

RoboCup Soccer Simulation 3D League

Rules for the 2016 Competition in Leipzig, Germany (June 30th - July 4th)

Rules Based on RoboCup 2015 – Hefei, Competition Rules

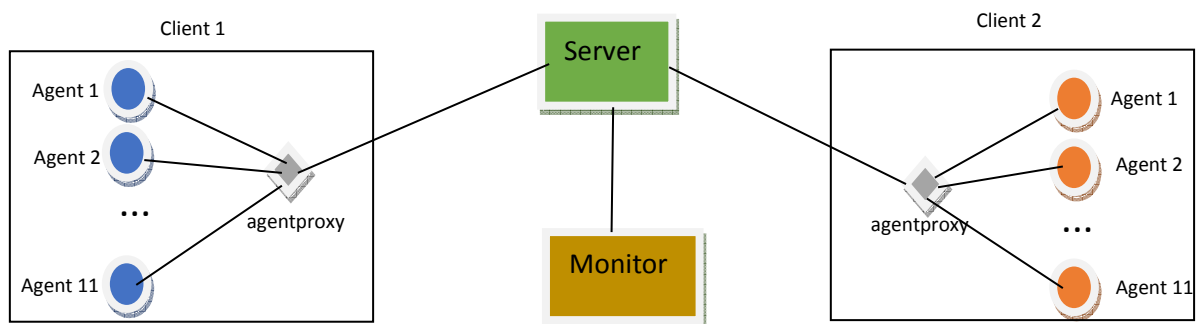
1 Organizing Committee

This document describes the rules that will be used at the RoboCup 2016 3D Simulation League. The goal is to provide for fair games and smooth execution of the competitions. The Organizing Committee (OC) has the right to append or change these rules at any time within reasonable bounds. All teams will be notified of these changes as soon as possible. Teams can appeal to these changes or to the rules in general, however the final binding decision will be made by the OC. The organizing committee for RoboCup 2016 simulation 3D league is composed by Klaus Dorer (Klaus.dorer@hs-offenburg.de) – Chair, and Stefan Glaser (stefan.glaser@hs-offenburg.de).

2 Competitions and Schedule

2.1 Server and Server Changes

The competition will use Simspark 0.2.4 + Rcserver3D 0.6.11 and Ubuntu 14.04 64 Bits. Oracle Java 8 Runtime (<http://www.webupd8.org/2012/09/install-oracle-java-8-in-ubuntu-via-ppa.html>) will be available for clients. Clients have to work with agentproxy 2.1 available at: <https://github.com/magmaOffenburg/magmaProxy> to connect to the server. The following figure shows how the software and hardware of competition environment is used. There are two client computers – one for each team – named client1 and client2; one server computer; and one monitor computer (roboviz). All teams are strongly encouraged to test their code using a similar environment to avoid be penalized during competitions due to faulty agents. The OC will not install any additional libraries. So teams MUST manage to build their binaries including static links to all libraries they need.



Changes 2016

- Major change will be the application of a new foul model that has been announced since years and will now be finally used. Details of the foul model are described in document: <http://www.acso.uneb.br/bahiart/uploads/Main/FoulModel2016.pdf>

- All kicks (kickoffs, kick-ins, corner kicks, goal kicks, and free kicks) no longer allow for the ball to be touched a second time in a row by the same player who took the kick. Note that goal kicks don't officially count as having been taken until the ball leaves the goal box penalty area. The penalty for double touching the ball is an indirect free kick awarded to the opposing team just like in human soccer.
- Kickoffs, kick-ins, and free kicks are all indirect. In human soccer thrown-ins are indirect while kickoffs are direct, however we need to keep kickoffs indirect as otherwise the league could degenerate into a kickoff shooting contest. Free kicks are changed to be indirect so as to use them as an awarded penalty for double touching the ball on kicks. Note that goal kicks and corner kicks are still direct as they are in human soccer.
- The penalty for scoring on an indirect kick is a goal kick for the other team, and the penalty for scoring an own goal on an indirect kick is a corner kick for the other team. These are the same rules as human soccer.
- Just as in human soccer, an own goal can no longer be scored on a goal kick with the result of such an own goal being a corner kick awarded to the other team (same as in human soccer).
- When the ball is placed for a kick it's been an occasional problem that the ball is put right underneath an agent of the team taking the kick. This results in an unfortunate event where the agent taking the kick immediately touches the ball and loses the kick. To avoid this, players from the team taking a kick are repelled away from the ball when it is placed for a kick if they are right next to the spot that the ball is being placed. The distance a player is repelled back from the ball when it is placed for a kick is a variable added to naosoccersim.rb called KickRepelDist (currently set to 0.5 meters). Players within KickRepelDist of the ball when it is placed for a kick are moved back to a position exactly KickRepelDist from the ball. This is done for all kicks except kickoffs (players know that a kickoff is coming and can beam to where they want to be beforehand).
- Penalty time reduced from 60 to 40 seconds.

