K.Anter | M.Greiner | J.Vatter | J.Weghake
Direction: H.Schnaubelt

SoftBank Robotics

# NAO 6

## LEARN IT


TECHNIK LPE

sprachliches + naturwissenschaftlich-technologisches
bertha-von-suttner
gymnasium neu-ulm

## THE BASICS

Learn it NAO[6] - The Basics
1st edition 2019



Authors: Kai Anter, Marcel Greiner, Jonas Vatter, Jannes Weghake
Direction: Heike Schnaubelt (OStR, senior councilor of studies)
Editor: Tony Schuster (StR, councilor of studies)
Program contribution: Caspar Sachsenmaier

All program examples and screenshots for NAO[6] were tested and taken in the environment Choregraphe (Version 2.8.X).
It is possible to transfer the content to earlier NAO generations, however their correct functioning cannot be guaranteed. The same applies the other way around.
In this book, "NAO" always refers to the sixth generation of NAO.

TECHNIK LPE

Technik-LPE GmbH
info@technik-lpe.com
www.technik-lpe.de

Friedrichsdorfer Landstraße 64
69412 Eberbach / Germany
Phone: +49 6271 944650-1
Fax: +49 6271 944650-2

We,

the team of authors comprised of **Kai Anter**, **Marcel Greiner**, **Jonas Vatter**, and **Jannes Weghake**, under the direction of **Heike Schnaubelt (OStRin)**, are pleased to present our book
"Learn it NAO⁶ - The Basics".

It was created as part of our study skills seminar "The real and virtual STEM classroom of the future" in cooperation with the company **Technik-LPE GmbH**.

## Our target group:

Anyone who is interested – anyone at all!

## We have set ourselves the following goals for the book:

- NAO⁶ is intended as an ideal introduction to humanoid robotics.
- This book, NAO⁶ with a laptop/notebook, and the required materials are all you need to learn about NAO⁶.
- We want to spark interest in the STEM field through playful exploration.

## We will achieve these goals through:

- Clear illustrations
- Step-by-step instructions
- Practical exercises with suggested solutions


We hope we can inspire you to explore this new universe and that this book will be of help to you in doing so.

Have fun discovering this new NAO-verse!

Your author team

Kai Anter — Marcel Greiner — Jonas Vatter — Jannes Weghake

Beginner

Advanced

# A. NAO

## A.1. Tips and tricks

Here are several tips we have gathered while working with NAO. They should help you to use your NAO for as long as possible without any incidents.

1. Do not work with your NAO on tables or other raised surfaces.
2. Disconnect the Ethernet and charging cables from NAO after you have transferred the program (risk of tripping).
3. Charge NAO while it is not in use.
4. Do not set the speed of the NAO movements above 80% as it could overbalance (recommended values: 60% - 70%).
5. Always let your NAO move on an even and stable surface, otherwise it is more likely to fall over.
6. Do not lift up NAO while it is sitting as this triggers the Fall Detection. (The Fall Detection is a procedure that is always active on NAO. If NAO falls, it prevents serious damage. NAO goes into a protective position very quickly. Your fingers could become trapped when this happens.)
7. Only move NAO by holding it under the arms in a standing position.
8. Do not leave NAO unattended for a longer period of time.
9. Use the Pose Library with caution. If you want NAO to stand up, use the Stand Up box. (The Pose Library is a collection of several positions that NAO can assume. You will learn about the Stand Up box later in C.2.1.5.)
10. Only store NAO in the styrofoam box or the transport case that is available separately, or lean it against a wall with a piece of fabric in between (risk of tipping, damage).
11. When NAO is switched off, the battery needs around 2 hours to charge from 0% to 100%, when switched on around 2.5 hours.
12. It needs around 2-3 minutes to start up.
13. Keep the styrofoam protection provided as storage for NAO.
14. If you work with Choregraphe 2.8.X, only use NAO[6]. If you work with NAO[6], only use the latest version, Choregraphe 2.8.X.

