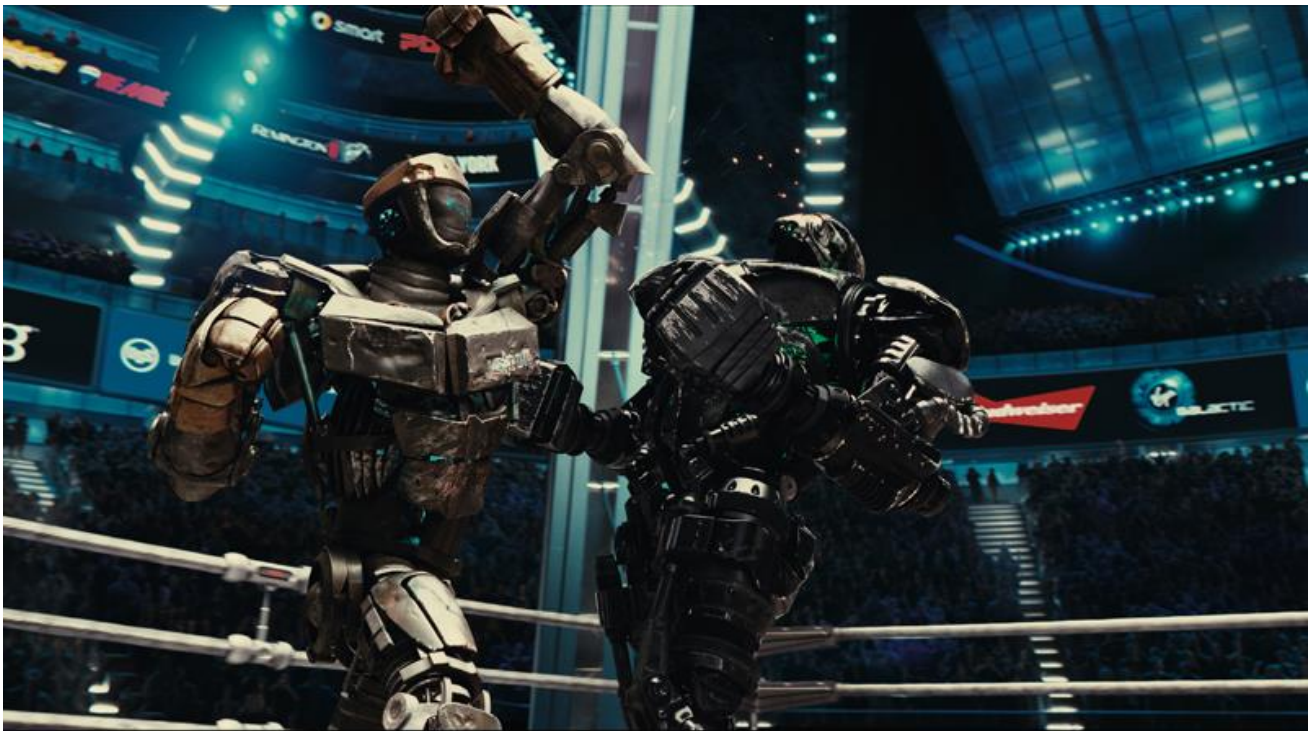


ROBO WARS

The Ultimate Destruction Machine



1. PROBLEM STATEMENT

Design a wired/wireless, manually controlled machine that is capable of knocking out the opponent or is able to score the maximum points.

2. GAME PROCEDURE

2.1. Each team can have maximum of **5** members.

2.2. During the match **only one team-member** will participate in competition (active members). He will be controlling the robot. Teams are allowed to switch the active members in different matches. Only one team member will be given safety gear and others have to stay away from the arena.

NOTE: This switch is not allowed in the middle of an on-going match.

2.3. Setup time: **60 seconds**. In case a team does not report to the weight and measurement counter before their setup time starts, then the opponents will be declared the winners of that round.

2.4. Also, if a team fails to setup their robot within 60 seconds, then the opponents will be given a walk-over.

2.5. Match duration: **3 minutes**.

2.6. A robot is declared victorious if its opponent becomes totally inactive. A robot will be declared inactive if it cannot display any movement for a time period of **30 seconds**.

3. ROBOT SPECIFICATIONS

3.1. Robot dimension & fabrication

3.1.1. The initial dimension of the robot should not exceed **60cm x 60cm x 60cm**. However there is no limitation on robot dimension once the match starts.

3.1.2. Any machine component should not be detached (intentionally) during any point of the war.

3.1.3. The weight of the machine should not exceed **25 kg** and should not be less than **7 kg** (excluding remote control and remote control wires).