Changes from 2015

- added new rule requiring that the ball must either touch an opponent, or touch a teammate outside the center circle, before a team taking a kickoff can score;
- penalty shootout kickoffs may be direct now, but it is not mandatory;
- added noise to the beam effector with the amount of noise added controlled by the 'BeamNoiseXY' (in meters) and 'BeamNoiseAngle' (in degrees) values in naosoccersim.rb;
- added new training command parser commands for setting the game time and score;
- added penalty shootout mode where a goal is awarded to the left team (penalty kicker) if the right team's player (penalty goalie) leaves the penalty area.

Teams should refer to the complete information available at <http://sourceforge.net/projects/simspark/files/rcssserver3d> for the latest version changes and other information.

2.2 Competition Format and Challenges

General Format and Schedule

The competition will include 4 rounds (seeding round, first, second and third round) followed by semifinals and finals. Teams not qualified in any round will play additional matches for full ranking. It will also include 3 challenges: Free/Scientific Challenge; Keepaway challenge and a Gazebo Challenge. The tentative format and schedule is the following:

Tuesday: June 28 th	Team set-up
Wednesday: June 29 th	Team set-up Team Leaders Meeting (TLM) and Group Drawing (2pm-3pm)
Thursday: June 30 th	Seeding Round – (9am) <i>(code upload deadline[Cud]: 8.30am)</i> TLM, TC Election and League Discussion (4pm-5:30 pm) Free/Scientific Challenge (6pm-7.30pm)
Friday: July 1 st	First Round – (9am) <i>(Cud: 8.30am)</i> Keepaway Challenge (4pm-6pm) <i>(Cud: 3.30pm)</i> Team Leaders Meeting (TLM) (6pm-7pm)
Saturday: July 2 nd	Second Round – (9am) <i>(Cud: 8.30am)</i> Third Round (3:00pm-4:30pm) <i>(Cud: 2:30pm)</i> 9 th to 15 th places round(4:30-7:00pm) <i>(Cud: 4:00pm)</i> Gazebo Challenge (5:00pm-7:30pm) <i>(Cud: 4:30pm)</i>
Sunday: July 3 rd	Semi Finals (9am-9:15am) <i>(Cud:08:30am)</i> 5 th to 8 th places matches (9:30am-10:00am) <i>(Cud: 8:30am)</i> 3 rd place match (10:30am-10:45am) <i>(Cud: 10:15am)</i> Finals (11:00am) <i>(Cud: 10:15am) (Finals time subject to other league finals)</i>

Qualifying Rounds

For the seeding round and first round the teams will be split between two groups of equal or approximate size. For the second round two groups of 5 teams will be played. After the second round, all teams not qualified for third round will play a 9th to 15th places round. In third round, two groups of 4 teams will run a round robin and the 2 best teams from each group will qualify to semifinals. Each team in each group plays each other team of the group once in each round robin. In each round, placing will be determined in the following order:

- Points gathered. A win gives 3 points, a tie 1 point and a loss 0 point.