# A. 2. Sensors

Interacting with, recognizing, and understanding surroundings is an important fundamental skill for humans. And depending on the area in which they are used, robots need to be able to do this, too. As NAO is a humanoid robot, or one that looks like a person, it should also "function" like a human. To enable it to do this, several sensors and actuators are built into NAO. This chapter briefly explains where some of them are installed.

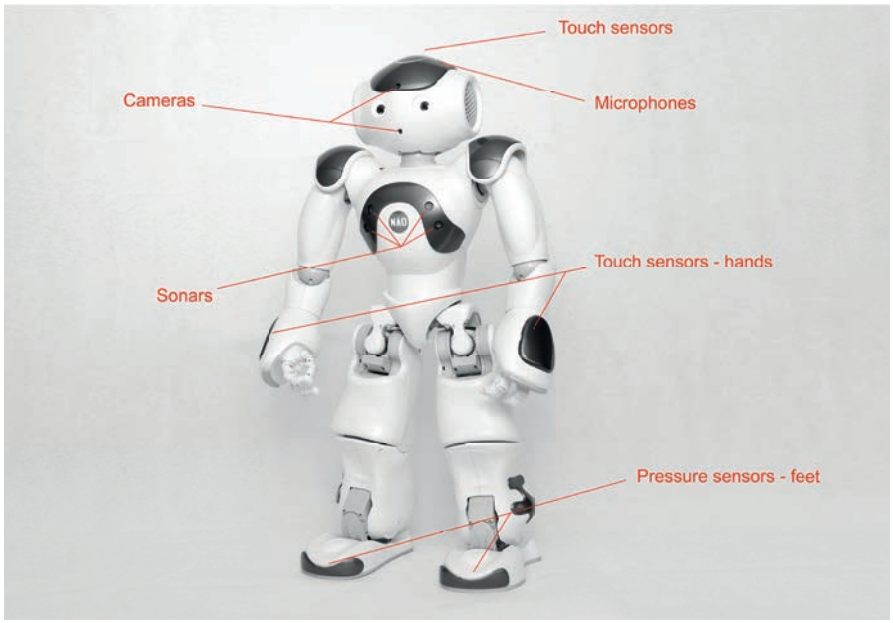



*Fig. 1 – Brief overview of NAO's sensors*

## NAO's head

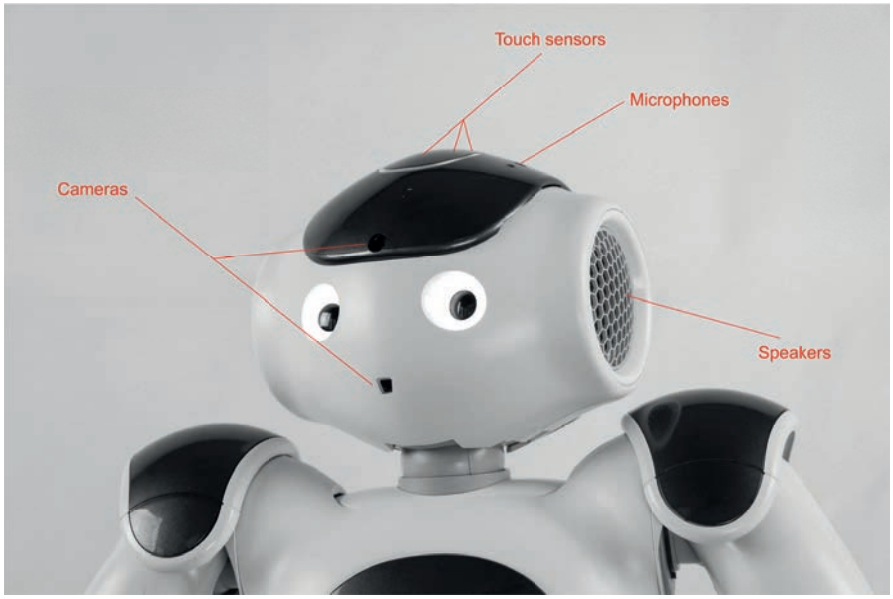



*Fig. 2 – NAO's head*

On its head, NAO has two very important sensors, two cameras, and four microphones. Plus, there are two speakers fitted. Finally, there are the tactile, or touch, sensors on the top of its head. They can be controlled using a box (you will learn what a box is in C.1.) in Choregraphe (see Tactile Head box, C.2.1.7).

