

The
Western Canadian
Robot Games
Official 2004 Rulebook

(14th Year)

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The Purpose of the Western Canadian Robot Games (WCRG)

The purpose of the Western Canadian Robot Games (WCRG) is to encourage people to design and build robots, to engage in friendly competition, and to have fun.

We encourage beginners to build kits, because this is a great way to get started. We encourage "scratch" built robots, because they develop both design and building skills.

All venues and competitions are open to anyone interested, young or old. So grab a soldering iron, and start building.

Designing and building robots is fun!

General Rules for ALL Robots

Robots must be safe. This means no flammable liquids, no compressed gases, no internal combustion engines, no noxious fumes, no shooting or whacking parts, and nothing that is unsafe. The decision of the officials is final.

A safety inspection also must be passed, which involves evaluation for sharp edges and wheel treads that can catch a finger, etc. Officials have final say in regards to safety.

A robot must not expel any liquid, powder, or gas.

A robot must not attempt to damage or injure any other robot, competition arenas, or people. For example, a robot must not include a flame thrower device, or throwing device.

Anyone who brings an unsafe robot may be ejected from the Western Canadian Robot Games. The decision of the judges and officials is final.

All competitors must respect all other competitors, robots, and property, and all competitors must respect all judges, officials, and their decisions. We are here to have fun. Judges or officials may eject any competitor from the Western Canadian Robot Games, who is not behaving appropriately. This includes unsportsmanlike behaviour, using violent language, slander, swearing, using any language that is inappropriate around children, or any other form of behaviour that is inappropriate in a public place. **All decisions of the judges and officials are final.**

Definition of a Scratch Built Robot

First, a kit is a robot that you build without having to design it. We recognize that all robots are built with parts, however it still requires design to put the parts together to build a scratch built robot.

Scratch built robots can have pre-assembled gear boxes, gearhead motors (for example, the Tamiya gear box/motor), pre-built motors, L293 motor controllers, wheels, range finders, etc.

To be a scratch built robot, the main control circuit and frame, must be **designed** and **built** by the competitor. For microcontroller controlled robots, the program must be written by the competitor.

If there is still a question of whether a robot is a modified kit, or a scratch built robot, the judges will look at the number of hours and ability needed to **design** and **build** the robot, with a very strong focus on the number of hours and ability needed for **design**. The judges' decision will be final.

Regarding Running Other Designers Robots

We have had some requests regarding if a person can enter somebody else's robot by proxy (running it for them). The official policy of the WCRG is that each robot must have a person associated with it to compete. This means YES, you can run Jimmy-Joe's robot for him, but it will be treated as if it was yours.

This may not be a problem unless you are personally entering the same event as the proxy robot, because you (the person running both your own robot and the proxy robot) can only walk away from the event with one prize. So if your friend's autonomous sumo robot (that you're running for him) wins first place, and you win second with your own robot, you will only receive the award for first place, that's all.

Minimum Number of Entrants

To avoid running events with low interest, each competition must have at least 5 competitors, or it may be run as a demonstration event only, with no prizes.

Sumo Rules

(Mini & Full Size Sumo)

Object

The object is for your robot to push the other robot out of the sumo ring.

Robot Specifications

Robots must not intentionally harm other robots.

Robots must be safe, and must comply with the "General Rules for All Robots."

Mini-Sumo

Maximum size: 10 cm x 10 cm square x any height, at the start of the match.

Maximum weight: 500 grams.

Full Size Sumo

Maximum size: 20 cm x 20 cm square x any height, at the start of the match.

Maximum weight: 3 kilograms.

Classes

Mini-Sumo (Novice and Advanced)

There are two classes for mini-sumo: Novice and Advanced. The classes are based on the robot builder. A builder cannot enter both mini-sumo classes (if you have two robots, you must place them both in the same class). For more details see "Which Mini-Sumo Class To Enter."

Full Size Sumo

For bigger more powerful robots, come play with the big boys, if you think you can handle it.

