

Judges reserve the right to take any corrective action, up to and including disqualification, deemed appropriate in response to any activity that jeopardizes the safety, fairness, or integrity of the competition. This includes such activities that are not necessarily listed in the above rules.

For a robot to be considered a competition participant and be eligible for prizes, it must comply with all robot specifications, climb from the starting position on the assigned ramp onto the arena on its own power, survive at least one full round (remaining mobile and controllable with available battery power at the end of the round time), and must have activated at least one pillar at some point during the round. Robot specifications are provided in the following section.

ROBOT SPECIFICATIONS

Robots must be able to fit within a 12” x 12” x 12” cube. This is the orientation in which the robots must be placed into the starting zones and remain until the start of the round. Any expansion beyond these dimensions that occurs after the beginning of the round must be completed under the robot’s own
power. Multiple robots may be used by the same team simultaneously in a round, as long as all of the robots fit within a single 12” x 12” x 12” cube.

Teams may choose to purchase commercially available robots, toys, or kits, and may choose to modify or not to modify these devices as the team sees fit for succeeding in the competition. Such devices must comply with all other rules and specifications. Note that, due to the mobile and interactive nature of this competition, **all robots must be wirelessly controlled**. Tethered robots will not be allowed to compete. There are many possible RC devices that can be used. If you are looking for a good place to start, check here:


Robots must be constructed of “normal” engineering materials such as wood, metals, and plastics. Materials such as toxic heavy metals, hazardous chemicals, or radioactive substances are not permitted. Judges reserve the right to disqualify any team on the basis of questionable robot construction material choice, not limited to examples given in this list.

Robots may not be powered by combustion, hydraulics, pneumatics, or any other system deemed unsafe by judges. Small battery powered electric motors and actuators are the preferred method of powering the robot. The maximum permissible system voltage is 24V. Elastic power is also acceptable. Judges may disqualify any team on the basis of dangerously overpowered energy systems, such as high voltage or current electrical systems, or potentially dangerous levels of stored elastic energy.

Robot offensive or defensive systems may be designed only with the intent of physically pushing, ramming, or grasping the opponent. Use of the following robot weaponry will result in disqualification:

- Rotary
- Projectile
- Fluid
- Entanglement
Cutting
Puncturing
Extreme temperature
Flame
Explosives
Electrical
Radioactive

If a robot is deemed unsafe to robot operators, audience, or bystanders, by the sole discretion of the judges, it will be disqualified and not allowed to compete.

Robots must be constructed such that potentially hazardous components are protected from damage. For example, batteries must be mounted such that they are protected from potential crushing or puncturing; electrical circuitry must be sufficiently insulated to prevent arcing, etc.

CONTACT US

Any questions related to game rules, field specifications, or other clarifications can be directed to David Marsh (dmarsh5@vols.utk.edu). Please include “Tech Carnivol - RoboRage Arena” in the subject line.

Visit us at Website for team registration and Q&A updates.