HUMANOID ROBOT COMPETITION

1.　OBJECTIVE

The Humanoid Race is a competition between bipedal robots. The competition is to promote technology that allows robots to walk and run like human.

2.　SPECIFICATIONS OF ROBOT

2.1　The robot has TWO legs ONLY. For each leg, the ONLY contacting area with the ground is the Foot. The diagram below shows the MINIMUM configuration for a lawful LEG.
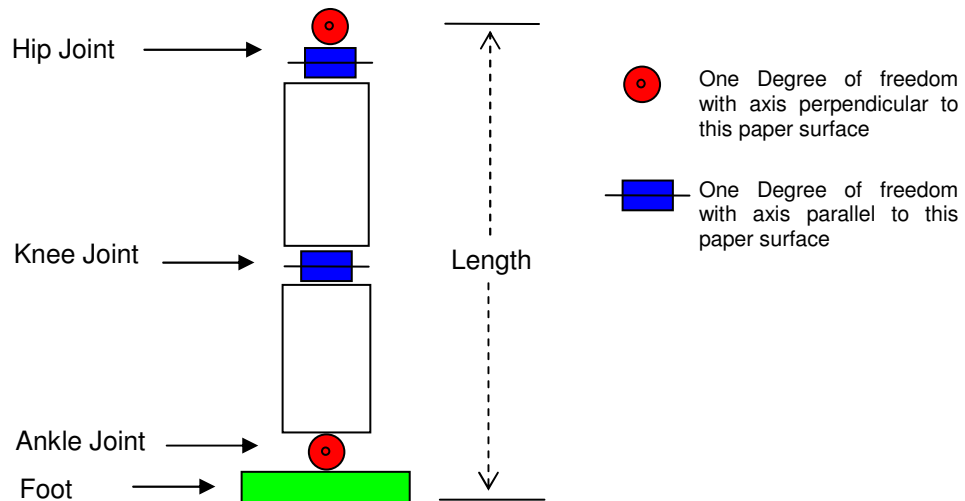

Fig. 1 – Humanoid Leg

2.1.1 Each leg should have the three joints, namely HIP joint, KNEE joint and ANKLE joint.
- HIP joint: the hip joint should have at least TWO degree of freedom as shown in the diagram above.
- KNEE joint: the knee joint should have ONLY ONE degree of freedom as shown in the diagram above.
- ANKLE joint: the ankle joint should have at least ONE degree of freedom as shown in the diagram above.

2.1.2 The **length** of leg (from HIP joint to Foot when the leg is completely extended) should not exceed 300mm.

2.1.3 The **aspect ratio** of the leg, which is defined as following

Aspect Ratio = Length of Leg / Maximum Dimension of the Foot Surface

The Aspect Ratio should be more than 1.5.

2.1.4 The maximum weight of the robot should not be more than 10kg.

2.2　The robot should be FULLY AUTONOMOUS and self-contained, i.e. there should be NO external control and power source allowed.

3.　SPECIFICATIONS OF RACE TRACK

3.1　The Race Arena: There is no predefined race arena for this game. The participating robots will race using the natural floor of the competition venue. Note that since the competition venue is indoor, the floor surface can be carpet, parquet, concrete surface, etc. Participating robots are advised to be designed with tolerance with difference floor surface.

3.2　The Race Track: The Race Track shown in Fig 2 is constructed directly on the floor of the competition venue by WHITE color reflective tape of WIDTH 25mm.

3.2.1   All the track lines will be straight
3.2.2   The starting line length is 100mm
3.2.3   The STOP POINT and WAYPOINT1 are indicated by the BEACON that will be a standard table tennis ball of ORANGE color.
3.2.4   The exact location of the STOP POINT and WAYPOINT1 with respect to the center of starting line is defined by coordinate pair (X0, Y0) and (X1, Y1) respectively. The exact coordinates will be determined at the competition day. Note that X value will not be bigger than 5 meter and Y value will not be bigger than 3 meter.