## NAO's chest

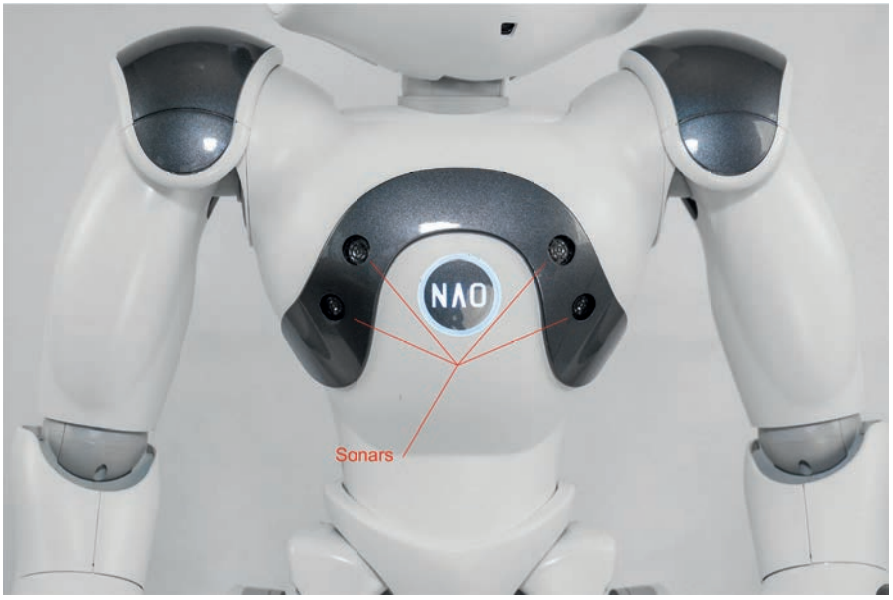



*Fig .3 – NAO's chest*

On its chest are four ultrasonic or sonar sensors. They can measure distances from walls, people, or objects.

## NAO's hands


*Fig. 4 – NAO's hands*

There are three tactile sensors installed in each hand, which can also be controlled using a box (see Tactile Hands box, C.2.1.8).