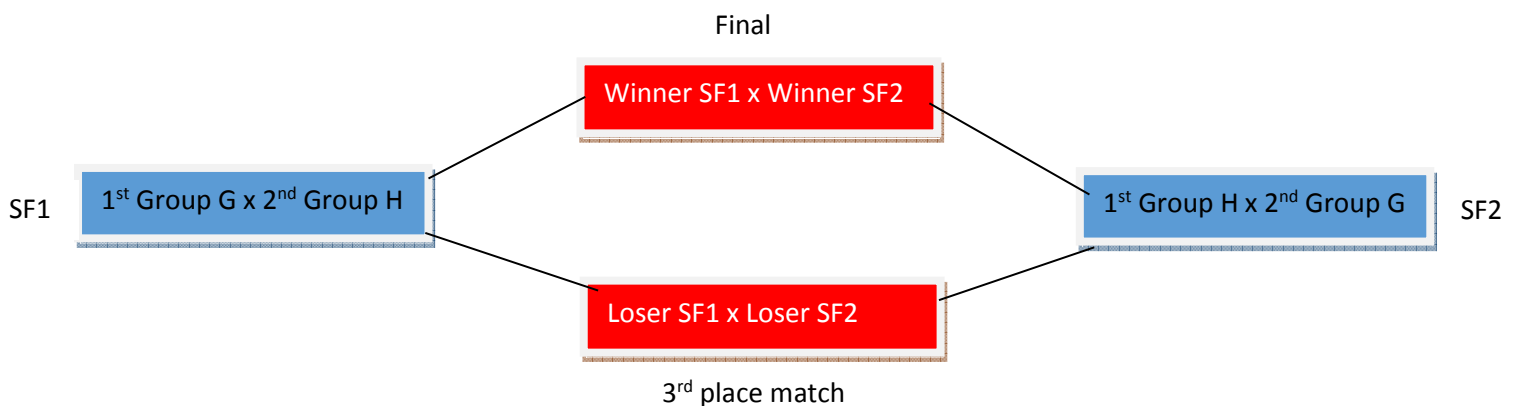
- Goal difference (goals scored minus goals conceded) in this round.
- Goals scored in this round.
- Head to head game of this round.
- Two extra halves of 3 minutes each (only in cases where it matters for advancing to the next round or define the ranking in the 9th to 12th places round)
- Penalty shoot-outs (for 2-team ties only)
- Coin toss

Semi Finals and Finals

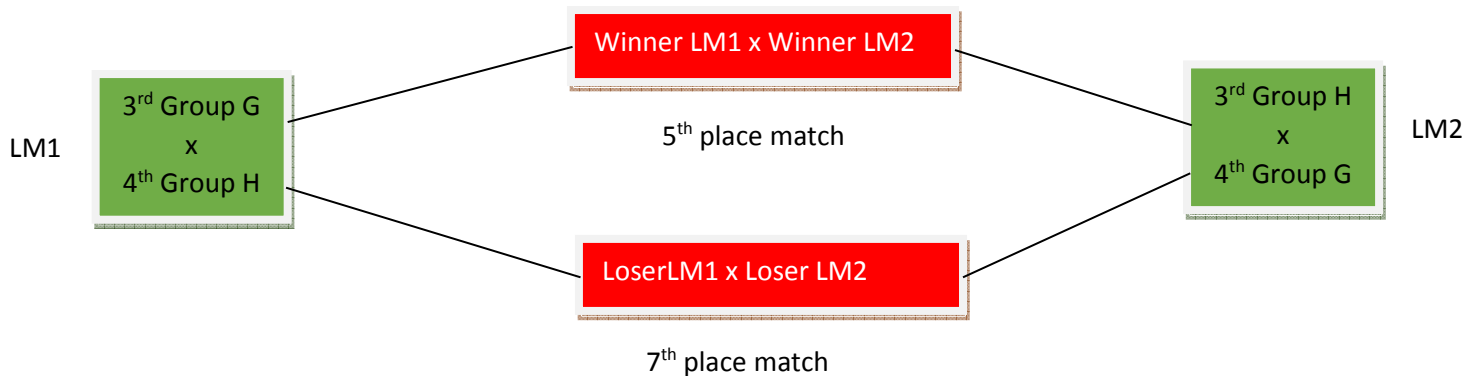
After the third round, a knock-out system is used. The first of each of the groups in round three plays the second of the other group. The winners of these matches will play against each other in the final. The losers will play a match to decide who wins the third prize. The losers of round three will play a Loser's Bracket to rank 5th to 8th place. If a knock-out game ends in a tie, two extra halves are played. If these end in a tie as well, a penalty shootout determines the winner. In the knock-out matches, the winner will be determined in the following order:

- Number of goals scored in the game
- Two extra halves of 3 minutes each
- Penalty shoot-out
- Coin toss

Winners' Bracket



Losers' Bracket



Gazebo Challenge

In order to support the efforts of evaluating the possibility to switch to a gazebo based simulator, this year we have a competition run in the new gazebo simulator. The number of players per team and other details for this challenge will be chosen depending on the state and speed of the new simulator. A first version of the gazebo based simulator is available at <https://bitbucket.org/osrf/robocup3ds>.