Note that is reflective tape is for guiding purpose for the robot but is not mandatory for robot to follow exactly. Please refer to Section 4.3 for how the race is run.
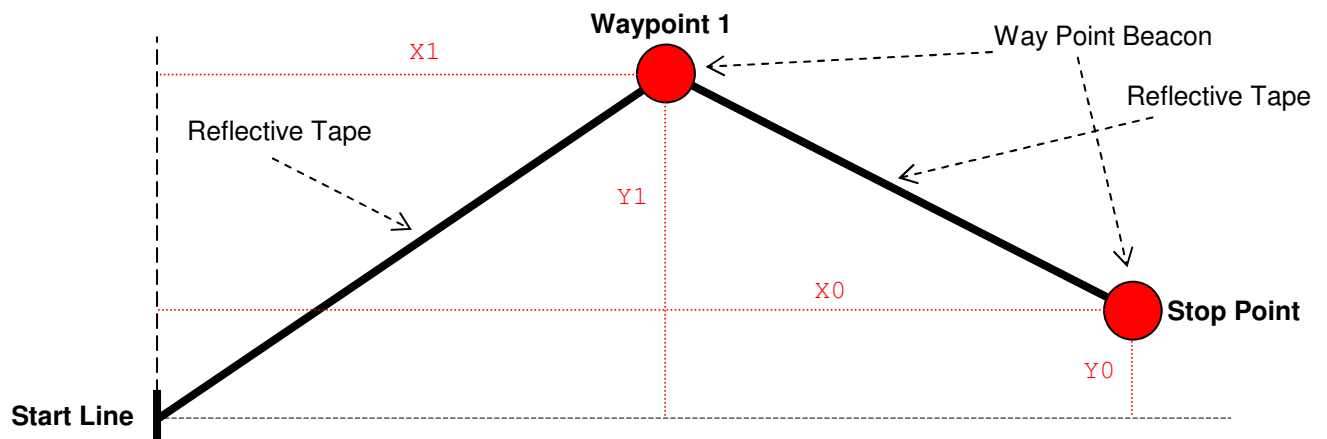

Fig. 2 - Sample Humanoid Race Track

4.   RULES OF COMPETITION

4.1   The robot will be "caged" 30 minutes before the start of the competition. Once the competition starts, no individual is allowed to access the robots in the "caging" area. Charging of batteries is not allowed in the caging area.

4.2   During the caging, the humanoid robot entries will be inspected to ensure that they conform to the leg specifications. Robot handlers should demonstrate the required number of freedoms at the specified joints. Robots that are not meeting the leg specifications will be disqualified.

4.3   How the robot run the race
    4.3.1   The robot is to start from a stationary position behind the Starting Line.
    4.3.2   It has to reach the WAYPOINT1 and then reach the STOP POINT. The robot must touch the BEACONs at the WAYPOINT1 and STOP POINT for the race to be considered SUCCESSFUL. The robot does not necessarily follow the guiding reflective tape exactly.
    4.3.3   The robot can be stopped by the handler after touching the STOP POINT.
    4.3.4   There may be a few robots running in the same time.

4.4   The running time starts when the robot crosses the Start Line and ends when the robot touches/crosses the Stop Line and shall be recorded by the official timer. The robot with the shortest running time is the winner. If a robot is not able to reach the Stop Line within 10 minutes, its race shall stop and its running time shall be 10 minutes.

4.5   In the competition, there will be preliminary round, semi-final round and final round. In each round, the robot entries will be grouped in group size of 2 or 3 to race together to run on different tracks in the same time. In each round, the running times of all robots will be tabulated and compared for the fastest ones. The first N fastest robots will advance to the

next round. The number N will be determined on the competition day based on the number of entries.

4.6   Between each round, the handlers of the robots are given 5 minutes to service the robot. Changing of battery is allowed. Change of robot program is strictly prohibited.

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 and the handlers will be notified by the judges if their robot has been identified as a clone.

5.2   The decision of the Judges will be final when implementing the rules of the humanoid robot competition.

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Frequently Ask Questions

Q1: What happens if the humanoid falls during the walk? Will it warrant a restart from start line or start from there with a penalty?

Ans: The race will continue without restart or penalty. If the robot is bale to recover by itself and reach the finish line, the race time is still valid. If it is not able to reach the finish line, the race time will be 10 minutes.

Q2: Will the waypoints co-ordinates be known before or after caging?

Ans: It will be made known after caging.

Q3: Can we align the robot with the reflective tape at the start point ?

Ans: Yes.

Q4: Will the background of the floor of the event location be conditioned to make the white tape easy to detect?

Ans: There will no guarantee on that.

Q5: Will the lighting condition be controlled to allow easy detection of the orange beacon?

Ans: There will no guarantee on that. The race will be based on the lighting condition of the actual competition venue.

Q6: Will reset be allowed?

Ans: No reset is allowed during the race. If the robot malfunctions, the race time will be maximum time of 10 min.

Q7: Does the robot have to follow the guide tape closely?

Ans: No, the robot does not have to follow the guide tape exactly. The race is successfully done once the robot touches all the waypoint in order.

Q8: As the robot is allowed to "fall" down and recover. Can the robot use "falling and recover" mode of moving to the waypoints?

Ans: No, the robot should not deliberately use "fall" and "recover" to complete the race. The judges will have the final decision on this matter.

Q9: Does the robot have to stop after reaching the finish line?

Ans: No, the robot does not have to stop by itself. The handler may remove the robot after it reaches the finish line.