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# A new RoboCup@Home Challenge

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**Abstract.** The RoboCup@Home is an initiative to test if robots could be useful in the challenging environment of your home. This means that the robots have to be able to navigate through a cluttered environment and in addition also have to interact with your family. To do that, the robot should understand which objects could be present in your home, find them and manipulate them. Quite a challenge, where the RoboCup community works on since 2005 (and should be finished in 2050). To accelerate the developments in the league, it could be very beneficial to exchange algorithms and software based on a Standard Platform, as demonstrated in other RoboCup leagues. This year the RoboCup@Home will be extended with a Standard Platform competition, with its own Social Challenge.

## 1 Introduction

The RoboCup@Home was initiated in 2005 [1] by a Dutch RoboCup Trustee. The idea was that such competition was closely related to artificial intelligence [2], because for the social interaction the robot needs cognitive awareness of the natural surroundings of humans. Since its initiation, the RoboCup@Home competition has grown into the largest yearly competition for domestic service robots [3]. Several Dutch teams<sup>1</sup> have been active in this league [4, 5, 6]. Note that the Dutch are also active in several other leagues, that Belgium has been active in the RoboCup Junior and that Luxembourg initiated recently a Standard Platform soccer team<sup>2</sup>.

The idea behind the RoboCup@Home is to have a fixed number of domestic tasks that have to be executed by the robots, but that the circumstances under which those tasks have to be performed get more challenging / realistic every year. Examples of such domestic tasks are e.g. that the robot follows a person over the venue guided by voice and gesture commands or that the robot retrieves certain objects from a shelf. To be able to perform such tasks, the robot needs on advanced physical and sensory capabilities, to be able to manipulate [7] and navigate [8] in these surroundings. On this basis one could further develop situation awareness, learning of appropriate responses, understanding the relation

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<sup>1</sup> See for an overview <http://www.robocup.nl/teams.html>

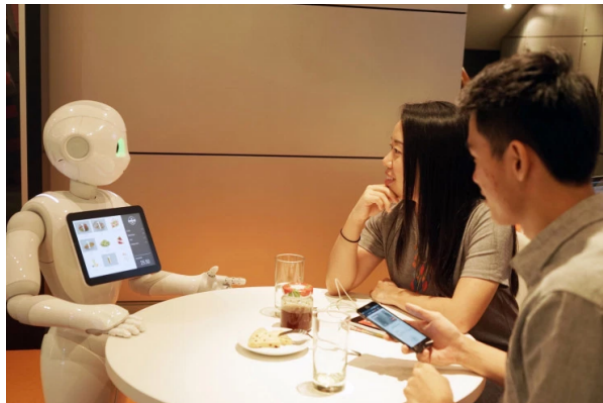
<sup>2</sup> Luxembourg United founded by Patrice Caire

between spoken requests and objects in the surroundings and recognizing human emotions and intentions [9].

With every team building their modules on top of their own robotic platform, it is difficult to exchange modules as easily as when a standard platform is used [10]. To promote such synergy, the RoboCup@Home competition is extended with two Standard Platform Leagues. The first is the Domestic Standard Platform League (DSPL), which has as main goal to assist humans in a domestic environment, paying special attention to elderly people and people suffering of illness or disability. To accomplish this, the teams in this competition will focus on Computer Vision, Object Manipulation and Safe Navigation. The second is the Social Standard Platform League (SSPL), where the robot is the one who will actively look for interaction. Hence, this league focuses on Human-Robot Interaction, Natural Language Processing, People Detection and Recognition, and Reactive Behaviors.

## 2 Social Standard Platform League

The robot to be used for the SSPL will be the human-shaped Pepper robot from Softbank Robotics. The first task given to this robot is to be a waiter on a cocktail party (see Figure 1).



**Fig. 1.** A Pepper robot servicing in a restaurant setting.

The full scenario for the Pepper robots task at the cocktail party is as follows:

1. **Entering:** The robot enters the arena and navigates to the party room and waits for being called.
2. **Getting called:** The guests call the robot simultaneously, either rising an arm, waving, or shouting. The robot has to approach one of them. The calling person introduces themselves by name before giving the order of a drink. The robot leads the dialogue to learn the person and retrieve their drink order.

3. **Placing the orders:** The robot has to navigate to the *Bar*, a designated location in another room where drinks are served. The robot must repeat each order to the *Barman*, clearly stating:
  - (a) The person's name,
  - (b) The person's chosen drink,
  - (c) A description of unique characteristics of that person that allow the *Barman* to find them (e.g. gender, hair colour, how is dressed, etc).
 While the robot places the orders, the people in the "party room" may change their places within the party room (on request of the referees).
4. **Missing beverage:** One of the ordered drinks is not available, therefore, missing from the bar. The robot should realize this inconvenience and tell the *Barman*, providing a list of 3 alternatives considering the other drinks it needs to deliver. If the robot can't detect which drink is missing, the *Barman* will clearly state which of the beverages is not available and provide a list of 3 alternatives.
5. **Correcting an order:** The robot should navigate back to the "party room", find the person whose drink is missing and provide the alternatives to choose from.

As can be seen from this scenario, the test focuses on the robot capabilities in human detection and recognition, safe navigation and human-robot interaction with unknown people.

### 3 UvA@Home

The Universiteit van Amsterdam (UvA) has been selected to buy a Pepper robot under the special conditions of Softbank Robotics for RoboCup teams<sup>3</sup>. The UvA@Home has submitted a team description paper and qualification video<sup>4</sup>, to be one of the 12 teams world-wide that will be selected to participate in the Social Standard Platform League. In their team description paper [11] they indicate how they will perform the face recognition, natural language processing, object recognition, object manipulation and navigation. Their software is published in a public repository<sup>5</sup>.

### 4 Conclusion

The Social Standard Platform League imposed a new challenge inside the RoboCup@Home competition. Progress in this league will be directly applicable to social relevant scenarios and can directly be disseminated to interested companies and the community.

<sup>3</sup> <http://www.robocupathome.org/athome-spl/pepper>

<sup>4</sup> <https://www.youtube.com/watch?v=-i8xgfzAFoQ>

<sup>5</sup> <https://github.com/SpinazieSin/UvA-Home>

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