

# RoboCup Soccer Simulation 3D League

*Rules for the 2018 Competition in Montreal, Canada (June 16<sup>th</sup> - June 22<sup>nd</sup>)*

*Rules Based on RoboCup 2015 to 2017 Competition Rules*

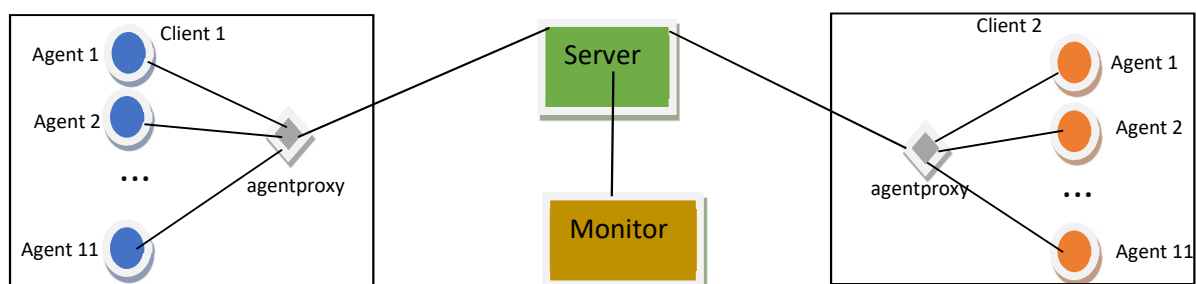
## 1 Organizing Committee

This document describes the rules that will be used at the RoboCup 2018 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 2018 simulation 3D league is composed by Nuno Lau ([nunolau@ua.pt](mailto:nunolau@ua.pt)), Luis Paulo Reis ([lpreis@fe.up.pt](mailto:lpreis@fe.up.pt)) and Marco Simões ([msimoes@uneb.br](mailto:msimoes@uneb.br)).

## 2 Competitions and Schedule

### 2.1 Server and Server Changes

The competition will use Simspark 0.3.0 + Rcserver3D 0.7.1 and Ubuntu 16.04 64 Bits. Oracle Java 8 Runtime will be available for clients. Clients have to work with agentproxy 2.1.3 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 being 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.



Teams should refer to the complete information available at <https://gitlab.com/robocup-sim> 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 2 challenges: Free/Scientific Challenge and Skills Challenge. The tentative format and schedule is the following:

June 16 <sup>th</sup> : Saturday	Team and Competition setup
June 17 <sup>th</sup> : Sunday	Team setup 02:00 pm - 03:00 pm Team Leaders Meeting (TLM) & Group Drawing
June 18 <sup>th</sup> : Monday	09:00 am - 12:00 am Seeding Round ( <i>code upload deadline[Cud]: 8.30am</i> ) 04:00 pm - 05:30 pm TLM, TC Election and League Discussion
June 19 <sup>th</sup> : Tuesday	09:00 am - 12:00 am First Round ( <i>Cud: 8.30am</i> ) 05:00 pm - 06:00 pm Free/Scientific Challenge 06:00 pm - 07:00pm Team Leaders Meeting,
June 20 <sup>th</sup> : Wednesday	09:00 am - 11:30 am Second Round ( <i>Cud: 8.30am</i> ) 03:00 pm - 05:30 pm Third Round ( <i>Cud: 2:30pm</i> ) 06:00 pm - 07:00 pm Skills Challenge ( <i>Cud: 5:45pm</i> )
June 21 <sup>st</sup> : Thursday	10:15 am - 10:30 am Semi Finals ( <i>Cud: 08:30am</i> ) 12:15 am - 12:30 am 3 <sup>rd</sup> place match ( <i>Cud: 12:00am</i> ) 12:30 am - 12:45 am Finals ( <i>Cud: 12:00am</i> ) ( <i>Finals time subject to other league finals</i> )

### Qualifying Rounds

For the seeding round and first round all teams will be included in a single group and play a round robin. For the second round, one group of 6 teams will play a round robin. In the third round, one group of 5 teams will play a round robin. Each team in each group plays with every other team of the group once. 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 games of this round.
- Two extra halves of 3 minutes each (only in cases where it matters for advancing to the next 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 plays with the fourth, for the first semi-final, and the second plays with the third, for the second semi-final. 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. 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

### **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 17, 8:00 pm) 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.

### **Skills Challenge**

#### **Tool**

The Skills Challenge will evaluate the goalie on a sequence of goal attempts. This challenge will be managed through the magmaChallenge tool available at:

<https://github.com/magmaOffenburg/magmaChallenge>

by selecting "Goalie Challenge" in the top-left dropdown list.

#### **Requirements**

The start player script has to start a player that will act as the goalie without leaving the penalty area when it receives "GoalieChallenge" as the challenge name argument. Please

check Preparation section of the Rules (<https://github.com/magmaOffenburg/magmaChallenge#preparation>) for the meaning of the other script parameters (some of which are not relevant for this challenge).

## Evaluation

Teams can participate in this challenge using their normal goalie or with a goalie with very few adaptations. The goalie challenge tool may also be used as a developing tool to test goalie behavior.

Evaluation rules:

- the final score is based on the percentage of unsuccessful goal attempts, i.e. the percentage of failed goal attempts;
- the winner will be the goalie able to achieve the higher percentage of unsuccessful goal attempts;
- the goalie cannot get out of the penalty area or a goal is considered;
- if the top teams draw, the challenge will be repeated for these teams with a different seed a maximum of 3 times. If the draw is maintained, several winners will be announced;
- the evaluation will be based on 12 shots with different targets on the goal, different initial speeds, and different origins on the field;
- the sequence of shots is randomly selected from a large list of possible kicks (targeting the goal);
- the random sequence is the same for all teams (for the same seed);
- during the competition, each team may decide on one of the digits for the random seed;
- shots are performed automatically using the magma challenge tool;

## Challenge Trophy Rules

A trophy will be awarded for the team with the highest combined score on the two 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. In case of a tie, the best team in the Free/Scientific Challenge will be declared the Winner of this Trophy.

## 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 4<sup>th</sup> 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. 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.

**7. 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.

**8. 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/bahart/uploads/Main/FoulModel2016.pdf>

**9. 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.

**10. 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.