The goals and advantages of this challenge are:

- more support and interaction from our community for the developers of the simulator
- participation is voluntary, so teams that do not feel confident to prepare it, do not have to
- participating teams have the advantage that they get points for the technical challenge trophy
- participating teams also have the advantage that they are one year ahead of non participating teams if we finally decide to switch
- for all it has the advantage that we can decide if we want to switch on a much more solid base.

The competition format will be decided once the number of teams participating is known. It will probably be a tournament with one group if the number of teams is five or less.

Scientific/Free Challenge

The Simulation 3D scientific/free challenge is a presentation/demonstration competition that intends to encourage scientific work development and sharing in the context of the Simulation 3D league, allowing the teams to present interesting research work developed using Simspark and RCSSServer3D simulation platform. Each team will be given five minutes to present and demonstrate an interesting research topic of their team. Teams should deliver to the simulation technical committee a short, one page description of their intended presentation prior to the competitions (deadline: June 30, 1pm) in order to be distributed to all other teams and the jury during the competition. Presentations must be focused on only one significant research topic of the team and should not describe the whole team like in a TDP. Presentations, besides describing the scientific issue, must also show a demonstration using

the RCSSServer3D simulator. Demos should show real-time execution of the simulator, however they may also include pre-recorded videos and demonstrations of other related software tools. The winner is found by a voting process.

We are still looking for a responsible person for running the scientific/free challenge. Detailed Information about the scientific/free Challenge may be found at: https://dl.dropboxusercontent.com/u/1132618/FreeChallenge_3D_2015.pdf

Keepaway Challenge

The keepaway challenge replaces last years kick accuracy challenge and aims for improvements in team play and passing.

Requirements

The start player script of a participating team has to start three players that keep away the ball from an opponent for as long as possible.

Evaluation

The score of the team is evaluated as the number of seconds the team is able to keep away the ball from the opponent. The game ends if

1. the opponent touches the ball
2. the ball leaves the playable area

The time starts at kickoff for the taking team. The playable field will shrink over time to increase the difficulty and force an end even for good teams.

You can get the current version of the Challenge Tool and see more information at: <https://github.com/magmaOffenburg/magmaChallenge>

Klaus Dorer (klaus.dorer@hs-offenburg.de) is the responsible for running the keepaway challenge.

Challenge Trophy Rules

A trophy will be awarded for the team with the highest combined score on the three challenges. The combined score will be calculated by the following rules:

- Each participating team in a challenge is given a score between 5 and 25 with the winner of a challenge receiving 25 points and the last place team in a challenge receiving 5 points.
- Teams not finishing first or last in a challenge receive a score based on a linear equation of their finishing spot in the challenge. $\text{score} = (\text{number_of_participants} - \text{rank}) / (\text{number_of_participants} - 1) * 20 + 5$. Example: If there are five teams participating in a challenge then 1st place = 25, 2nd = 20, 3rd = 15, 4th = 10, 5th = 5.
- Teams not participating in a challenge receive 0 points for that challenge.

The overall winner of the challenges is the team with the highest total sum of points earned across all the challenges.

General Rules

- **Match Preparation and Format**

1. Set-up: The OC will supply upload instructions at the first day, which teams must use and follow to be able to run their agents. Teams will be given the opportunity to upload and test their agents on the competition system before the start of each round. When a round is started, it will no longer be possible to upload or make changes to the agents, until all matches of that round have been played.

