RoboCup Humanoid League Rule Discussion

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Dear TCs, OCs and fellow RoboCup humanoid league teams,

As we all know, big changes are coming to the humanoid league in terms of the rules. Naturally, this is something we should embrace, to drive the league forward, and we should try to make the rules as great as possible for next year. This email has been triggered by the culmination of a successful RoboCup in Leipzig, and the recent dissemination of the meeting minutes from the RoboCup rule discussion meeting, in addition to the initial proposed rules rewrite for 2016.

Although the rule discussion minutes are clearly not a final set of rules yet, we thought it would be valuable to open up the more in-depth discussion of some of the points that were raised, before they become the final rules, at which point they would be harder to discuss in a fair, productive and open manner. RoboCup 2016 is over now, and all the organisers and participants have in the meantime had the chance to take a step back from their robots, and have a balanced and prudent think about the proposed rule changes for next year. If not, maybe this email will trigger that, because there is a lot happening. Since the end of RoboCup 2016 it has also been possible for not only team leaders, but also the teams themselves to get informed about the rules and voice their opinions, away from the often time-limited and stressful backdrop of the RoboCup competition. The rules are quite important because they to some degree decide the future direction of the entire league, so some open discussion on the matter in our opinion is highly merited.

Our first proposal is that if a mailing list turns out to be insufficient for the ensuing discussion, then a **web forum** could be organised to allow more structured and organised discussion of the rules. If desired, one of the authoring teams would be more than happy to promptly set one up.

The following points, organised into appropriate topic headings, are in no particular order, and where relevant refer to the points made in the meeting minutes with appropriate shorthand (e.g. **MM4** is point 4 in the meeting minutes, the one regarding free kicks). Those who are not closely familiar

with the contents of the **meeting minutes document** should probably read them first as a reference for this discussion. We apologise somewhat for the length of the following material, but if there weren't so many open points to discuss we would definitely have kept it shorter!

Robot Certification

MM1 specifies that robot certification should include demonstration of walking and standing up. Do the stand up motions have to be from all directions, or would just standing up from the front for example suffice? How are stand up motions that only work some of the times evaluated?

Compass Sensors

In the context of **MM1**, while it should be clear that we are not contesting the ban on compass sensors, how does the TC propose to check that a robot does not possess or use a compass feature? Is it sufficient to just disable it in software, or would there be some requirement to have it removed from either hardware or software as well? We presume the latter, but how will this be checked? Would it be possible for the check to involve some kind of required demonstration/explanation of what other algorithm is being used instead to keep track of the direction that the robot is facing?

Auto-positioning

Based on the result of the vote on **MM2**, semi-mandatory auto-positioning is planned for the 2017 rules. This ruling relaxed the starting positions of the robots, and immediately added auto-positioning exceptions for goal keepers and attacking/dropball strikers. Some questions and comments:

- If the robot is allowed to be placed anywhere on the border of the field, are there still restrictions on the initial orientation of the robot? Compare this to **SPL**.
- Is a robot that is entering the game during play also allowed to be placed anywhere on the border of the field, or does the "anywhere on the border" ruling strictly only affect the initial robot positions for auto-positioning (i.e. at a kickoff or dropball)? If so, does the referee still have the authority to force a team to enter at a particular location anyway, or to **not** enter at a particular location because for example the ball is close?

- We do not think that the **goalie** should be allowed to be **manually positioned**, to avoid the situation that an incapable goalie is intently placed into goals with no hope of ever actually doing anything, just so that it can make itself wide, be in the way, and unfairly leverage the illegal attack (touching goalie) rule to prevent goals. The time for a goalie to be declared incapable and removed is very long in comparison to a coming attack, so this ruling does not solve the problem. By auto-positioning, the goalie is proving that at least until the ball is there, it is a capable player.
- If **strikers** that are taking a kickoff or dropball are allowed to be **manually positioned** behind the ball (or centre circle), then this forms a loophole for teams with autopositioning that is against the spirit of the rules. It is much safer and more advantageous for teams in such a situation to disable auto-positioning and manually place their striker behind the ball, instead of using the auto-positioning feature they already have. The rule also means that teams without auto-positioning are in no way penalised for not having this feature when attacking. If the league aims to move towards autonomous games with minimal interference by robot handlers, then there should be incentives to develop such features. Twelve of sixteen teams in the RoboCup 2016 meeting said that they would be able to implement some kind of autopositioning by 2017, so if the league wants to push the use of auto-positioning, the path is clear.
- If **both teams** in a game cannot auto-position, then an appropriate exception can be made to the rules to prevent a completely stuck game, but only then.
- If the allowance for manual positioning is maintained, then at least one proposition to close the aforementioned **striker loophole** would be that manually positioned strikers that are taking the kickoff are placed on the penalty mark instead, or even in their own goal area.

