

LEGGED ROBOT MARATHON RACE

1. OBJECTIVE

To design a Legged Robot to travel on a designated track by either walking, running or hopping on a flat terrain for a total distance of approximately 23.56 metres.

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 0.6m x 0.6m 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 approximately 1.2m wide divide into 2 equal width (approximately 0.6m) path and is approximately 23.56m in length. There will be a central divider of 10mm thick and 50mm tall running along the entire track. The central divider is not a rigid wall for robot to make contact with but mainly as a guide for official to check whether any robot crosses the designated path.
- 3.2 The track comprises of straight and circular sections connected together. The circular sections consist of a circle quadrant of radius (with reference to the retro-reflective tape) 0.5m or 0.8 m (depending on inner or outer path on the track) with respect to the longitudinal centreline of the path. There is designated Start Zone and Finish Zone on the track.

3.3 The entire track is constructed with 1/4-inch plywood with circular and/or straight sections raised about 50 mm off the ground (if 50 mm track is not available, the entire track will use 100 mm height). 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. The joint between 2 track sections 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 millimetres. There is a 50 millimetres wide retro-reflective tape (3M Scotchlite - Industrial Grade) in the middle of each path for navigation purpose.

Figure 1 shows a top view of the actual competition race-track which consists of a 11 straight segments and 10 circular segments forming a total close loop distance of 23.56 metres

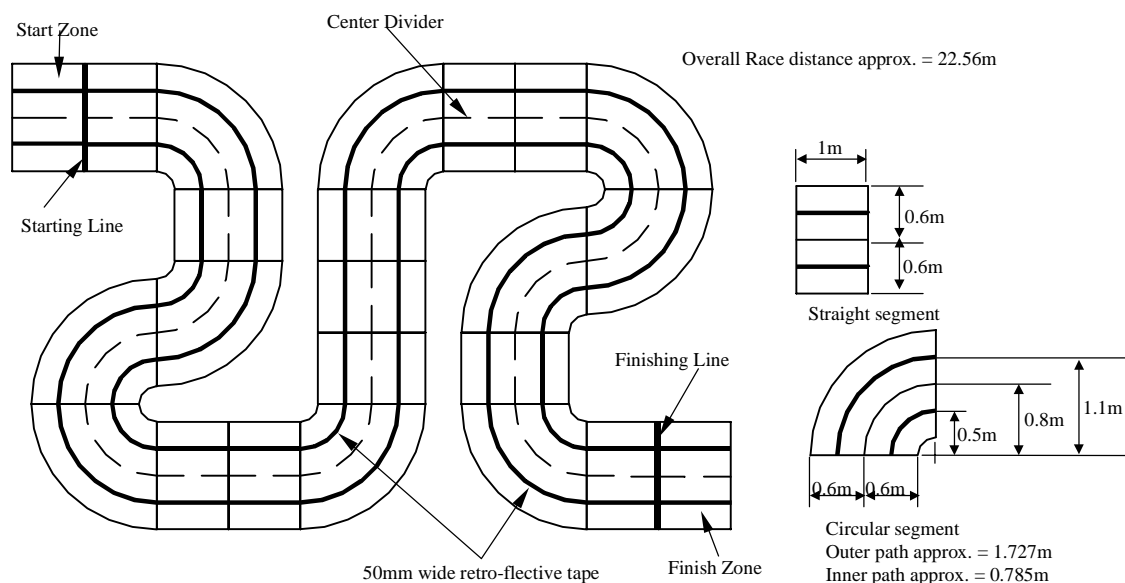


Fig. 1 The Legged Robot Race Track

4. FORMAT OF COMPETITION

4.1 There will be 2 phases in the competition:

- a) The Preliminary Matches
- b) The Knock-out Championship Matches

4.2 The Preliminary Matches

All robot entries will be randomly paired by drawing of lots. The odd number robot will run by its own. Every match will consist of 3 races. 2 robots competing in the race will be timed.

All the timing will be tabulated to determine the top 8 ranking for the next round of matches. If there are clones among the top 8 ranking, only the best clone will advance to the next round and the lower rank will be moved up.

The top 8 ranking will proceed to the Knock-out Championship Matches using Table of 8. (Note: If the total number of entries exceeded 30, table of 16 will be used to include more robots)

4.3 The Knock-out Championship Matches

The Table of 8 shown in Fig. 2 will be used. The pairing or opponents will go according to the ranking during the Preliminary Matches. Figure 2 shows the competition matches in a Table of 8.



Fig. 2. Table of 8

Each Match consists of 3 races. The winner of each match is decided by number of winning races. 4 Winners of quarterfinal round will proceed to semi-final round after which 2 winners of semi-final round will proceed to the Championship round. The Champion is again decided by number of winning races.

5 RULES OF COMPETITION

- 5.1 Robot will be “caged” at 15 minutes before the start of the competition. The caged robot should be the full robot **PLUS** all necessary power units of the same rate capacity. Once the competition starts, no individual is allowed to access the robots in the “caging” area.
- 5.2 Robot is to start from a stationary position before the Starting Line at the Start Zone. It has to travel along the designated track either by walking, running or hopping, or any other motion not identified as wheeled motion. **Two** robots will be racing at any one time and the sequence will be determined by drawing of lots. The robot has to complete the entire competition race-track for each race.
- 5.3 Robot must keep within the designated track during the race. The result is void if
 - a) any part of the robot completely touches the ground or the robot falls off the track before fully crosses the Finishing line. Or
 - b) any part of the robot crosses the central divider.

If any of the above situations occurs, the participant, under instruction from the judge, must remove their robot immediately without disturbing the other robot in the same race.

- 5.4 The race and race time both starts by the blow of a whistle. In the **Preliminary Matches**, a valid **Recorded Time** is measured from the time then the whistle is blown until the moment when the last part of the robot (trailing edge) crosses the demarcation line at the Finish Zone. Any robot moved before the whistle is blown will be considered a **False Start**. Only 1 warning will be given to False Start any robot and any subsequent False Start will be considered has lost the race.
- 5.5 No parts of the robot are to be left behind on the race-track. Winning is based on the best time of a completed race for each robot. If the robot failed to achieve any single complete run for any of the races, the longest distance travelled at any single attempt will be recorded instead
- 5.6 During the competition, If the robot, under any circumstance, does not demonstrates any positive action to start or complete the race (eg: always crash or run out of track for no apparent reason) may be asked to retire by the discretion of the judges while the other robot still carry on the competition on its own.
- 5.7 Once the robot has started its race, the robot handler can only access the robot after it crosses the Finishing Line at the Finish Zone on the competition track or the robot run out of the track completely. The robot need not slow down or stop after completing on the competition track.
- 5.8 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. Every robot must have their individual parts and no sharing is allowed. The only replacement in the robot is the power unit which was declared during caging. **Replacement of power unit is not allow in a same Match**. Robots are not to share each other's power unit.
- 5.9 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.

6. CLONING

- 6.1 will only be awarded one prize. Clones will be identified during the "caging" procedure.
- 6.2 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.
- 6.3 When in doubt, the decision of the Judges will be final.