2. Start/end: The matches will be started automatically by a competition managing system. Teams are required to provide scripts named `start.sh` and `kill.sh` for running and terminating their team. All players of a team must be running in less than 15 seconds when `start.sh` is executed. Additionally, each team must provide scripts named `start_penalty_kicker.sh` and `start_penalty_goalie.sh` to run their penalty kicker and goalie respectively. The IP address that the agents should connect to is given as the first parameter to the start scripts. Examples of start and kill scripts can be found on the SSL wiki.

3. Team format: A match is played by two teams of 11 players. A match may not start if either team consists of less players. Each match consists of two halves of five minutes each. After the first half the teams switch sides. Each player can select any available agent models, possibly forming a heterogeneous team. The details of the available models were previously announced. The possible team composition is described in the heterogeneous player section of this document.

4. Representation: For a match, each team has the chance to appoint a single team member as the team's representative. This representative should announce himself to the referee before the start of the match, otherwise it is assumed that the team has none for this match. During the match, only the team's representative can approach the referee.

5. Forfeiting rule: We define forfeiting as refusing to make a good faith effort to participate in a scheduled game. A team that forfeits is disqualified from the competition. In round-robins, when a team forfeits all the scores will be 3x0 against this team. In a knock-out round the teams who forfeits will be replaced by the next team in the rank from previous round.

6. Faulty agents: When a match has started and an agent shows clearly unnatural behavior or gets disconnected, the following rules apply:

- If this occurs in the first 30 seconds of the match, the match will be restarted up to 2 times. In the case of unnatural behavior, the team's representative is responsible of notifying the referee, who will make the binding decision whether to restart the game on his own discretion.

- If the problem persists after restarts, the team's representative can ask the referee for a 2 minute time-out to fix the problem. A fix may include the use of a binary from a previous round.
- If the problem still persists after the time-out, or if it occurs after the first 30 seconds of the match the game will continue. If due to the problem the team ends up with less than the minimum amount of players, the match will result in a win by the average score against this team but at least 1:0.

- **Heterogeneous Players**

Each team has to use a minimum of 3 different player types and no more than 7 players from one player type. If only 3 different player types are used then a minimum of 2 players for each type must be used. The standard player type is counted identically to heterogeneous player types. Possible configurations for the different player types are: (7-2-2), (7-1-1-1-1), (4-4-3), (3-3-3-2), (3-2-2-2-2), etc. If teams do not comply with this rule, the server will not allow the faulty player to connect (that is either the 8th player of a given player type or the first player that does not allow the '3 player types' rule to be fulfilled). The heterogeneous types that were used last year will also be used during this year's competition.

- **Game Play**

1. Kickoff: Goals scored directly from the kickoff are not accepted. Also, the agent performing the kick-off may not touch the ball again until it was touched by another player. In case of infringement, a kick-off is awarded to the opposing team. A goal can be scored after a kickoff only if a second player from the team performing kickoff touches the ball outside the main circle or if an opponent touches the ball.

2. Goalkeeper: The player with uniform number 1, and only this player, will be designated as the goalkeeper.

3. Handling the ball: Handling the ball involves a deliberate act of a player making contact with the ball with his hand or arm, as decided by the referee on his own discretion. Handling the ball is penalized with a free kick to the opposing team. The goalkeeper cannot be guilty of a handling offense when his hands are within his own penalty area.

4. Obstructing the ball: Obstructing the ball involves use of a player's body, arms or legs to prevent progress of the game, which includes covering the ball, carrying the ball, holding the ball between arms or legs and lying in front of the goal in an attacking situation. Deliberately obstructing the ball, as judged by the referee, for longer than 10 seconds is penalized with a free kick to the opposing team. Unintentional obstruction of the ball for longer than 10 seconds is ended by a drop ball by the referee.

5. Illegal defense: At any time during the match, no more than 3 players of a team may be inside of their own penalty area. If a 4th player enters the penalty area, it will be placed outside of the field. When the last to enter is the goalkeeper, the player furthest away from the own

goal of the three that were already in the penalty area will be placed outside of the field instead.

6. Crowding the ball: Crowding of the ball when an opponent is near (within 0.8m of the ball) is illegal. If two players of one team are within a circle with radius 0.4 m of the ball, the furthest of these two is repositioned. If three players of one team are within a circle with radius 1 m of the ball, the furthest of these three is repositioned.

