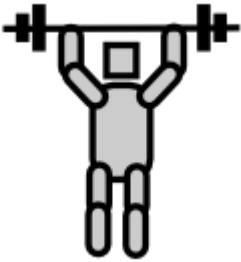


# Weightlifting - HuroCup Laws of the Game

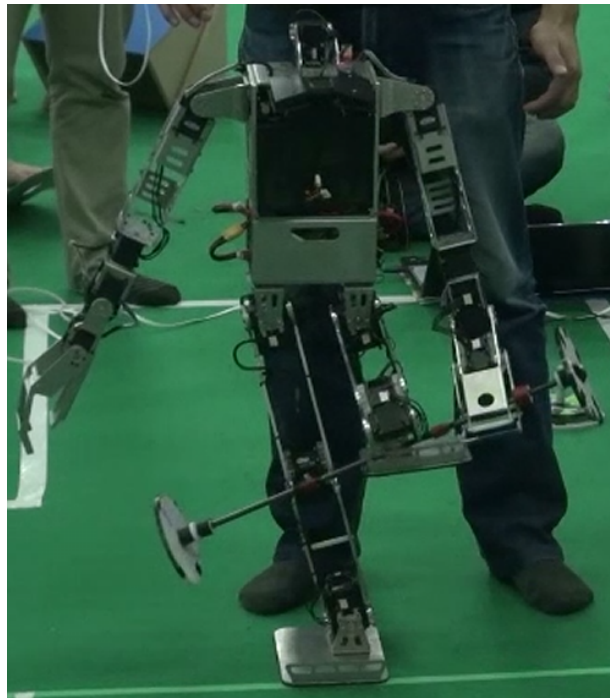
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## HuroCup Laws of the Game Weightlifting

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### *Abstract*

*The following rules and regulations govern the weightlifting event of 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 Weightlifting rules of HuroCup

There are no significant changes to the laws of the game for weightlifting in the 2015 competition.

## Weightlifting

The goal of the weightlifting competition is to encourage research in actively balancing robots and robots that are able to walk under a heavy load and are able to compensate for varying centres of gravity.

### HuroCup Weightlifting - Laws of the Game

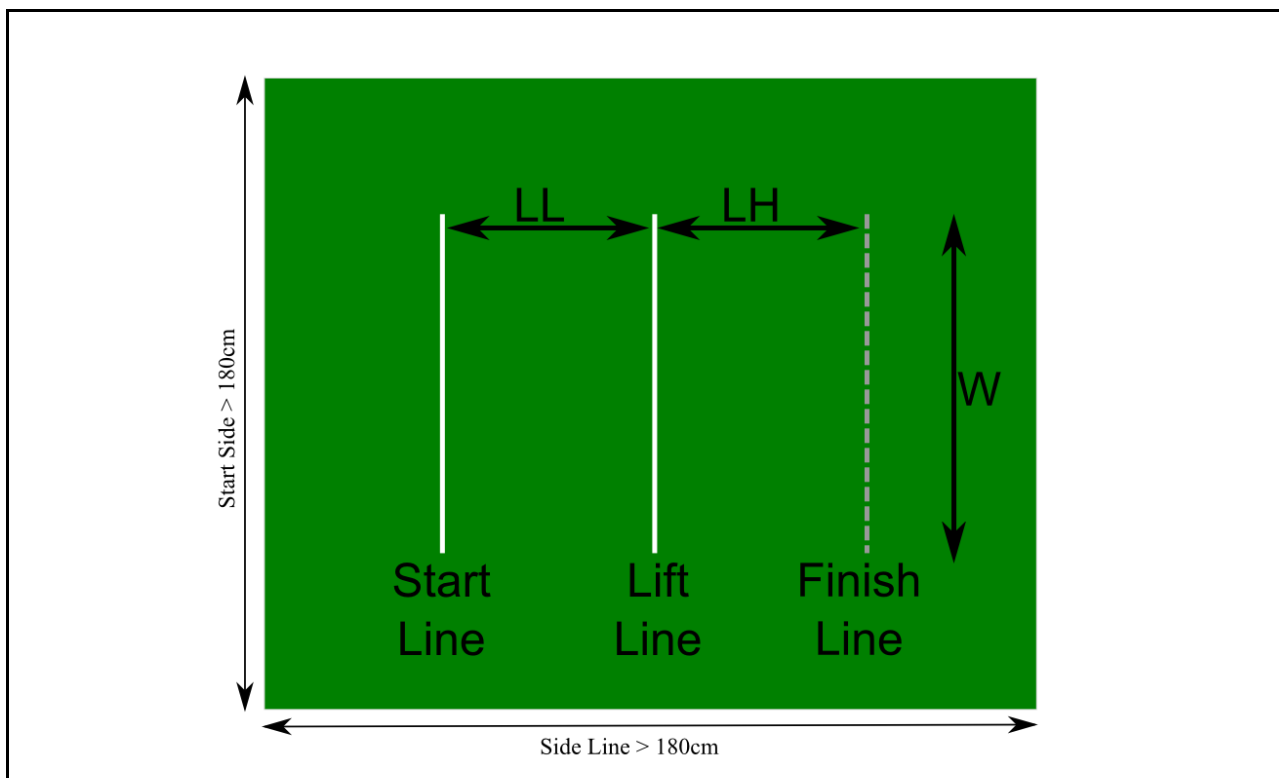
The following laws describe the specifics of the weightlifting event. For general specifications relevant to all HuroCup events (e.g., robot dimensions, playing field and lighting, responsibility of the referees) please refer to [General - HuroCup Laws of the Game](#).