Rule Formulation

Where a robot can be manually positioned for a drop ball is currently inconsistent in the rules, so in any rule revisions this should be clarified. Common knowledge says that you can position one robot just outside the centre circle, but the 2015/2016 rules if interpreted grammatically correctly actually say otherwise. There is a similar issue regarding the rule whether a robot can score directly from a kickoff that it is defending, so clarification of this rule would also be appropriate. It should also be noted at this point that although the size of the FIFA-based rules that were initially proposed for

2016 expanded to 66 pages, they cover all kinds of points that have no relation to robot soccer at all (or even conflict with certain rules of robot soccer in unintended ways), but fail to cover some of the most fundamental rules of the robot soccer game. If we wish to move to the new rules, and have them be workable, then they will still **need revision**.

Free Kicks

MM4: Will there be a differentiation between **direct and indirect** free kicks, with clear definitions of when which should be awarded? Which exact fouls trigger a free kick and which ones do not? Does the referee touch or **move the ball** when a free kick is awarded? Under what circumstances?

The execution of the free kick by definition depends on having the ball at the required free kick location. What happens if the ball is on one side of the field, and a foul occurs on the other side of the field? Is the game interrupted and the ball carried across the field? Surely not. What if the same foul occurs, but in the process of an attack on goals?

Very careful thought is required on how to define free kicks, and the execution thereof, so that they do not become constant game interruptions, points of contest for teams, and points of insecurity for inexperienced referees.

Referee Handling of Robots

MM5: We agree that each robot should have a **handle** (although better wording for the rules would be *'designated location to safely pick up a robot'*), but think that referees should only ever touch the robots of a team if the team was told to pick up a robot and did not immediately do so. This would avoid unnecessary pickups of the robots by referees, but still resolve the situation of teams intentionally delaying the pickup of their robots for strategic benefits. Referees should be responsible for talking to the teams before the game to ensure they know the correct location to pick up the teams' robots.

MM6: The rule that allows referees to touch robots to **untangle** them was motivated by making teams less able to 'cheat', but has it been considered that the referee is generally from a direct opponent team, and may therefore be greatly biased towards one or other of the teams? We argue that this proposition **does not solve** the underlying motivating problem. Would it be unreasonable for the game referees to be sourced from other size classes to ensure greater neutrality (e.g. kid and teen size teams together referee adult size games, and so on)?

There may be situations where a robot has malfunctioned and a particular action is required immediately (e.g. relaxing the robot) to prevent the robot from damaging itself. The referee will likely neither possess the knowledge to perform such an action, nor realise that it is required. More generally, what would be the correct procedure to deal with an event where the actions of a **referee damages or breaks** one of the team's robots, or affects the robot in such as way that it forces the team to take a service or timeout?

Initialisation of Robots

MM1 bans the use of a compass and **MM12** seems to specifically disallow manual initialisation of the location estimate of the robot. Is **initialising just the orientation** of the robot allowed, or is this similarly banned?

We ask the TCs, setting aside any attempts to try to remember what the audience looks like, how do they propose the robots should have any chance at all with all the new rules and bans that are being put in place to know what direction they should score in?

We invite a **concrete proposal** from the rule-makers how they intend this should be done while staying within the proposed new rules. The proposal should be robust, feasible, and has to work with/without a goalie, whether autopositioning, manually placed on the field by some exception, or entering a running game from the side of the field. Should it **not be possible** to provide such a proposal, then something needs to change.

Our proposition is that at absolute minimum it should be allowed to inform the robot which border it is entering the field from (bench side, away from bench side, or goal line). This is to resolve the fact that the field looks identical from both sidelines (especially close to the centre), and that no sensors with absolute heading information are allowed.

A particularly relevant question for this discussion is whether there are still proposed to be constraints on the direction that the robot is facing when entering the field (e.g. refer to the use of initial rotations in the SPL league).

Transmission of Information to Robots

It is clear that **MM12** may not have reached its final wording, but the voted rule as it stands is **very vague**. With the statement of the rule exactly as in the meeting minutes, almost any arbitrary action to configure the robots can be argued, if convenient or needed, to be in violation of the rule in some way. This cannot be a foundation on which teams participate in the humanoid league.