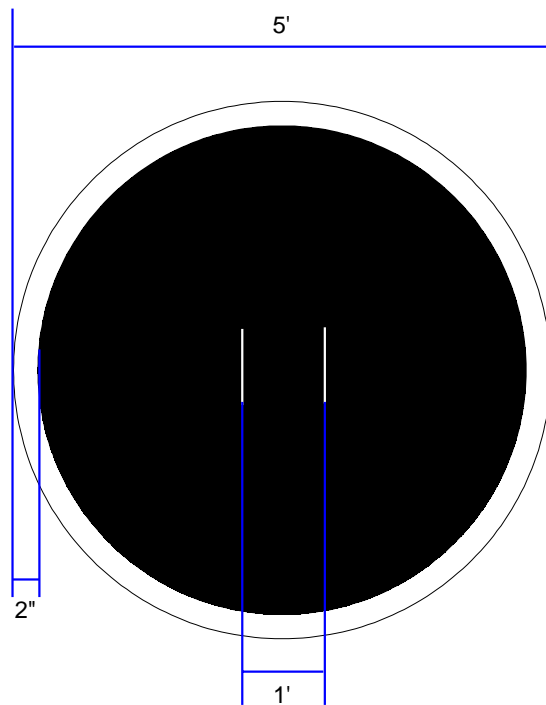
The Sumo Ring

The ring is a circle, made of particle board with a black melamine surface, and a painted white line around the edge. The top surface of the ring will be raised approximately 2.5 cm above the surrounding surface.

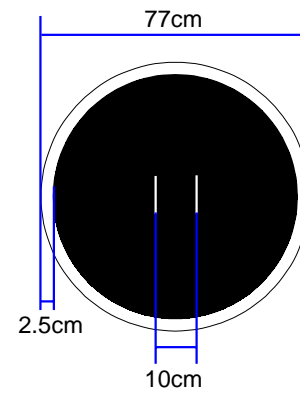
The starting lines, in the center of the ring, are made with black marker.

When the robots are competing, the area outside the ring shall remain clear of all spectators, competitors, and objects for a distance of 1 ring diameter beyond the edge of the ring. This is to maintain consistent conditions for sighted robots.

Sumo Rules



Full Size Sumo Ring



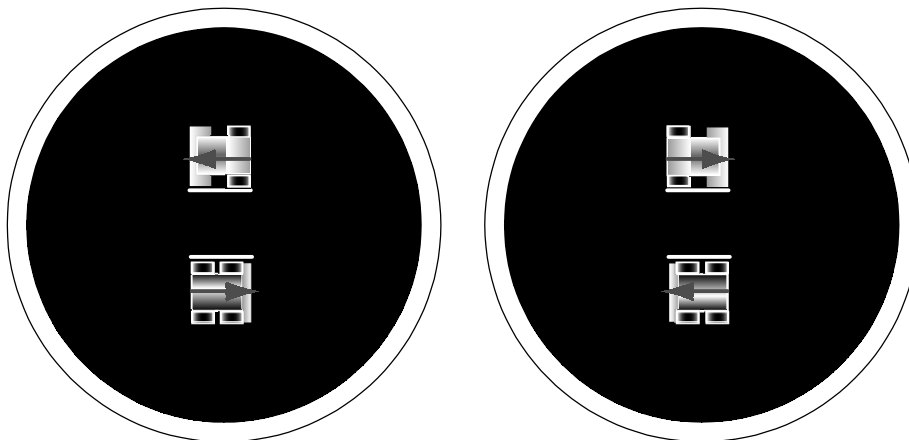
Mini Sumo Ring

The Sumo Match

Each "match" will consist of 3 "rounds" with each match a maximum of 3 minutes, unless extended by the judges. The winner of each round will be awarded 1 point. In the event of a tie for the round, no points will be awarded for that round.

The first robot to get 2 points is the winner of the match. If after three rounds, the score is 1 to 0, the robot with 1 point shall be declared the winner. In the event of a tie for the match, the judges will decide which robot is superior, and declare it the winner.