## NAO's feet

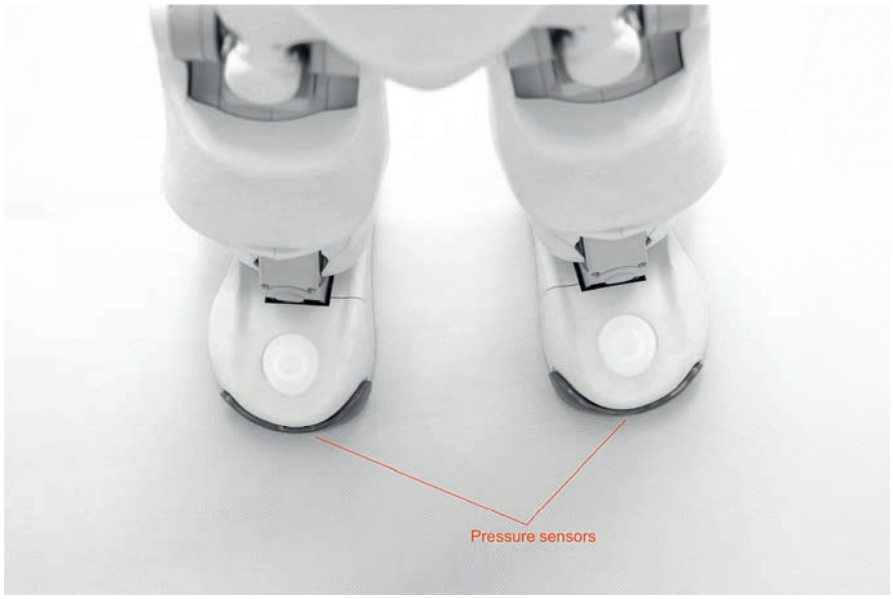



*Fig. 5 – NAO's feet*

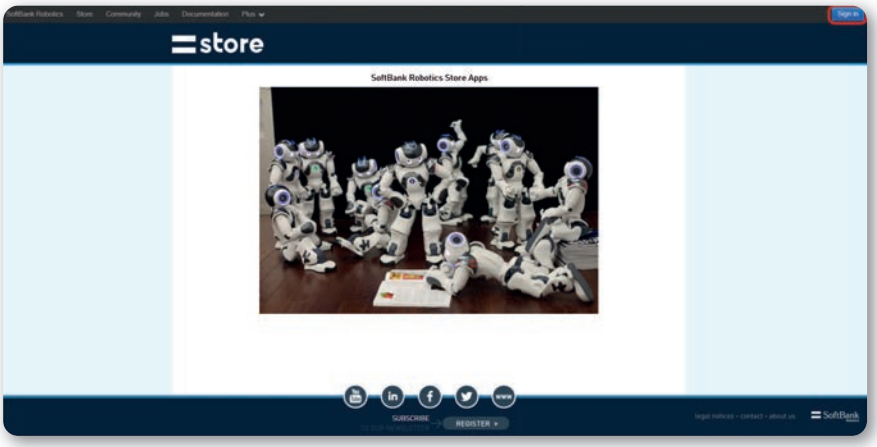
NAO has one pressure sensor on each foot. The term for these sensors is "Bumper". So if you come across this word, you'll know what it refers to.

# A. 3. Ready-made programs

Particularly difficult programs are complicated and time-consuming to create. To ensure that you still have fun with your NAO, several ready-made programs are available on the Internet. You can download them and install them on your NAO. Programs like this are called applications, or apps. There are also apps that have several functions. These "big apps" are called channels.

One application is the "Walk Together Demonstration". You can use it to direct NAO to any position you like. Here's how to install this application as an example. Other applications or channels are installed in the same way.

First go to the website "***https://cloud.aldebaran-robotics.com/***".

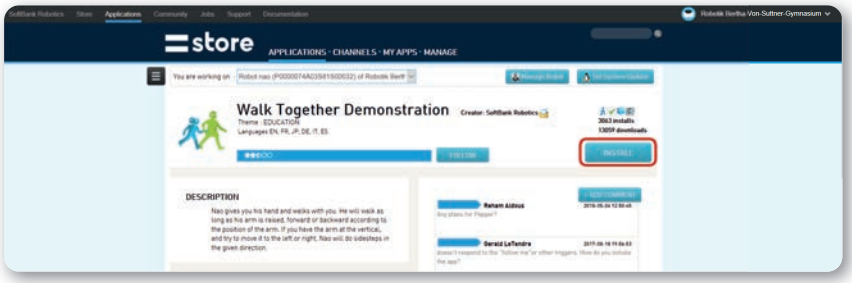



*Screen 1.1 – SoftBank store*

Then click the Sign in button to sign in. You are taken to this page:

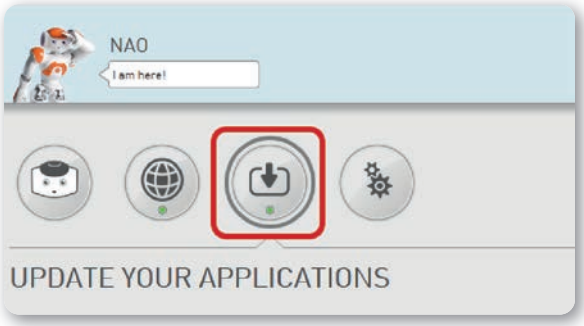

*Screen 1.2 – SoftBank applications*

Choose an application you like the look of and click on it. (The apps are sorted into three categories: Best rated, New apps, and Selected for you.)




