**LEGGED ROBOT MARATHON RACE**

1. **OBJECTIVE**
   
   To design a Legged Robot to travel 6 laps 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 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 25.4m in length (1 lap.)

   3.2 The track comprises of straight, U-turn, cross-over and circular segments connected together. Each circular segment consists of a circle quadrant of radius (with reference to the retro-reflective tape) 0.5m and 1.1m (depending on inner or outer path on the track) with respect to the longitudinal centreline of the path. The U-turn segments will have radius of xxx mm and will have poles of approximate diameter 10mm and height 120mm at the centres of the 2 semi-circular path segments at both ends of the track. The entire track is constructed with 1/4-inch plywood with circular and/or straight segments 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 segments is NOT
expected to be perfectly level and it may be uneven. Track segments 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.

Fig. 1 shows the top view of a sample competition race-track. The actual competition track which consists of a 5 to 7 curve segments, 5 to 7 straight sections and one (1) possible crossing section. The starting position and orientation will be determined by the judges in a random manner.

Fig. 1 The Legged Robot Race Track

4. FORMAT OF COMPETITION
4.1 The running sequence of all robot entries will be determined by drawing of lots. Every entry robot is given 3 competition chances to produce its best result.

4.2 Each robot is to run 6 laps around the closed track, winner is determined by shortest time to complete 6 laps.

5 RULES OF COMPETITION
5.1 Robot will be “caged” at least 30 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 Each robot is given 8 minutes to perform 3 runs, including 1 change of battery after the first run, to produce the best run time. For change of battery, only the plugging in and plugging out without any removal of parts is allowed, i.e. no removal of covers with screw drivers. No cleaning of robot parts and tracks are allowed.
5.3 Robot is to start from a stationary starting position, with the extremity of the robot aligned to the start line. It has to travel along the track either by walking, running or hopping, or any other motion not identified as wheeled motion. The robot has to complete the entire competition race-track for each run.

5.4 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 to the other track, except at the cross-over segment.

If any of the above situations occurs, the participant, under instruction from the judge, must remove their robot immediately. The robot is then considered to have used up 1 of the 3 competition chances.

5.5 The race and race time both starts by the blow of a whistle. A valid **Recorded Time** is measured from the time then the whistle is blown until the moment when any part of the robot crosses the Start/End line at the Start Zone after 6 laps. Any robot moved before the whistle is blown will be considered a **False Start**. All robots shall only be given 1 False Start warning and subsequent False Start will imply the robot has lost a competition chance.

5.6 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, it shall be retired from the competition.

5.7 Once the robot has started its race, the robot handler can only access the robot after it crosses the Finishing Line or the robot runs out of the track completely.

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.

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.

5.10 Any violation of the rules above would result in the run being invalidated.

6. **CLONING**

6.1 Clones 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.

6.3 When in doubt, the decision of the Judges will be final.