For each round, the two robots will be placed facing in opposite directions, 10 cm apart, as per the figure below. The robots will be placed to the satisfaction of the judges, so that the opposing robot is on either the right OR the left side of the robot being placed, in either of these configurations:



Sumo Placement on the Ring

Sumo Rules

Note: If a competitor takes more than 60 seconds to prepare their robot for a round, the other robot will be declared the winner of that round.

Once the robots are positioned, the judge will announce the start of the round. The contestants will immediately activate their robots, and will not do anything more to control their robots, until the round is over. The robots must not move for at least 5 seconds, after the beginning of the round.

One robot shall be declared the winner of the round, and awarded 1 point when:

- One robot starts to move before 5 seconds, and the second robot does not move until after 5 seconds, the second robot will be declared the winner of the round.
- The other robot touches the space outside the ring, which includes the vertical side of the ring (not the white line).
- The other robot stops moving for 10 seconds (it shall be considered not having the will to fight), or if it falls over "on the ring" and becomes immobilized in any way for 10 seconds. This is the case even if the first robot also stops moving or becomes immobilized during that 10 seconds.

The round shall be stopped and re-started when:

- Both robots are in a clinch and stop movement for 10 seconds, or move in the same orbit for 10 seconds, with no progress being made.
- Both robots stop (at the same time) and stay stopped for 10 seconds without touching each other.
- Both robots touch the outside of the ring at about the same time, and it can not be determined which touched first.
- If it is not clear if progress is being made or not, the Judge can extend any of the 10 second time limits for up to 30 seconds.

Also, if the judge considers a robot to be unsafe, the other robot shall be declared the winner of the match.

If there is no winner within 3 minutes, the match is declared a draw.

If the match is tied, the judges will decide which robot is the winner of the match. The judges will take the following merits into consideration:

- Technical merits in movement and operation of each robot.
- Attitude of the players during the match.

Fine Print

If a robot damages another robot, a ring, the facility, or a person, that robot will be immediately disqualified from competing for the rest of the Games.

A robot must not leave any residue on the ring.

Sumo Rules

Robots can use sticky wheels (that do not leave a residue), magnets, and vacuums.

A robot must not fix itself to the ring (for example, glue, etc.).

A robot must move (i.e. blocks of wood, etc. trying to impersonate a robot, will not be allowed).

All robots and competitors must also follow all the "General Rules for All Robots."

Which Mini-Sumo Class To Enter

The Novice level is for novices (i.e. newcomers to robot building). If you have won or placed in a prior WCRG Sumo or Mini-Sumo contest, or another major robotic Sumo or Mini-Sumo competition, then you cannot enter the Novice class. Apart from that we're relying on your integrity and common sense.

If this is your first robot and you have attended a workshop and built a simple kit then the Novice class is for you, even if your dad helped you out a bit.

If you are an electronics engineer and have designed and built a robot with a microcontroller, optical range finders and high powered gear motors, then even though it may be your first robot, you should be in the Advanced class.

If your uncle (who just happens to be an engineer with NASA) built and programmed an advanced robot for you, then you should be in the Advanced class even if you're only five.

If in doubt you should enter the Advanced class: that's where the bigger prizes, bragging rights and maximum respect will be earned.

Other Sumo Competitions

If you are planning on attending other robotic competitions, make sure you check the rules of each competition, for any variations in their rules. For example, some competitions use steel rings.