*Screen 1.3 – Walk Together app*

To install the application, simply click on Install and the NAO displayed in the top middle (your NAO) will be equipped with the selected application.

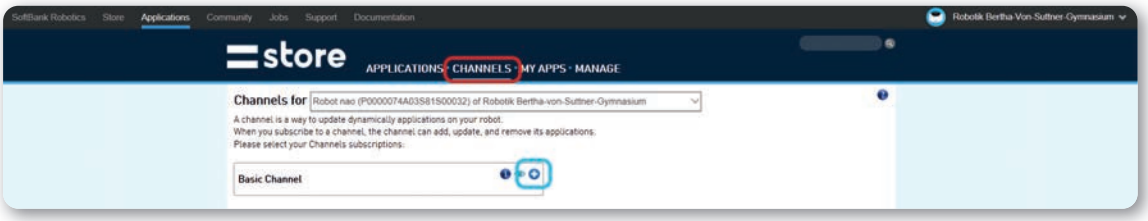



*Screen 1.4 – Update application*

To properly install it on the robot, you have to download the files to NAO on the robot page under Update application.


*Screen 1.5 – Manage robot*

To check whether NAO has saved the application, you can click on Manage Robot and view and uninstall all installed content under Installations.



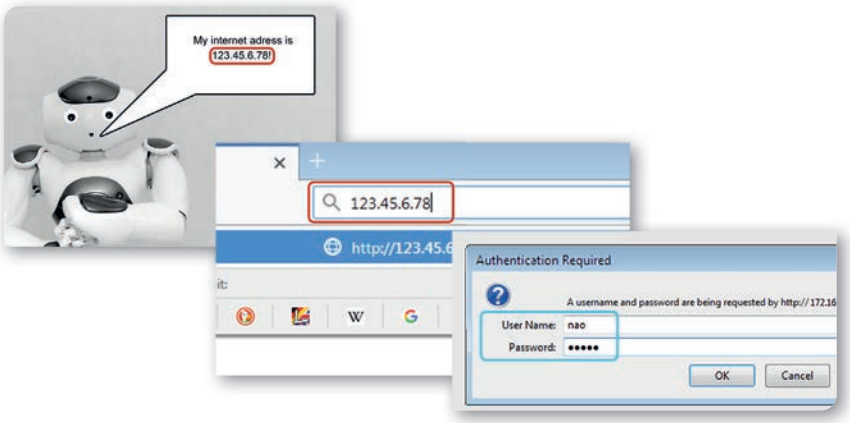

*Screen 1.6 – SoftBank channels*

To subscribe to a channel, go to the Channels tab.
Click on the blue plus symbol and you are subscribed to the channel.

The difference between a channel and an application is that a channel consists of several applications and updates itself automatically as soon as it connects to a WIFI network. The only channel available so far is the “Basic channel”: This adds dialog skills (you will learn what a dialog is later in C.3.1.1) and reactions to touch. It is necessary for making use of the full potential of Autonomous Life. (Autonomous Life is a behavior of NAO. It involves several programs running independently. How it works is explained in B.3.)