7. Immobility: Players that have been immobile or fail to stand up for too long will be repositioned. The goalkeeper will be repositioned after 30 seconds of immobility, or after failing to stand up for 60 seconds; other players will be repositioned after 15 seconds of immobility, or after failing to stand up for 30 seconds.

8. Penalty shoot-outs: During a penalty shoot-out, each team only has a single player in the field: the goalkeeper for the defending team and a striker for the attacking team. Each penalty shot starts with a kickoff. The attacking team gets 40 seconds to attempt to score. The goalkeeper of the defending team has to stay within his penalty area the whole of this time. If neglected, it will be considered as a goal for the attacking team. When penalty shots are used to decide a tied game, each team gets five penalty shots. If after five penalty shots the score is still equal, sudden death rounds of one kick each are used until one side scores and the other does not. If after ten penalty shots no winner is determined, a coin-toss is used to decide.

9. Colliding with other players: Players must avoid touching other players. If three or more players get in touch with each other, a player from the team with the most players in this situation, or a random player in case of an equal amount, will be re-positioned outside the field. The following collision events are considered fouls and can be rewarded with a free kick to the opposing team, if they result in tripping, obstructing, blocking, slowing down or forcing a change of direction of an opponent: running into an opponent from behind, and moving in the path of a faster moving opponent (illegal interception). Such fouls will now be called by the automated referee. Fouling players will be beamed outside the field as with other fouls. Details of what is considered a foul are described in:

<http://www.acso.uneb.br/bahiar/uploads/Main/FoulModel2016.pdf>

10. Output: Each player is permitted to generate output in files named stdout and stderr with the player number appended (e.g. stdout3 and stderr3 for player number 3). These write-only files will be located in their home directory under a log/subdirectory. Except these files, the home directory is read-only during the games, so agents should not try to open any other file for writing.

11. Fair play: Games should be played according to a fair and common-sense understanding of soccer and to restrictions imposed by the virtual simulated world of the 3D soccer simulator. Circumvention of these is considered violating the fair play commitment and is strictly forbidden during the tournament. Violation of the fair-play commitment includes, but is not limited to, for example:

- using another team's binary in your team
- jamming the simulator by sending excessive commands per client

- direct communication between players by using communication means other than those provided by the simulator, such as inter-process communication
- manipulating competition machines or restarting them intentionally

Any of these is strictly forbidden. Other strategies might be found violating the fair play commitment, after consultation with the OC. However, we expect it to be clear what a fair team should be like. In particular, the destructive disruption of opponent agent operation or the gain of advantage by other means than explicitly offered by the simulator counts as not fair play. If you are in doubt of using a certain method, please ask the OC before the tournament starts. If a team is found to use unfair programming methods during the tournament, it will be immediately disqualified.

- **Referee**

During each game a referee is appointed to enforce the rules laid out in this document. In situations that are not handled by the rules, the referee should decide based on his/her common sense. The referee can be a member of the OC or a volunteer, from a team other than the teams of the match, who has full knowledge of the rules as deemed by the OC. During a match only one representative of each playing team is allowed to approach the referee. Decisions of the referee are binding and cannot be appealed during a match. If there is any complaint about a game or a decision, this should be brought to the OC's attention as soon as possible, who will decide how to handle it after all games of the current round are finished. If the referee cannot decide in a situation, he can consult the OC who will give the final decision. Each team must supply a volunteer to be a referee, preferably the same as the team's representative.

- **Publication of Logs and Binaries**

The OC will make the logfiles of the matches available to the participating teams during the competition. After the competition, the OC will also publish these logfiles on the internet at their earliest convenience. The OC will also publish the binary, and additional files needed to run this binary, of each team after the competition. To do this, at the start of each round the home directory of the teams participating in that round will be archived. The team's last archive will be used for publication. If the home directory contains material that a team wishes not to be published and that is not needed to run the binary, it is the responsibility of the team to notify the OC of this. Note that teams that have used third party source code must follow that code's license regarding conveying the work. For instance, under GPL you are required to accompany your binary with the corresponding source, a written offer to supply the corresponding source, or information about where the source is offered to the general public. Failing to comply with any licensing will result in disqualification of the team from the current and/or future competitions.