Mine Sweeper Rules

Object

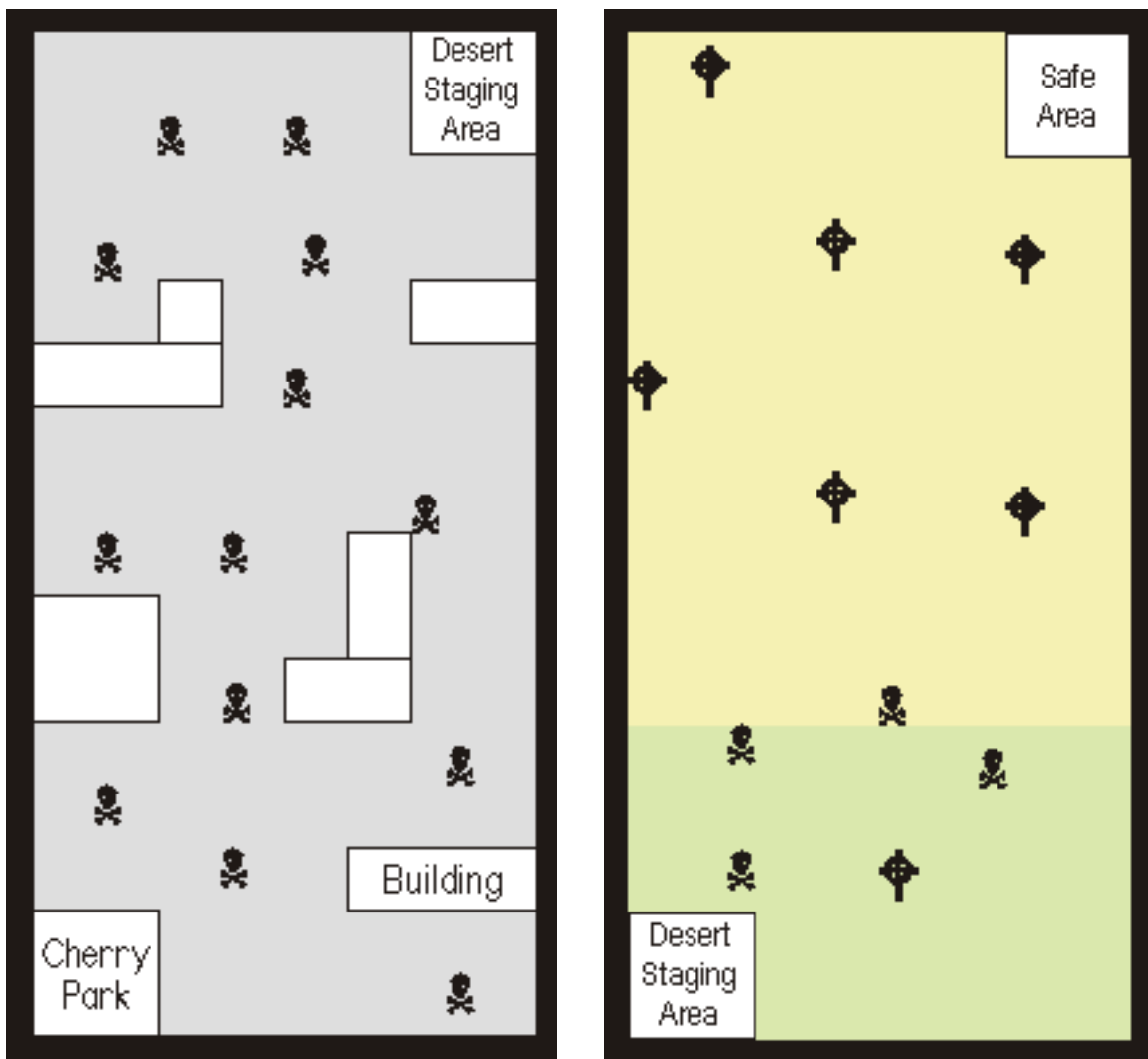
The object is for your minesweeper robot to remove unexploded bombs (UXB's) in Bellum City, and then to travel through the deadly Wgasa Desert (pronounced Wa-ga-sa), and remove unexploded bombs and flag all mines (preferably without setting the mines off, if you don't mind).

Arenas

There are two arenas, Bellum City and the deadly Wgasa Desert. Each arena shall consist of a 4' x 8' sheet of unfinished plywood, with 1.5" x 3.5" walls on the perimeter. The robot is not required to attempt both surfaces (it can attempt either or both surfaces, but if attempting both, it must attempt the city stage first).

You will deploy your robot in the launch area, a 30 x 30 cm square in the southwest corner of the arena, and proceed to its destination, a 30 x 30 cm square in the northeast corner.

