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### Dutch Nao Team

*Team Qualification Document for RoboCup 2016, Leipzig, Germany*

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TEAM QUALIFICATION DOCUMENT FOR ROBOCUP 2016  
LEIPZIG, GERMANY

# DUTCH NAO TEAM

<http://www.dutchnaoteam.nl>



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Jonathan Gerbscheid, Thomas Groot and Arnoud Visser  
December 1, 2015

## 1 Team Information

This is the qualification document for the Dutch Nao Team with Patrick de Kok as its team leader. The team consists of two master students, four bachelor students, one alumnus, and one staff member. The qualification video is available at our YouTube channel <sup>1</sup>.

## 2 Robot Information

The Dutch Nao Team currently has access to a large number of robots. Our main team consists of those Nao robots stationed at the University of Amsterdam:

- |                |           |
|----------------|-----------|
| – Bodies:      | – Heads:  |
| • 2 H24 v3+'s  | • 3 v3+'s |
| • 5 H21 v3.3's | • 7 v4's  |
| • 2 H24 v4's   | • 2 v5's  |
| • 2 H24 v5's   |           |

The team has also direct access to the Nao robots stationed at Universiteit Maastricht (3 v5's). For the future, there is only the intention to buy a Pepper robot from Aldebaran once they become available in Europe.

<sup>1</sup> <https://www.youtube.com/watch?v=kQ1IMMRLfMI>

### 3 Preference

The team prefers to compete in the following competitions, in order of preference:

1. Technical challenges
2. Indoor competition
3. Outdoor competition

As we have currently a small and inexperienced team, who has decided to start the development from scratch, we think we can better focus on smaller challenges. We do expect that our work will demonstrate good results which could be published when working on research questions with clear boundaries as defined in the technical challenges.

### 4 Code Usage

Before 2013, the team developed their code in Python. In 2013, the team switched to use Berlin United's code base (then called NaoTH). Because of the lack of documentation, the team decided to use to B-Human's framework in 2014 and 2015 during the soccer competitions. On this basis we were able to modify several modules, such as porting the walking engine to Nao v5 and modifying the goal detection to recognize white goals.

This summer, the Dutch Nao Team has decided to start from scratch while using ROS as basis. We think using ROS has many advantages over an SPL-specific framework:

- ROS is a more general-purpose framework than any SPL-specific framework. By using a framework with multiple fields of application, we hope to attract more students in our team, as they will learn to work with a system that they might use in other projects as well.
- Other projects at the Intelligent Robotics Lab, Amsterdam, are also based on ROS. We expect some form of “cross-pollination” between groups from the lab.
- By using a different approach than most teams, we hope to bring diversity in the league. The list of available ROS modules is large and still growing, and we think this will profit quick development, where we can easily test multiple ideas. Besides receiving from the ROS community, we can and will give back to the same community without any difficulty: because of the message passing architecture of ROS, it is straightforward to make a module available for other research groups.

We intend on isolating the most recent version of B-Human's motion engine and use it in our framework. This will be based on the *bh-motion* node written by UChile [1]. However, we will attempt to include the latest release of the motion engine, and implement it as a ROS nodelet, instead of a ROS node. ROS nodelets are “designed to provide a way to run multiple algorithms in the same process with zero copy transport between algorithms”<sup>2</sup>, which allows the development advantages of a message passing architecture with the performance advantages of a blackboard architecture [2]. Especially with the Nao's Atom CPU, one does not want to run too many threads as there is only hardware support for two threads.

From the experience of previous teams [1,3] have chosen ROS as framework we realize that it will be difficult to get the same performance as teams with a dedicated framework, but we believe that a generic framework is the way ahead towards the goals of the RoboCup initiative.

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<sup>2</sup> <http://wiki.ros.org/nodelet>

## 5 Past History

The predecessor of the Dutch Nao Team was the Dutch Aibo Team [4]. The Dutch Nao Team debuted in the Standard Platform League (SPL) competition at the German Open 2010 [5]. Since their founding, the Dutch Nao Team has been qualified for the world cup competitions in Istanbul [6], Mexico City [7], Eindhoven [8] and João Pessoa [9]. Besides the major RoboCup events, we have attended multiple GermanOpens, IranOpens, the Humanoid Soccer School 2013, the Mediterranean Open 2011 and the Colombia Robotics week.