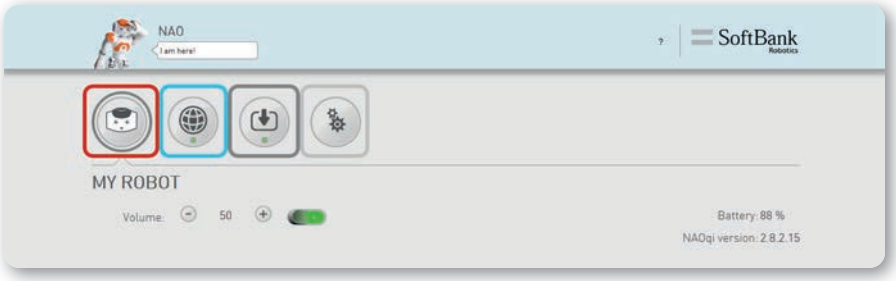
# B. First steps

## B.1. Robot page



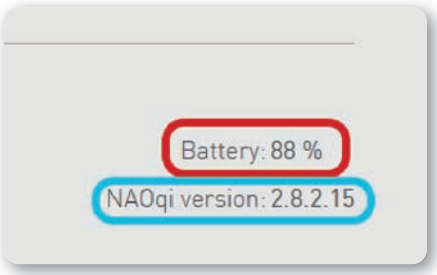

*Screen 2.1 – How to get to the robot page*

You can find the robot page by pressing the chest button on your NAO once, entering the IP address in your browser, and signing in with your username and password.




*Screen 2.2 – Robot page*

You are taken to this page. Here you can manage the volume, WiFi connection settings, applications, account settings, language, time zone, and Autonomous Life.

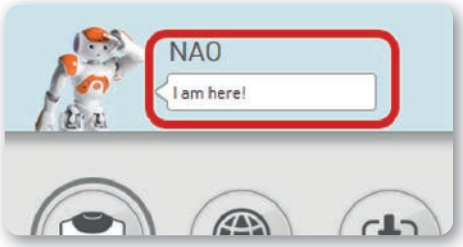



*Screen 2.3 – Battery level*

Here you can call up information about the battery level and current NAOqi version.


*Screen 2.4 – Settings*

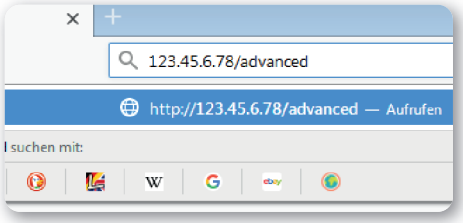
It is also possible to turn off, reboot, and perform a factory reset for NAO here.




*Screen 2.5 – Speech bubble*

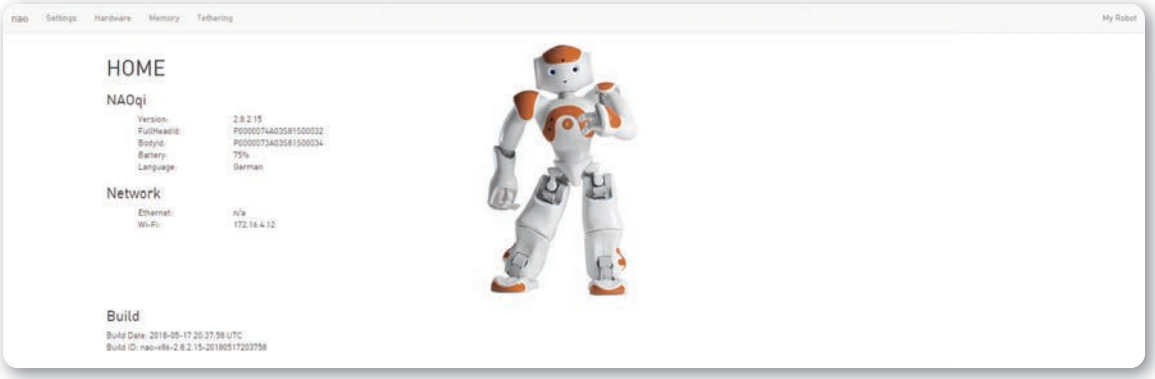
In addition, you can use the speech bubble at the top left to get NAO to say something directly via text input.
There is another website for more detailed information about NAO.

**However, this website is intended more for the purpose of analysis, as in the worst case you can make NAO unusable by changing the settings.**




*Screen 2.6 – Advanced IP address*

To go to this page, type "**/advanced**" after the IP address after signing in.