The actual arena layout will not be announced until Game day, but will look something like this:



Bellum City

Bellum City has a plywood surface only. Bellum City has some obstacles such as buildings, stones, brick, and other objects which may be found on the ground (the smaller objects may be up to 4mm in size). The gaps between the buildings are at least 30 cm. The buildings are at least 10 cm high. The buildings are at least 30 cm x 30 cm in size, and are made from 12 mm particle board.

Wgasa Desert

The deadly Wgasa Desert is another story. It begins as "grass" (a fine nap carpet), but quickly degenerates to a sandy surface, with small dunes ranging in size up to 2". The dunes will be made of sand and loose material.

Mission

You will have 3 minutes to complete each stage of the mission . Once your robot arrives at the destination area in the northeast corner, that stage is concluded (i.e. your robot may not enter and leave the destination area).

Stage 1 - City Mission

Your robot will be landed in Cherry Park in the southeast corner of Bellum City. Your robot must leave Cherry Park, navigate through the city, and rendezvous at the Desert Staging Area. While enroute, it must collect as many unexploded bombs (UXB's) as it can, and deliver them to the Desert Staging Area.

Reconnaissance reports that the pavement is in fair condition, with minor irregularities due to military action. Minimize any further damage to city buildings (that means don't knock them over or move them from their foundation!). It is also reported that there are 15 UXB's to be collected.

If you wish to supply a homing beacon, it can be air-dropped at the Desert Staging Area.

Stage 2 - Minefield Mission

Your robot should detect and flag all the mines it can find without detonating them (that's WITHOUT detonating them!). There are also UXB's to collect. Rendezvous at the Safe Area on the northeast side of the minefield, and deliver the UXB's, after flagging all the mines.

Reconnaissance indicates that the ground conditions vary from grass in the south to predominately sand dunes of varying depths, with some small boulders and other natural hazards in the North (don't forget your sand equipment!). It was also reported that there are 8 mines to flag, and 8 UXB's to collect.

The robot must flag each mine in any non-destructive and non-permanent way you choose (e.g. a flag or ball, but not paint). The marker must fit inside a 45mm cube. At least part of the marker must lie within a circle with a radius of 50mm from the center of the mine. A judge may disqualify any marker if, in his opinion, it was not placed deliberately on a mine (if a flag is place more than 50mm from a mine, deliberately or not, it will lose 10 points, as shown under Scoring).

Mine Sweeper Rules

After the city stage, you will have 3 minutes to prepare your robot for the desert stage. You may reprogram or reconfigure your robot for the desert. You may detach pieces and leave them at the Desert Staging Area, but you may not add any pieces (i.e. all pieces of the robot must be carried through the city by the robot).

If you wish to supply a homing beacon it can be air-dropped at the Safe Area.

Intelligence Reports

Unexploded Bombs (UXB's)

The UXB's consist of the magnetic "flasher lights" found in many novelty stores, and at the Robot Games in 2003.

Each UXB has a neodymium iron boron magnet, with a strength of approximately 2.2 Mega Gauss Oersted's (MGOe), 3/8" dia. x 1/10" thick, attached to the bottom of the UXB. Each UXB is 7/16" in diameter x 1/2" tall, and weighs 5.4 grams. Each UXB also has two light emitting diodes (LED's) flashing alternately at 2.5 Hz, and at a brightness of 20 Millicandelas (mcd).

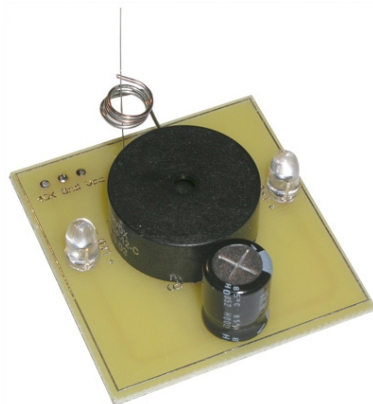


Be careful! These babies are more deadly than they look.

Landmines

The mines consist of a 9V battery with a 38.5 kHz infrared (IR) transmitter LED. The frequency of the mines will be adjusted to match the response of the popular IS1U60 IR receiver.