3.1.4. In case of a wireless robot, weight will be counted as (0.8 x actual weight).

3.1.5. Readymade gear boxes, parts, chassis, control circuits and remote controls can be used.

3.2. Robot control

3.2.1. In case of wired bots, the minimum length of the wires should be **10 meters**. The wires should remain slack at any instant during the fight. All the wires coming out of the machine should be stacked as a single unit. Also, the wires should be projected **1000 mm** above the ground to avoid entanglement.

3.2.2. In case of wireless system, it should have a minimum four frequency remote control circuit or two dual control circuits or a transmitter-receiver paired module so that frequency interferences with the opposing team can be avoided (in case of any interference in the wireless systems, they will not be considered for rematch or in the results).

3.2.3. Remote controls that are readily available in the market may also be used.

3.3. Battery & power

- 3.3.1. The machine can be powered electrically only. Use of an IC engine in any form is not allowed. Batteries must be sealed, immobilized-electrolyte types (such as gel cells, lithium, NiCad, NiMH, or dry cells).
- 3.3.2. The electrical voltage at any point of time in the machine should not exceed **40 V DC/AC**.
- 3.3.3. **230V (AC)** power will be provided (wired bots).
- 3.3.4. In case of wireless robot batteries should be placed on the robot.
- 3.3.5. In case of wired robots teams can use external batteries.
- 3.3.6. All efforts must be made to protect battery terminals from a direct short and causing a battery fire. Failure to do so will lead to disqualification.

3.4. Mobility

- 3.4.1. Rolling (wheels, tracks or the whole robot).
- 3.4.2. Non-wheeled robots having no rolling elements in contact with the floor and no continuous rolling or cam operated motion in contact with the floor, either directly or via a linkage. Motion is "continuous" if continuous operation of the drive motor(s) produces continuous motion of the robot. Linear-actuated legs and novel non-wheeled drive systems come under this category.
- 3.4.3. Jumping and hopping is not allowed. Flying/hovering (using airfoil, helium balloons, ornithopters, etc.) is not allowed.

3.5. Pneumatics and hydraulics

- 3.5.1. Participants can use pneumatic and hydraulic weapon systems but use of external pressure/liquid cylinders are not allowed. Cylinders should be placed on the robots.
- 3.5.2. The outlet pressure of the source/tank should not exceed **8 bars**.
- 3.5.3. Robots can use pressurized, non-inflammable gases/liquid to initialize their pneumatic mechanisms.
- 3.5.4. The used pressure should be indicated by means of a temporarily fitted pressure gauge or there should be a provision to measure the cylinder pressure on the robot.
- 3.5.5. The storage tank and pressure regulators used by teams need to be certified and teams using pneumatics are required to produce the Safety and Security letters at the Registration Desk at the venue. Failing to do so will lead to direct disqualification.
- 3.5.6. You must have a safe way of refilling the system and determining the on board pressure.
- 3.5.7. All pneumatic components on board a robot must be securely mounted. Particular attention must be paid to the pressure vessel mounting and armor to ensure that if ruptured it will not escape the robot. The terms 'pressure vessel, bottle, and source tank' are used interchangeably.

3.6. Weapon Systems

3.6.1. Robots can have any kind of cutters, flippers, saws, hammers, lifting devices etc. as weapons, with the following **exceptions**:

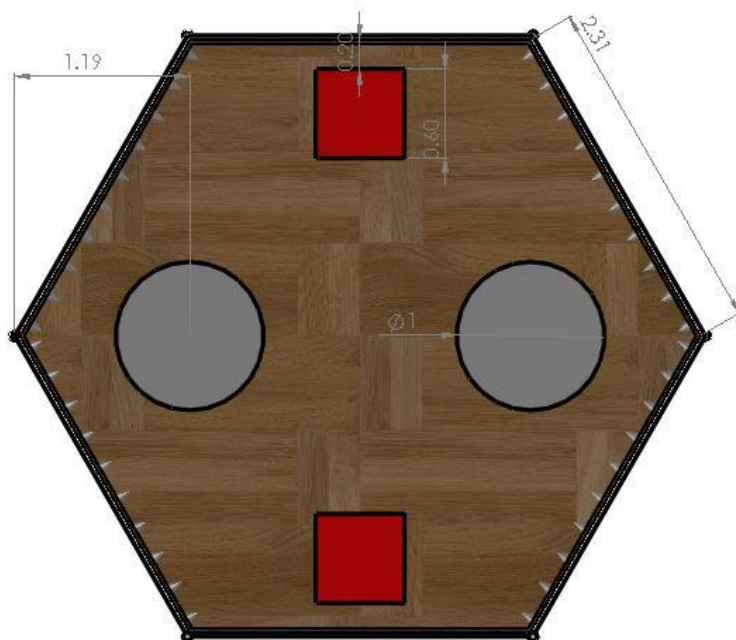
- Liquid projectiles
- Acid based Weapons
- EMP generators
- Any kind of flammable liquid
- Flame-producing weapons
- Explosives
- Nets, glue or any other entanglement devices
- High power magnets or electromagnets

3.6.2. Robots' weapons are classified as defensive or offensive by the event coordinators based on the description given by the team in the Team Description Paper (**TDP**).