As requested, results from 2013 onward are published. The results of the games at RoboCup Eindhoven 2013 have been presented in Table 1a. The team placed itself first in the initial pool, but got eliminated in the second, placing 16th in world ranking. The team did not participate in the technical challenges.

Table 1b shows the game scores for IranOpen 2013, 2014 and 2015. The scores during the IranOpen are not so representative for the potential of our team, because those games are mainly used to test the latest developments in preparation of the world championships.

Round	Opponent	Score
First	rUNSWift	2:1
	Mi-Pal	1:0
Second	Northern Bites	0:1
	RoboEireann	1:5
	EdInferno	0:2

(a) Game scores for RoboCup 2013.

Year	Opponent	Score
2013	SPQR	0:6
	Kouretes	2:0
	MRL	0:2
2014	Berlin United	0:1
	HTWK Leipzig	0:2
	MRL	0:9
	DAInamite	0:0
2015	HTWK Leipzig	0:6
	MRL	1:3
	ETH Z-Knipsers	3:2
	Berlin United	0:5

(b) Game scores for IranOpen competition.

Table 1: Game scores for the Dutch Nao Team in different competitions.

During RoboCup João Pessoa, the team only obtained 5 points for the technical challenges, as both on-site team members were struggling with symptoms of stomach infections. Three bachelor theses [10,11,12] were published on the research questions of the technical challenges of 2014. The Dutch Nao Team had not enough funding to respond to the call for applications for participation for RoboCup Hefei 2015.

The Dutch Nao Team will come well prepared to the competition in Leipzig; in December 2015 the Dutch Nao Team will visit Techfest in Mumbai<sup>3</sup>, in January 2016 the team will visit the Shaastra event in Chennai<sup>4</sup>, followed in March 2016 by the RoboCup European Open in Eindhoven<sup>5</sup> and in April 2016 by the RoboCup IranOpen in Tehran.

<sup>3</sup> <http://www.techfest.org/>

<sup>4</sup> <http://www.shaastra.org/>

<sup>5</sup> <http://www.robocup-europeanopen.org/en>

## 6 Impact

The Dutch Nao Team has published in the period since 2013 five conference papers [13,14,15,16,17], a master thesis [18], four bachelor theses [19,10,11,12] and a number of project reports [20,21,22]. In the same period the Intelligent Robotics Lab was initiated. In 2013 a white paper was published with a vision about the historical and future impact of the Intelligent Robotics Lab [23]. This impact is not only in Development & Education, but just as important is Outreach & Public Awareness. The document gives an overview of media appearances, demonstrations, workshops, courses, internships and summer schools given in the years 2012–2013.

Recently the Intelligent Robotics Lab has evolved in a platform to preserve the robotics research from the Intelligent Autonomous Systems group and as initiation point in the cooperation with the robotics research from the Computational Intelligence Group. In the archive<sup>6</sup> papers and articles from 1994 onward can be found.

The Dutch Nao Team is not the only team of the Intelligent Robotics Lab; students and experience are shared with teams participating in the RoCKIn@Work camp [24], the HumaBot competition [25] and the RoboCup@Rescue [26].

## 7 Other

The Dutch Nao Team will be host of the Standard Platform League during the RoboCup European Open 2016. The venue will be the Evoluon in Eindhoven and the intention is to have two fields to enable a competition with at least 8 European SPL-teams.

The Dutch Nao Team has received a grant from the RoboCup Federation to further enhance the integration of ROS and NaoQI at the Aldebaran Atelier Paris. This would enable to facilitate development of ROS-modules for the whole Robotics community.

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<sup>6</sup> [http://www.intelligentroboticslab.nl/articles\\_papers/](http://www.intelligentroboticslab.nl/articles_papers/)

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