We strongly suggest that the rule should be reworked into a **concrete list of items** that encompasses the pieces of information that are not allowed to be provided to the robots, even over a LAN cable during a service. The game state is not that complex, considering that most game state information is provided legally by the game controller, so we do not imagine that such a list would be too difficult to produce. Very importantly however, producing such a list would bring the rule to a state that it can be applied **unambiguously and in an objective way**, which is necessary for fair competition.

One particularly relevant question however, is how this rule is proposed to be **regulated and enforced**? Teams cannot remove every program on their laptop, and feature in their code, that could possibly even remotely provide one of the forbidden pieces of information to the robot, so regulating this cannot be done by proof of the absence of such ability.

What would be the standard procedure to deal with a situation that one team accuses another of being in violation of this rule, when the 'trust' fails?

Mediums of Transmission

Some questions were raised in this past RoboCup as to the medium of transmission of information to the robots, and it would seem that the rules, or at least the application thereof, is slightly **inconsistent**. It is clear that use of the wireless network to configure the robots is disallowed. When the robot is out of play however, of all the remaining options of **configuring the robot** (LAN cable, audio/sound/speech command, visual perception of signs/codes/gestures, tactile input to the robot), the use of a LAN cable is by far the most invasive and with the most freedom to perform configurations. As a result, it constitutes a service, and it would make no sense at all for any of the other (more difficult and advanced) options to be penalised harder than a service (if they deserve even that at all), or even worse, disallowed.

Let us all keep in mind that the idea of RoboCup is to advance the state of the art collectively as a robotics community, not to block such advances due to temporary reasons.

Playing Without Wifi

Year after year we as a league strive for better gameplay, and the rules seek to promote and support this. In light of the proposed changes however, there is an **archaic rule** that can no longer be supported:

The robots must not rely on availability or quality of the wireless network. They must be able to play if the network is not available or of low quality.

Of low quality maybe, but not if there is none available at all. Game controller, free kicks, auto-positioning, drop-in games, increasing numbers of robots on the field at a time, new restrictions on how robots can be interfaced, configured and started... The requirements of the rules are **no longer compatible** with the absence of a wireless network, and should in fairness thus, **like the SPL rules**, not have this backdoor built into them anymore.

If a team has concerns about the quality of a wireless network then a standardised test with a laptop or wifi scanner can be performed to verify and prove the quality of the network.

Stability of the Rules

Over the past few years, the level of difficulty of the rules has increased very quickly, and it is affecting the **quality of the games** being played. Now we stand yet again before our next major complicating rule change, before the wide concensus of teams have even become completely comfortable with the current rules. We think that there should be some kind of regulation of how often and frequently **major rule changes** can occur. This would give new teams and existing teams with less resources a chance to get established and keep up, whichever the case may be. So for instance, after the major rule changes go through for RoboCup 2017, it would be appropriate to guarantee now already to teams that there will not be any major rule changes directly again for RoboCup 2018. We would like to keep as many teams in the competition as possible, because after all that's what RoboCup is for.

On a more organisational level, there should be a rather conservative date by which the TCs should make the new proposed 2017 rules **available to teams for comment**, and a date (not imminently before RoboCup) by which the rules then have to be finalised in such a way that only extreme exceptional cases would allow for the rules to still be changed.

If an **exceptional situation** outside of the rules occurs, in particular at RoboCup itself, then there should be a standardised procedure to deal with this. A good option would be for the TCs and OCs to vote on the matter, and require a unanimous decision to proceed. As part of this voting process however, it should be clear that all officials with direct conflicts of interest to the matter being voted on should of course not be permitted to vote. If this excessively reduces the number of participants in the vote, then other RoboCup officials, possibly higher up or from other leagues, could potentially be sought for an independent third-party opinion. Standardising these mechanisms would be important to avoid giving the impression to

teams that rules can be made up on the spot, at any time, and to a team's significant disadvantage.

Game Controller

There seemed to be a misconception at RoboCup 2016 that the game controller was somehow counting the time too 'slow', or otherwise stretching half-times. To our understanding, this is actually a **feature and not a bug**. At the instant that play continues after every stoppage of play (i.e. kickoff or drop ball), the game controller **in knock-out games** automatically compensates for *wasted time*. Actually, a preliminary compensation already occurs when the SET state is entered after a stoppage of play. This intends to automatically simulate the concept of *additional time* (also: *stoppage time*) in the FIFA rules. If this feature is undesired then it should be removed, but we think the feature should continue to be there. No matter what is decided however, in every situation the game controller should be the one and true source of game time, not a manual stopwatch timing the game.

Final Notes

That completes the points. We look forward to the opinions of all TCs, OCs and teams!

This document was prepared, and is equally supported by all three author teams.

All the best,

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