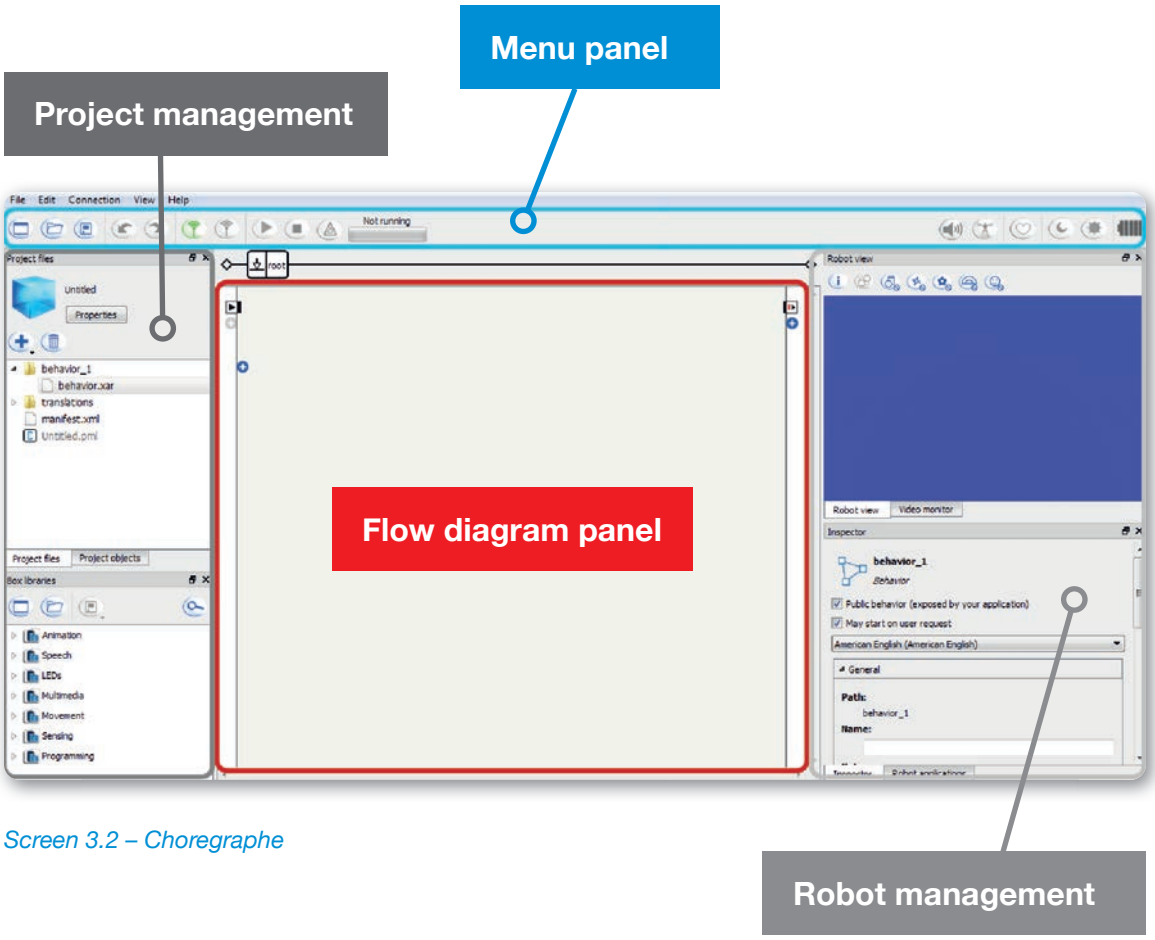

*Screen 2.7 – Robot page, advanced*

Here you can switch off the fall manager reflexes, see the serial numbers of the parts fitted, call up current temperatures, view the memory, and manage Internet settings.

