HuroCup Laws of the Game

Sprint (Pro/U19)

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Abstract

The following rules and regulations govern the game of the Robot Sprint event in HuroCup, a robotic game and robotics benchmark problem for humanoid robots.

Latest Version of the Rules for HuroCup

The latest official version of the rules of the game for HuroCup is always available from the [HuroCup Facebook Page](#).
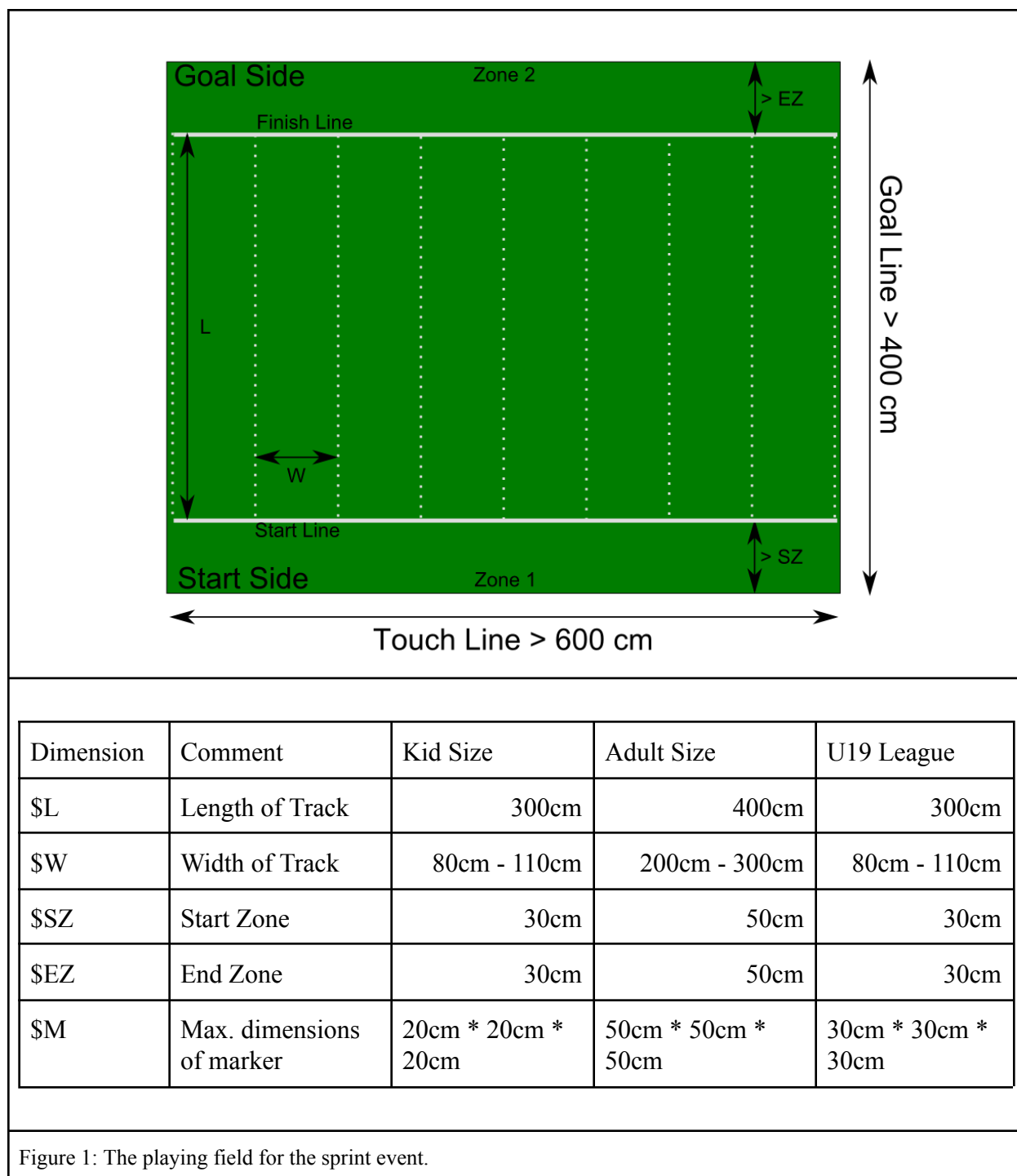
Changes to the Rules of HuroCup Sprint

For Junior league, requirement to walk backwards across the finish line that indicates the end of the forward segment is added. Please refer to [SP-6.4](#).