The mines will also have a spring loaded vertical trip wire which will trigger when the mine is touched. The wire will extend up 4 cm from the surface of the sand (3 cm from the top surface of the mine). The IR LED will be on the circuit board (not on the trip wire).



There will be 8 landmines in the Wgasa Desert. These mines may be placed loosely on the surface or buried just beneath the surface with the transmitting IR LED exposed.

Robot Specifications

Your robot must fit entirely inside the launch area (30 x 30 cm) at the start of the match, but may expand once the match begins.

The robot must be fully autonomous, however the operator may place a stationary homing beacon (bright light, IR, radio, etc.) on or behind the destination area, before the beginning of the match. Once placed the beacon may not be touched.

Your robot must be safe, and must comply with the “General Rules for All Robots”.

Walker Only Class

Should there be 5 or more walkers in this event, there will be a separate class created, just for walkers. Otherwise, the walkers will compete with the wheeled vehicles, with appropriate bonus points added.

Scoring

The following point system will be used to score the missions:

Points

- 10 Per foot of distance covered to the destination area in the northeast corner.
Maximum 70 points.
- 20 For arriving at the destination area.
- 25 Each mine flagged.
- 10 Each UXB collected by the robot, and still held at the end of the time limit, whether the robot makes it to the destination area or not (0 points if the robot drops the UXB some where outside the destination area and does not pick it up again).

Penalties

- 25 Each mine detonated.
- 10 Each flag that is dropped more than 50mm away from any mine.
- 25 Each building knocked over or moved from its foundations.
- 25 Each human intervention. The robot may be lifted and rotated, but not moved from its current location.
- 20 For use of an unmodified kit.

Bonus points

- 50 For completing the desert stage without tripping any mines.
- 100 For flagging all the mines, and not putting any extra flags down.
- 25 For collecting all the UXB's.
- 1 For every 5 seconds the robot arrives at the destination before 2 minutes (120 seconds), for each stage.
- 50 For a walker completing the course. This will be not applicable in the event this is a walker-only event, or if there are enough walkers to have a separate walker only class.

Prizes

A robot must score at least 25 points to be eligible for a prize.

Because this is the first year for this event, prizes will be awarded even if there are fewer than 5 competitors in this event.

Line Follower Rules

Object

The object is for a small autonomous robot to follow a line, under various conditions (e.g. round corners, sharp corners, crossovers, up hills, etc.). Points are awarded for distance covered and for speed.

Robot Specifications

There is no "official" size restriction, but the robot should fit inside a 9" cube in order for it to navigate past or under specific obstacles that may or may not be present on the course. Also, it must be light enough to work on a table top.

The robot must comply with the "General Rules for All Robots."

Bonus points will be awarded for scratch built robots (see also "Definition of a Scratch Built Robot").

Arena

The arena consists of a white semi-gloss painted surface, with a line made from standard 3/4" wide black electrical tape. The total length of lines in each stage that the robot will need to traverse will be approximately 3m in length. Lighting levels will be unpredictable, so the robot must be able to operate over a wide range of lighting conditions.

There will be four stages, each of a different level of complexity. Completing of each stage will add points to that robots score.

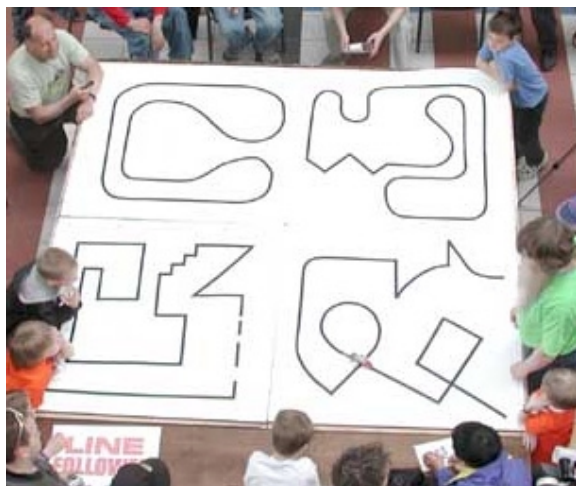
The course may include (but is not restricted to) the following line configurations:

- Gentle rounded corners
- Sharp rounded corners
- Sharp obtuse angles (greater than 90 degrees)
- Sharp acute angles (less than 90 degrees)
- Crossovers
- Dark tunnels (make sure your robot can see in the dark and fit through the tunnel)
- Gaps in the tape (of several inches)
- Hills (both up and down)
- Bumps (small cracks may exist on the surface)
- Colored surfaces (for example a red, green, or blue surface with a black line on top, for a stage)

The Line Follower Contest

Your robot should follow the line to the end of each stage, as fast as it can. The robot will be placed at a preassigned starting point on each stage, and may be started by hand when directed by the judge. Robot operators are allowed to pick up and replace an errant robot and place it back onto the line, at the point just before the robot last left the line, but it will suffer a penalty for each replacement. For example if the robot left the line at a 90 degree bend in the line, then the operator can place the robot at the point just before the 90 degree bend in the line.

A robot must have a positive score on the first stage, or it will NOT be allowed to attempt the other stages. As long as the robot gets a positive score on the first stage, it will be given the opportunity to attempt all of the other stages. The course layout will not be made available until the day of the event, but here's last years course:



Scoring

All points are awarded per stage. The final score for the robot, will be the total of the scores from each of the stages. See table on next page.

Line Follower Rules

Points Awarded	Description	Example
100 points x percentage of distance robot traveled, per stage.	A percentage of 100 points is awarded depending on the distance covered in that stage (to the nearest 10cm).	If a robot travels 30% of the stage: 30 points.
100 points per stage.	Bonus awarded for successful <u>uninterrupted completion</u> of the entire stage.	If a robot completes one stage without being touched by the operator: 100 points. If a robot completes one stage, but is picked up and repositioned by the operator once during that stage: 0 points.
3000 points divided by the time to complete a stage in seconds.	Points for faster robots. The timer runs even when a robot leaves the line and is replaced.	If a robot completes a stage in 25 seconds: 120 points.
75 points per stage attempted.	For scratch built robots (see “Definition of a Scratch Built Robot”).	If a robot is a slightly modified Queen Ant: 0 points. If a robot is completely scratch built: 75 points per stage.
-50 points per violation.	Picking up the robot and replacing on the line (just before the point where robot left the line).	Operator decides to pickup his robot after it has left the line, and place it back onto the line (just before the point where it left the line): -50 points.

Note: If a robot is made out of Lego, AND if it is designed, built, and programmed by the competitor, it gets 50 points per stage, for being scratch built (this is less than the 75 points for full scratch built robots, because the Lego controller is not designed and built by the competitor).

Other Line Follower Competitions

If you are planning on attending other robotic competitions, make sure you check the rules of each competition, for any variations in their rules. For example, some competitions use different widths of lines.

Mission Mars - First Lego League

Object

Now everyone can try the First Lego Leagues' Mission Mars challenge. Mission Mars is open to all ages at the WCRG.

Details

All the details are on the First Lego League site.

Mission Descriptions

For a description of the missions go to:

http://www.firstlegoleague.org/default_large.aspx?pid=12930

Rules

For the rules go to: <http://www.firstlegoleague.org/default.aspx?pid=11250>

Field Setup

For the field setup go to: <http://www.firstlegoleague.org/default.aspx?pid=11330>

Mat and Borders Details

And for details on the mat and borders go to: <http://www.firstlegoleague.org/default.aspx?pid=11380>

Art & Innovation Award

Object

This is a judges award for robots that show unusual innovation, design, or have some other aspect that is really cool.

Judging

All the robots are automatically eligible for this award. Judges may nominate any robot whether or not it was specifically entered for this award. This category is also for robots and robotic art that don't fit into any other categories.

The judges will only give this award if they find something really cool (i.e. there will be no awards given for this, if the judges feel there are no robots worthy of this award).