# B. 2. Choregraphe

*Screen 3.1 – Choregraphe symbol*

Choregraphe is the most important program you use when working with NAO. With Choregraphe you can create programs, write dialogs, or set NAO's behavior. However, Choregraphe provides you with many more options, too. For example, you can have it display what the camera sees, change settings like volume and language, create a preview for your program, or change the source code for boxes. As the interface shows all these different areas, here is an overview for you. Individual components are explained in more detail at the end.




*Screen 3.2 – Choregraphe*

“To download all course content, please complete the form on this page”

https://www.softbankrobotics.com/emea/fr/nao-robot-education-ebook

On a Sharefile folder you will find :

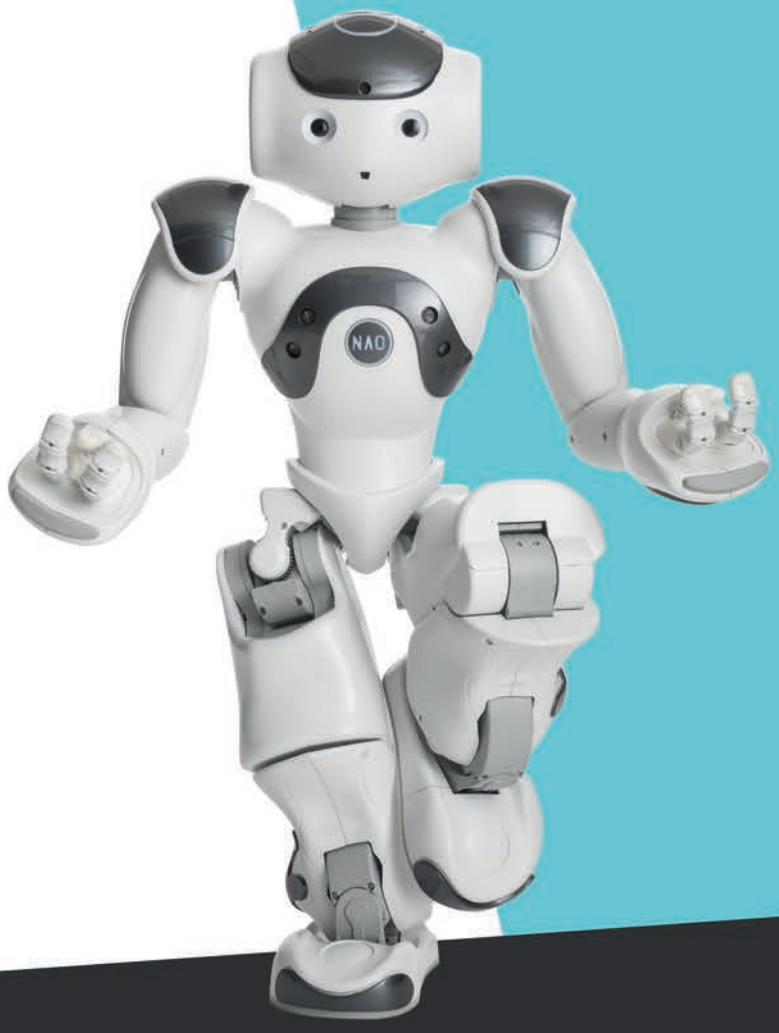
- The Basics - Learn it NAO6 ebook (pdf file)
- The Creative Projects Ideas - Do it NAO6 ebook (pdf file)
- Solutions and materials to help you to complete your projects

Enjoy and be creative with NAO6!

SoftBank Robotics

# EXPAND YOUR COMPETENCE

## SCIENCE | TECHNOLOGY | ENGINEERING | MATHEMATICS |




More information:
www.softbankrobotics.com/emea

Contact:
emea-sales@softbankrobotics.com

SoftBank Robotics Europe
NAO Robot

@SBREurope
@NaoRobot
@PepperTheRobot

SoftBank Robotics Europe

@sbreurope

SoftBank Robotics Europe