#### [WL-1]: Field of Play

[WL-1.1]: The weightlifting competition is played on a field with a minimum dimension of 1.8m by 1.8m. See Figure [Weightlifting Field](#).

[WL-1.2]: The field is marked with three lines: (a) the start line, (b) the lift line, and (c) the finish line. The distance between the start line and the lift line is \$LL\$, the distance between the lift line and the finish line is \$LH\$.

[WL-1.3]: The width of all lines is \$L\$.



Dimension	Comment	Kid Size	Adult Size	HuroCup Junior
\$LL	Distance between start and	50cm	100cm	50cm

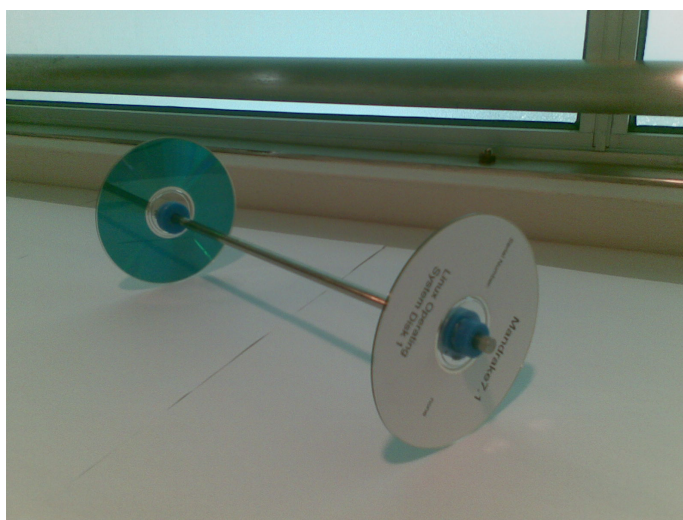
	lift line			
\$LH	Distance between lift and finish line	50cm	100cm	50cm
\$W	Width of the field lines	50cm	100cm	50cm
\$L	Width of the start and lift line	3cm - 7cm	3cm - 7cm	3cm - 7cm
\$H	Minimum difference in low and high lift height	15cm	45cm	15cm