HuroCup Sprint - Rules of the Game

The robot sprint challenge is a sprint event for humanoid robots. The goal is for the robots to move as quickly as possible from a start line to the end line for a series of segments. Laws of the Game: Sprint The following laws describe the specifics of the robot sprint event. For general specifications relevant to all HuroCup events (e.g., robot dimensions, playing field and lighting, responsibility of the referees) please refer to [General - HuroCup Laws of the Game](#).

[SP-1]: Field of Play

[SP-1.1]: The dimensions of the playing field are at least 600 cm by 400 cm. A figure of the playing field is shown in [Figure 1](#).

Dimension	Comment	Kid Size	Adult Size	U19 League
$L	Length of Track	300cm	400cm	300cm
$W	Width of Track	80cm - 110cm	200cm - 300cm	80cm - 110cm
$SZ	Start Zone	30cm	50cm	30cm
$EZ	End Zone	30cm	50cm	30cm
$M	Max. dimensions of marker	20cm * 20cm * 20cm	50cm * 50cm * 50cm	30cm * 30cm * 30cm

Figure 1: The playing field for the sprint event.

[SP-1.2]: The length of the lanes is $L.

[SP-1.3]: The width of the lanes is $W.

[SP-1.4]: The playing field consists of a several lanes that run the length of the playing field. The lane markings may not be visually distinct enough so that they can be identified through a robot's sensors or they may just be given explicitly as guidelines for the referees. A robot should not rely on being able to detect the lane markings consistently and must be able to remain in its lane even in the absence of lane markers.

[SP-1.5]: The size of the start zone is at least $SZ and the size of the end zone is at least $EZ.

[SP-1.6]: Teams may placed visual markers into the end zone of their lane as long as they make all reasonable attempts to not interfere with other robots. The maximum size of the markers is given by $M.

[SP-2]: Number of Players

[SP-2.1]: A single robot from each team competes in the sprint event.

[SP-3]: The Players

[SP-3.1]: Please refer to [HuroCup - General Laws of the Game](#) for details about the players.

[SP-4]: The Referee

[SP-4.1]: Please refer to [HuroCup - General Laws of the Game](#) for details about the referee and his or her duties.

[SP-5]: The Assistant Referee

[SP-5.1]: Please refer to [HuroCup - General Laws of the Game](#) for details about the assistant referee and his or her duties.

[SP-6]: Game Play

[SP-6.1]: At the beginning of the competition, all robots must be completely behind the start line (i.e., in Zone 1) of their respective categories, in the middle of their assigned track, and face

straight forward.

[SP-6.2]: The referee will signal the start of the competition by blowing the whistle. After the referee blows the whistle, the robots is allowed to start and walk forwards towards the end of segment 1 (i.e., Zone 2).

[SP-6.3]: The finish plane is the plane which intersects the playing field at a 90-degree angle at the back of the finish line. A robot has completely crossed the end line of one segment with both feet, that is when both feet of the robot crossed the finish plane and touch the ground in the respective end zone.

[SP-6.4]: After the robot has crossed the finish line of the first segment (i.e., the robot has reached Zone 2), the robot must walk backwards towards the end line for segment 2 (i.e., Zone 1). A robot is walking backwards if the difference of the robot's current orientation to its orientation when positioned at the start line is at most 90 degrees in either direction. Junior league robots only require to finish the forward segment and then walk backwards across the line to indicates the end of the forward segment.

[SP-6.5]: Each robot may have at most one human handler associated with it.

[SP-6.6]: The human handlers are not allowed to interfere in any way with other robots, the referee, or other human handlers.

[SP-6.7]: A human handler may only enter the playing field or touch his/her robot with the permission of the referee.

[SP-6.8]: The handler shall remove his/her assigned robot as soon as possible from the respective end zone after it has crossed the finish line.

[SP-6.9]: Any robot that either leaves the playing field or breaks down may be picked up by its handler and moved back behind the start line. This is subject to laws RS-6.6 and RS-6.7.

