ROBOWARS: Hell in a Cell

Introduction

From all corners they come through flame and fear, flipping, cutting, hurling maces-the messiahs of destruction, all fighting for the crown...

The carnage will be veiled, the damage catastrophic...

All at the Inter-Collegiate Combat Robotics Championship, promising a wilder, fiercer competition this year. You could be forgiven for thinking that the machines you'll see are from outer space or the depths of hell, but they're the wild, weird and wacky creations of skillful roboteers from all around the country. Equipped with the fiercest weaponry and toughest armor, gears will grind and sparks will fly, much more is at stake as the robots battle it out in a bid to be the best. Robowars is manufactured mayhem of the highest order.

It's big...It's better...It's back...Let the wars begin...

Problem Statement

Design and construct a remote controlled robot capable of fighting a one on one tournament.

Specifications

Dimensions and Fabrications:

1. The machine should fit in a box of dimension 750mm x 750mm x 1000mm (lxbxh) at every given point of the race. The external device used to control the machine or any external tank is not included in the size constraint.
2. The machine should not exceed 40 kgs. of weight including the weight of pneumatic source/tank. If the tank is external, its weight would be considered 1.5 times its actual weight. Weight of external power source (batteries and adaptors) will not be counted. Weight of wireless wheeled robots will be counted as 0.75 x the actual weight.

Mobility:

All robots must have easily visible and controlled mobility in order to compete. Methods of mobility include:

1. Rolling (wheels, tracks or the whole robot)
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. Jumping and hopping is not allowed.
4. Flying (airfoil using, helium balloons, ornithopters, etc.) is not allowed.

Robot Control Requirements:

1. The machine can be controlled wirelessly or with wires. Off board power supplies are allowed. Refer below for further details on battery and power.
2. If the machine is wired then the wire should remain slack under all circumstances during the competition. All the wires coming out of the machine should be stacked as a single unit. The wires should be properly insulated. Teams are suggested to use only rated wires. Loose connections or improper wiring may lead to direct disqualification even before the event.
3. If the machine is controlled wirelessly, the machine must at least have a four frequency remote control circuit or two dual control circuits which may be interchanged before the start of the race to avoid frequency interference with other teams. The case of any interference in the wireless systems will not be considered for rematch or results.
4. Remote control systems from toys might be used. Remote control systems available in the market may also be used.

Battery and Power:

1. The machine can be powered electrically only. Use of an IC engine in any form is not allowed. On board Batteries must be sealed, immobilized-electrolyte types (such as gel cells, lithium, NiCad, NiMH, or dry cells).
2. The electric voltage between 2 points anywhere in the machine should not be more than 36 V DC at any point of time. If a team is using AC voltage in any of its parts then the voltage should not exceed 36 V AC at any point of time as well.
3. All efforts must be made to protect battery terminals from a direct short and causing a battery fire, failure to do so will cause direct disqualification.

4. All efforts must be made to protect battery terminals from a direct short and causing a battery fire.
5. Use of damaged, non-leak proof batteries may lead to disqualification.
6. Battery Eliminators are allowed and power source would be available at the venue for the eliminators.

Pneumatics:

1. Robot can use pressurized non-inflammable gases to actuate pneumatic devices. Maximum allowed outlet nozzle pressure is 8 bar. 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.
2. Participants must be able to indicate the used pressure with integrated or temporarily fitted pressure gauge. Also there should be provision to check the cylinder pressure on the bot.
3. The maximum pressure in cylinder should not exceed the rated pressure at any point of time.
4. You must have a safe way of refilling the system and determining the on board pressure.
5. All pneumatic components on board a robot must be securely mounted. Particular attention must be made to 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.

Hydraulics:

1. Robot can use non-inflammable liquid to actuate hydraulic devices e.g. cylinders.
2. All hydraulic components onboard a robot must be securely mounted. Particular attention must be made to pump, accumulator mounting and armor to ensure that if ruptured direct fluid streams will not escape the robot.
3. All hydraulic liquids are required to be non corrosive and your device should be leak proof. Maximum allowed pressure is 8 bars.
4. Participant must be able to indicate the used pressure with integrated or temporarily fitted pressure gauge.

Weapons Systems:

Robots can have any kind of magnetic weapons, cutters, flippers, saws, lifting devices, spinning hammers etc. as weapons with following exceptions and limitations:

1. Liquid projectiles.
2. Any kind of inflammable liquid.
3. Flame-based weapons.
4. Any kind of explosive or intentionally ignited solid or potentially ignitable solid.
5. Nets, tape, glue, or any other entanglement device.
6. High power magnets or electromagnets.
7. Radio jamming, tazers, tesla coils, or any other high-voltage device.
8. Un-tethered projectiles.
9. Tethered projectiles in any direction with each having a maximum tether length of 4 feet are allowed.
10. Spinning weapons which do not come in contact with the arena at no point of time are allowed.

In no case should the arena be damaged by any bot.

The competition will be played on a knock-out basis.

