

Singapore Robotic Games 1999

20 – 22 MAY 1999

RULE BOOK

V 3.3

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SRG Home Page : <http://www.eng.nus.sg/mpe/srg>

Rules in the SRG Home Page will be used eventually in the Games.

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LEGGED ROBOT RACE

1. OBJECTIVE

To design a Legged Robot to travel on a designated track by either walking, running or hopping.

2. SPECIFICATIONS OF ROBOT

- 2.1 The robot must have at least one leg. There is no limit to maximum number of legs used. The maximum length and maximum width of the robot is restricted to a 1m x 1m square area in the starting zone. There is no height restriction on the robot. There is no restriction on the dimension and geometry of the robot once it started each race attempt (ie: once any part of the robot crosses the starting line.)
- 2.2 The robots must be completely autonomous. It should contain both the controller and power units. The robot must not weigh more than 10 kg.
- 2.3 Radio-frequency (RF) control is strictly prohibited in the robot design except for start/stop operation of the robot (i.e., remote push button to start and stop the operation of the robot.)
- 2.4 Each leg of the robot must consist of minimum two limb segments and demonstrate relative motion between the limbs to realise a walking motion.
- 2.5 The limbs of the robot must include some means of controlled motion to realise the walking, running, and/or hopping action for the robot. The following are some examples NOT considered as a legged robot:
 - Rotating wheel with spokes or any other structure sticking out radially to represent 'feet'.
 - Traction belt with studs or roller chain with 'feet' mounted in any orientation.
 - Robot, with feet or any floor contact point, mounted with motion-assisted roller wheel(s) is strictly prohibited
- 2.6 Locus for every feet of the robot cannot be higher than its associated pivoting joint.

3. SPECIFICATIONS OF RACE TRACK

- 3.1 The race-track is a raised platform of a fixed width of 1m and a maximum length of approximately 10m (not inclusive of starting zone and finishing zone.) It comprises of straight and circular sections connected together to make up the entire length. The circular section consists of a one-eighth circular path (45-degree sector) with radius of 1m (with respect to the longitudinal centerline of the path). The straight segment consists of 1 m straight paths. There will be a 1-meter **Starting Zone** and a 1-meter **Finishing Zone** at the start and the end of the race-track.

- 3.2 The track is constructed with 1/4-inch plywood with circular and/or straight sections raised about at either 50 mm or 100 mm off the ground. It will be lined with 3 mm thick black rubber mat. It is designed to support a robot with a maximum weight of 10 kg. Each section of the track is not expected to be perfectly level and it may be uneven. Track sections at the same elevation are joined with a maximum step at the joints of 5 millimeters. There is a 50 millimeters wide retro-reflective tape (3M Scotchlite - Industrial Grade) in the middle of the track for navigation purpose.

Figure 1 shows a top view of an example of a competition race-track. It consists of 4 straight segments (A) and 8 circular segments (B). The segments are at different elevations of 50 mm or 100 mm off the ground.

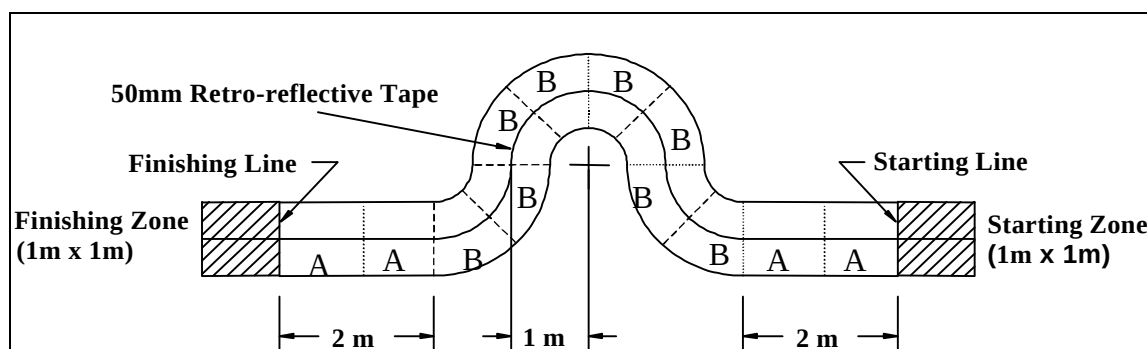


Fig. 1 Sample Legged Robot Race Track

4. RULES OF COMPETITION

- 4.1 The robot will be “caged” at 15 minutes before the start of the competition. (This includes approved electronic spare parts and spare power unit. Mechanical spare parts are not required for the “caging” exercise.) Once the competition starts, no individual is allowed to access the robots in the “caging” area.
- 4.2 The robot is to start from a stationary position before the starting line in the Starting Zone. It has to travel along the designated track either by walking, running or hopping, or any other motion not identified as wheeled motion. A valid **Record Time** is measured from the instance any part of the robot crosses the starting line to the moment when the last part of the robot (trailing edge) crosses the finishing line. No parts of the robot are to be left behind in the race-track.
- 4.3 The robot must keep within the designated track during the race. The result is void if any part of the robot completely touches the ground or the robot fell off the track before fully crosses the Finishing line.
- 4.4 Each robot is given **4 minutes Competition Time** to produce its best result (this include setup time) Team may withdrawn temporarily within the 1st minute of competition and all successful run during the 1st minute (before they withdraw) will be voided. In this case, they will then re-start their entry at a later time, but will be given only **3 minutes** competition time to produce its best result.

- 4.5 Winning is based on the shortest time to complete the FULL competition track. If the robot failed to achieve any single complete run within the Competition Time, the longest distance travelled at any single attempt will be recorded instead. As for the single attempt which started just before the lapse of the competition time, it will be allowed to continue till it crosses the Finishing line or step out / fall out of the track, and the result will be recorded.
- 4.6 The robot need not stop in the Finishing Zone. As there might not be any track provided after the Finishing Zone, it is the participants' responsibility to take care of their robot if it chooses to overshoot the Finishing Zone.
- 4.7 Modification of robot during competition is **STRICTLY PROHIBITED**. No extra parts are to be added to or removed from the robot once the competition time starts. On the other hand, the robot is allowed to change identical mechanical spare parts, electronic components (except for the control and memory unit) and power unit.
- 4.8 During the competition, chassis of each robot are not allowed to be modified and used by different controllers; likewise, individual controller is not allow to be fitted on different chassis to represent different entries.
- 4.9 All robots should be returned to the caging area or a designated location after its run. The teams are not allowed to take back their robots before the whole competition is concluded.

5. CLONING

- 5.1 In accordance with the spirit of the competition, clones among the winning entries will only be awarded one prize. Clones will be identified during the "caging" procedure.
- 5.2 Clones are robots with substantially identical physical appearance and walking mechanism. Scaling of the same mechanism is considered as cloning. Robots with the same mechanism but different driving principles will not be considered as clones.
- 5.3 When in doubt, the decision of the Judges will be final.