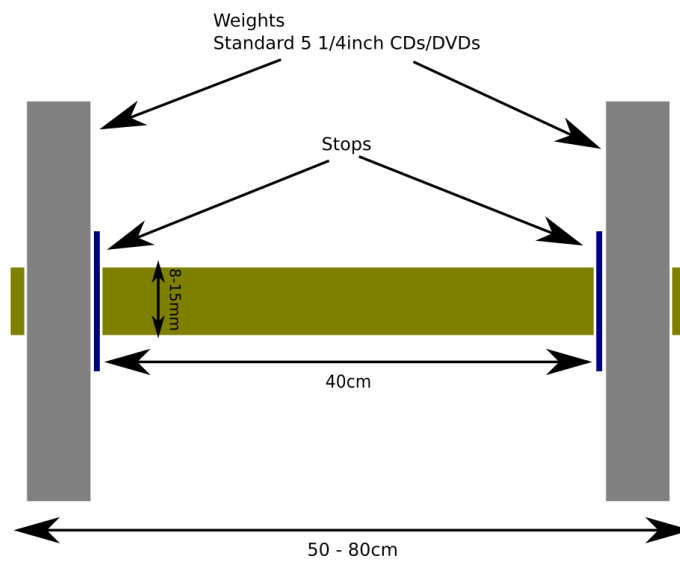
*Weightlifting Field*

**[WL-2]: The Lifting Bar and the Weights**

[WL-2.1]: The lifting bar is a wooden, metal, or plastic bar with a width between 8 mm to 15mm. Two stops are used to mount the weights. The distance between the inner stops is at least 40cm. The total length of the lifting bar is between 50cm to 80cm.

[WL-2.2]: ] The ``weights" used in the competition are standard 5 1/4 inch CDs or DVDs that must be lifted by the robot as seen in Figure [Lifting Bar](#).





### *Lifting Bar*

*An example of a possible lifting bar and a schematic diagram showing the bar.*

## [WL-3]: **Number of Robots**

[WL-3.1]: A single robot competes in a match.

## [WL-4]: **The Players**

[WL-4.1]: Please refer to [Â General - HuroCup Laws of the GameÂ](#) for detailed information about the players.

## [WL-5]: **The Referee**

[WL-5.1]: Please refer to [Â General - HuroCup Laws of the GameÂ](#) for detailed information about the referee and his or her duties.

## [WL-6]: The Assistant Referee

[WL-6.1]: Please refer to [Â General - HuroCup Laws of the GameÂ](#) for detailed information about the assistant referee and his or her duties.

## [WL-7]: Game Play

[WL-7.1]: A single robot is designated the lifter. All other robots must be outside of the playing field.

[WL-7.2]: The only robot allowed to move during a run is the designated lifter.

[WL-7.3]: The lifter will be placed behind the start line.

[WL-7.4]: At the beginning of the try, the team will inform the referee how many CDs the team wants to attempt to lift and the referee will attach the desired weight to the lifting bar.

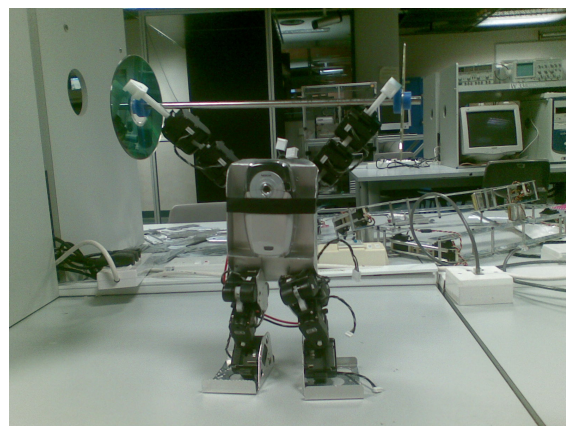
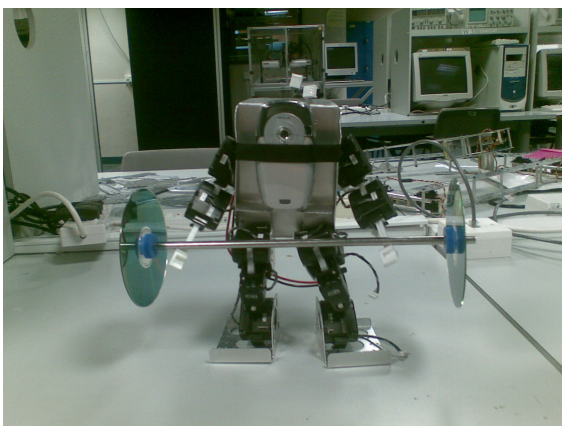
[WL-7.5]: The referee will signal the start of the competition by blowing the whistle.