Rules

Video and Abstract Submission:

Participants have to submit a portfolio of their machine, consisting of a written abstract and a video of the working model before the competition. This portfolio will be used to seed teams for the competition. Only the shortlisted teams will be eligible to participate in 'Robowars: Hell in a Cell' at Techfest 2011.
The last date of submitting the portfolio is 1st of December 2010.

Abstract:

The written abstract should be prepared on the following lines:

1. The weapon systems and power supply method should be explained in detail, along with proper diagrams. Picture(s) showing these should be attached.
2. Description of any unusual advantageous mechanism used.
3. The specifications of all the components used, including motors, suspension springs, remote controller, wires, battery etc. have to be mentioned.

4. The abstract can be attached as a PDF file to the video and a CD can be prepared; or the abstract can be submitted on paper. The CD and the papers have to be couriered in a single envelope to the postal address
   Techfest Office,
   Students' Gymkhana,
   IIT Bombay, Powai,
   Mumbai - 400076.
5. You can email the portfolio minus the video and send the video by a CD. This will make sure at least the abstract part of your portfolio reaches us before the deadline.
6. An email will be sent to the team leader confirming the receipt of the entry. Each team is allowed to make one written submission only. In case of multiple submissions, only the first submission will be used for judging purposes.
7. Techfest 2011 is not responsible for any postal/courier delays, so participants are encouraged to send their entries well in advance to ensure receipt before the last date.

Video Abstract:

1. The video should be at least 1 minute unedited clip showing the machine performance to the fullest. All destructive mechanism(s) being used must be shown working.
2. The clip should preferably be in AVI format. If any other unusual format is used, please attach appropriate video plug-ins to ensure that the organizers can run the video properly.
3. It is not necessary to explain the mechanisms in the video.

All portfolios will be used strictly for the seeding purposes. The elimination procedure will be objective and the evaluation of every participant will be published on the website. Techfest assures total privacy of the matter submitted to us. The portfolio of your machine will be helpful in future as an evidence of your hard-work along with determining your position for the competition. Hence, please pay adequate attention to it.

The portfolio is meant to assess the efforts put in by participants. Thus even if you are not able to meet the requirements asked in the portfolio, please send us the portfolios based on the current state of your machine before the deadline. That means even if your machine is incomplete, please send the portfolios anyway, instead of not sending them or sending them late.

Criteria for Victory:

1. A robot is declared victorious if its opponent is immobilized.
2. A robot will be declared immobile if it cannot display linear motion of at least one inch in a timed period of 30 seconds. A bot with one side of its drive train disabled will not be counted out if it can demonstrate some degree of controlled movement.

3. In case both the robots remain mobile after the end of the round then the winner will be decided subjectively.
4. A robot that is deemed unsafe by the judges after the match has begun will be disqualified and therefore declared the loser. The match will be immediately halted and the opponent will be awarded a win.
5. Points will be given on the basis of aggression and damage.

General Rules:

1. The competition will be played on a knock-out basis.
2. The maximum duration of each round will be 5 minutes. Any team that is not ready at the time specified will be disqualified from the competition automatically.
3. The machine would be checked for its safety before the competition and would be discarded if found unsafe for other participants and spectators.
4. The name of your machine must be prominently displayed on the machine.
5. The organizers reserve the rights to change any or all of the above rules as they deem fit. Change in rules, if any will be highlighted on the website and notified to the registered teams.
6. Violation of any the above rules will lead to disqualification.
7. Judges' decision shall be treated as final and binding on all.

Safety Rules:

1. 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.
2. 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 this event. 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.
3. Each event has safety inspections. It is at their sole discretion that your robot is allowed to compete. As a builder you are obligated to disclose all operating principles and potential dangers to the inspection staff.
4. Proper activation and deactivation of robots is critical. Robots must only be activated in the arena, testing areas, or with expressed consent of the event coordinators.
5. All weapons must have a safety cover on any sharp edges.
6. 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.

Team Specification:

A team may consist of a maximum of 6 participants, all from the same institute.

Registration:

For registration you have to send an official confirmation either through e-mail to robowars[at]techfest[dot]org or a fax to 022 2572 3480 signed by a competent authority of your institute. Once we receive the signed copy the name of the institute would be put up on the website.
The last date for sending submission letters is 20th November, 2010.
Download the confirmation letter (doc).

Certificate Policy:

Certificate of Excellence will be given to all the winners.
Certificates of Participation will be given to all the teams who qualify first round of the competition.
The teams which get disqualified due to disobeying any of the competition rules will not be considered for the certificate.

Guidelines:

1. Proper planning is necessary for making a properly functioning bot. So, plan everything well before making a robot. Planning includes deciding the ratings of parts like motor, wires, battery to be used. For calculating the specifications of various parts required, visit http://www.societyofrobots.com/calculator.shtml. Any wrong specifications would lead to a failure and also disqualification from the competition.
2. All pneumatic systems should have a flow valve for control of flow of air. It would help you adjust the flow rate and hence, the output power to your choice.
3. All terminals should be properly insulated to prevent any chances of short-circuit.
4. For safety purpose, there should be a fail-safe mechanism to deal with all kinds of failure.

For list of resources, please visit www.techfest.org/competitions/robowars/#resources