[SP-6.10]: The end of the competition is signaled by the referee by blowing the whistle a second time. The referee terminates the competition if
1. the maximum duration of the competition (3 minutes) has elapsed,
2. all robots have crossed the finish line of the backward segment (Junior league robots only require to finish the forward segment and then walk backwards across the line to indicates the end of the forward segment), and
3. no more active robots remain in the competition.

[SP-7]: Fouls and Misconduct

[SP-7.1]: Before the start of the race or before restarting after a foul, the robot must be placed in the centre of its assigned track facing straight forward.

[SP-7.2]: A robot is not allowed to leave its assigned running track.

[SP-7.3]: A robot is not allowed to interfere with any other robot in any way.

[SP-7.4]: A robot that commits any fouls or misconducts as described in SP-7 must restart behind the start line as described in SP-7.1.

[SP-7.5]: The referee may use other penalties described in HuroCup - General Laws of the Game where appropriate.

[SP-8]: Method of Scoring

[SP-8.1]: Robots are awarded points based on the last segment that the robot completed successfully as well as the order in which they crossed the end line of the last segment.

[SP-8.2]: The minimum performance criteria for the sprint is to cross the finish line of the first segment. So all robots that have not crossed the finish line of at least the first segment are automatically awarded no rank and 0 points.

[SP-8.3]: Among the robots that have crossed the finish line of the at least the first segment, the robots are ranked (i.e., 1st place, 2nd place) based on the maximum segment number that the robot completed successfully.

[SP-8.4]: In case robots have the same maximum segment number, they are ranked based on the faster time to complete that segment. For more details about the point allocation, please refer to Point Allocation [Organization - HuroCup Laws of the Game].

[SP-9]: Tiebreaker

[SP-9.1]: In case two or more robots have the same number of points after all rounds of the sprint

event, the maximum segment number will be used as tiebreaker. If two robots are tied even after comparing the maximum segment number, then the total time is used as a tiebreaker.

[SP-10]: Sprint Final

The winner of the overall Sprint event over multiple rounds will be decided by a single elimination round only open to the top four placed robots after all rounds in the sprint event. The semi finals will be R1 vs R4 followed by R2 vs R3. The final race will then determine the winner of the sprint race. There is at least a 10 minute break between the last semi final and the final race.

World Records

This section contains the list of official world records for the HuroCup Robot Sprint competiton first introduced in the 2002 FIRA World Cup competiton.

Kid Size

Date	Event	Team	Affiliation	Time
15th August, 2019	FIRA RoboWorld Cup, Changwon, China	Ichiro 2	Institut Teknologi Sepuluh Nopember Surabaya, Indonesia	00:18.0 sec.
18th Dec. 2016	FIRA World Cup, Beijing, China	Ichiro 1	Institut Teknologi Sepuluh Nopember Surabaya, Indonesia	00:21.18 sec.
25th Aug. 2012	World Cup, Bristol, U.K.	Red Atom	Nanyang Polytechnic, Singapore	00:29.02 sec.
30th Aug. 2011	World Cup, Kaohsiung, Taiwan	Team Plymouth	University of Plymouth, U.K.	00:42.00 sec.
20th Aug. 2009	World Cup, Incheon, South Korea	H.I.T.	Harbin Institute of Technology	01:07.50 sec.
23rd July 2008	World Cup, Qingdao, China	aiRobot	National Cheng Kung University, Tainan, Taiwan	00:20.00 sec.
16th June 2007	World Cup, San Francisco, U.S.A.	Pie	Tamkung University, Taipei, Taiwan	00:24.00 sec.
July 2006	World Cup	Manus	National	00:25.00 sec.

			University of Singapore	
July 2004	World Cup	Manus	National University of Singapore	00:27.00 sec.
July 2003	World Cup, Vienna, Austria	Manus	National University of Singapore	01:05.00 sec.

Note: In 2002, robots just had to walk forward. In 2004, the backward leg was added. In 2009, the distance was increased to 3m.

Adult Size

Date	Event	Team	Affiliation	Time
15th August, 2019	FIRA RoboWorld Cup, Changwon, China	Ichiro Adult Sized	Institut Teknologi Sepuluh Nopember Surabaya, Indonesia	00:29.1 sec.
25th Aug. 2012	FIRA World Cup, Bristol, U.K.	Evo Rocky	Nanyang Polytechnic, Singapore	00:56.03 sec.