[WL-7.6]: After the referee gives the start signal, the robot must pick up the lifting bar positioned at the start line.

[WL-7.7]: The robot must walk towards the lifting line while continuously carrying the weight below head height until a foot touches the lifting line.

[WL-7.8]: While at least one foot is touching the lifting line, the robot must lift the lifting bar above its head. The height difference between the low and high position must be at least \$H.

[WL-7.9]: While keeping the lifting bar above its head, the robot must continue to walk towards the finish line. A lift is considered successful if the robot crosses the finish line with both feet and with the weight above its head.



*Low and High Lifting Positions*

[WL-7.10]: A robot is not allowed to leave the playing field.

[WL-7.11]: Each robot may have at most one human handler associated with it.

[WL-7.12]: The human handlers are not allowed to interfere in any way with other robots, the referee, or other human handlers.

[WL-7.13]: A human handler may only enter the playing field or touch his/her robot with the permission of the referee.

[WL-7.14]: 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 robot has successfully crossed the finish line,
2. the robot was unable to complete the try within 2 minutes,
3. the robot falls and is unable to get up on its own or is immobilized by a technical defect,
4. the robot leaves the playing area by completely crossing the start line or the implicit side lines of the rectangle formed by the start and finish line.

[WL-7.15]: A robot may continue in the competition as long as it has failed less than three tries. When the robot will be declared the lifter in the next round, then the team may choose a new weight for the next try.

[WL-7.16]: At the end of the try, another robot will be designated the lifter.

## **[WL-8]: Fouls and Misconduct**

[WL-8.1]: The lifting bar is below the head of the robot while it traverses the zone between the lift line and the finish line.

[WL-8.2]: The robot handler touches the robot.

[WL-8.3]: Any infractions as listed by [General - HuroCup Laws of the Game](#) as far as they are applicable in this event.

[WL-8.4]: Any team that commits one of the infractions listed in this section will be penalized by having the try declared invalid.

## **[WL-9]: Method of Scoring**

[WL-9.1]: All robots that have not lifted successfully at least 0 CDs are automatically awarded no rank and 0 points.

[WL-9.2]: Among the robots that have lifted more than 0 CDs, the robots are ranked (i.e., 1st place, 2nd place) based on the maximum weight lifted successfully.

[WL-9.3]: For more details about the point allocation, please refer to [Point Allocation \[Organization - HuroCup Laws of the Game\]](#).

## **[WL-10]: Tiebreaker**

[WL-10.1]: In case two or more robots have the same number of points after all rounds in the weightlifting event, the sum of the maximum weight in all rounds will be used as tiebreaker.

[WL-10.2]: In case two or more robots have the same number of points after all rounds and are still tied after applying the previous tiebreaker, the maximum weight in a single round will be used as a tiebreaker.

## Official World Records

This section contains the list of official world records for the HuroCup Robot weightlifting competition first introduced in the 2007 WorldCup competition.

### Kid Size

Date	Event	Team	Affiliation	Weight
17th Sept. 2011	WorldCup 2011, Kaohsiung, Taiwan	Beyond	Nanyang Polytechnic, Singapore	80 Disks
23rd July 2008	WorldCup 2008, Qingdao, China	aiRobot	NCKU, Taiwan	70 Disks
20th June 2008	EuroBy 2008, Linz, Austria	Pie	TKU, Taiwan	46 Disks
16th June 2007	WorldCup 2007, San Francisco, U.S.A.	Pie	TKU, Taiwan	45 Disks

### Adult Size

Date	Event	Team	Affiliation	Weight
27th August 2012	World Cup 2012, Bristol, U.K.	Evo Rocky	Nanyang Polytechnic Singapore	64 Disks

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