4. ARENA SPECIFICATIONS

4.1. Arena Zones

4.1.1. Start Zone: The robot is initially placed in this zone before the match starts.
*These are the **Red Squares of 60cm by 60cm***



4.1.2. Rotation Zone: In this region there is a rotating turntable rotating at a speed of 100 RPM.
*These are the **Grey circles of 100cm diameter***

4.2. Arena Dimensions

- 4.2.1.** Arena will be a hexagonal wooden plane surrounded by wire mesh.
- 4.2.2.** The dimensions, weights, etc. of the arena and weapons described in this problem statement have a margin of error of $\pm 5\%$ unless otherwise stated.
- 4.2.3.** The exact dimensions can be seen in the figures document.

4.3. Arena Description

There are two types of arena weapons. These weapons are placed symmetrically in the arena as shown in the figure.

- 4.3.1. Turntable:** It is a rotating disc at the same height as the entire arena. The diameter of the disc is 100cm and it is rotating at 100rpm. The effect of this will be to create a change in the motion of the robot, even pushing it to the spikes protruding from the corners. Teams have to be careful when they move onto it, as it leads to negative points.
- 4.3.2. Spikes:** These are conical protrusions on the sides, other than in the start zones. They are capable of piercing the robots, and if a team pushes an opponent onto it, gives points as mentioned in the scoring.

5. SCORING

Points are earned by attacking opponent team either with arena weapons or otherwise. In case of no knock outs or if both robots are inactive, winner will be decided by points criteria.

- 5.1. Turntable:** Whenever a team is successful in pushing an opponent onto the turntable, it gives them **50 points**. This is awarded for a maximum of 2 times. If a team goes onto this zone on its own, it leads to **-20 points**.
- 5.2. Spikes:** If a team pushes its opponent onto the spikes, it gives them **20 points**. Pressing the opponent onto the spikes counts as pushing only once and awarded only 20 points. If a robot crashes on to these spikes on its own there, then **-10 points** are awarded.
- 5.3.** Points awarded for the above two will be based on coordinators' discretion.
- 5.4. Attacking:** Only offensive weapons are considered for scoring. If a team attacks the opponent robot with an offensive weapon and makes a **great impact** (decided by the event coordinators), the team will be awarded **100 points**.
- 5.5.** A team successfully toppling the opponent is awarded **150 points**.
- 5.6.** If a **robot is toppled**, the match is paused and the team is allowed to get the robot back to the starting zone. Then the match is restarted. This leads to a **deduction of 150 points**. This can be done only **TWICE**.

NOTE: In case of a tie, there will be an extra minute as tie breaker and the winner will go to next round. If there is still a tie then depending on aggressiveness (decided by the coordinators), one team will go to the next round or both teams will be rejected.

6. VIOLATIONS

- 6.1. If the robot operator is seen to be using the wire from the controller to pull, move or hold the robot, i.e. if the wire becomes taut at any point, the team will be **disqualified**.
- 6.2. All efforts must be made to protect battery terminals from a direct short and causing a battery fire. Failure to do so will lead to **direct disqualification**.
- 6.3. Violation of any of the guidelines under **robot specification** will lead to a **direct disqualification**.
- 6.4. Any intentional damage (including track marks on the arena floor) to the arena will lead to **direct disqualification**.

7. SAFETY

- 7.1. The arena will be secured so that there is nothing coming out of the arena when the match is going on.
- 7.2. Safety equipments will be provided for the team member controlling the robot.
- 7.3. Compliance with all event rules is mandatory. It is expected that competitors stay within the rules and procedures of their own accord and do not require constant policing.
- 7.4. The machine would be checked for its safety before the competition and the team would be disqualified if their machine is found unsafe.
- 7.5. Participants are expected to abide by the rules and should co-operate with the organizers.
- 7.6. If you have a robot or weapon design that does not fit within the categories set forth in these rules or is in some way ambiguous or borderline, please contact the event organizers. Safe innovation is always encouraged, but surprising the event staff with your brilliant exploitation of a loophole may cause your robot to be disqualified before it even competes.
- 7.7. All participants build and operate robots at their own risk. Combat robotics is inherently dangerous. There is no amount of regulation that can encompass all the dangers involved. Please take care to not hurt yourself or others when building, testing and competing.

PS: The decision of the event organizers is final and binding to all.

Problem Statement, Rules and Scoring may change and all changes shall be reflected in the Shaastra website. Hence, the teams are responsible for keeping themselves well informed about the event. Keep visiting the website **www.shaastra.org** for updates regarding the event.

For any queries please mail **robowars@shaastra.org** with the subject as “Query: <query-topic>”