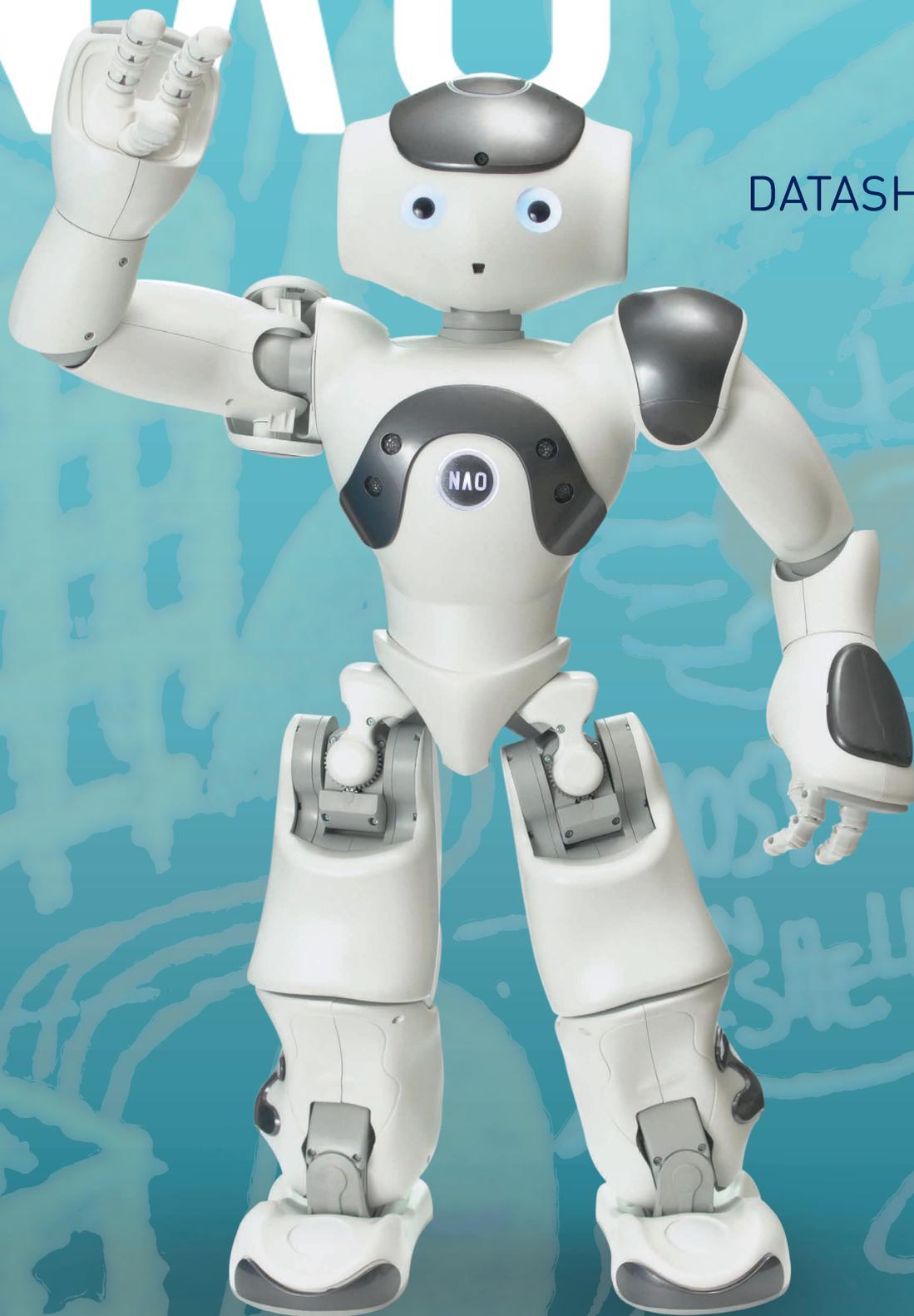


6

NAO

DATASHEET



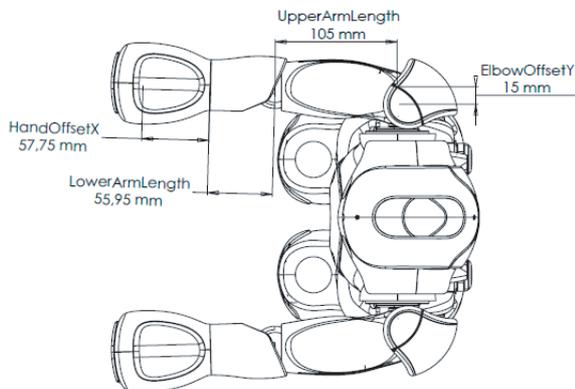
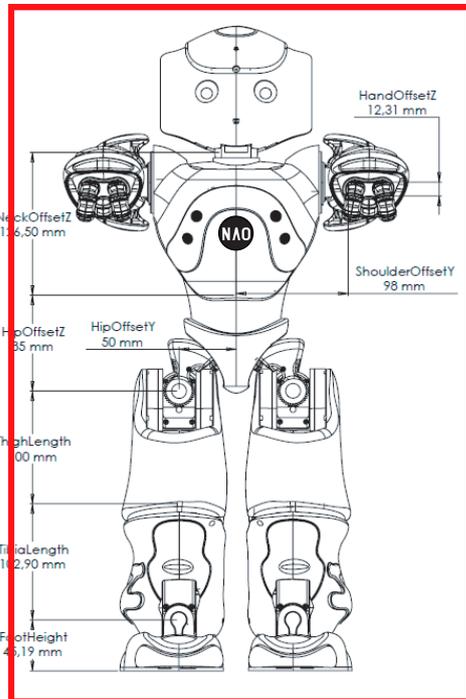
NAO⁶

MODEL: H25600

PHYSICAL CHARACTERISTICS

GENERAL

Size (HxDxW)	574x311x275 mm / 22.6x12.2x10.8 in
Weight	5.48 kg / 12.08 lb



BRAIN SYSTEM

MOTHER BOARD

CPU	CPU processor	ATOM E3845
	Cache memory	2 MB
	Clock speed	1.91 GHz
RAM	4GB DDR3	
Flash memory	32GB eMMC	

HUMAN INTERACTION

LANGUAGES

Text to speech & Automatic speech Recognition	Czech, Danish, Dutch, English, Finnish, French, German, Italian, Japanese, Greek, Polish, European Portuguese, Brazilian Portuguese, Spanish, Swedish, Russian, Turkish, Arabic, Brazilian, Standard Mandarin, Taiwanese Mandarin, Norwegian.
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AUDIO

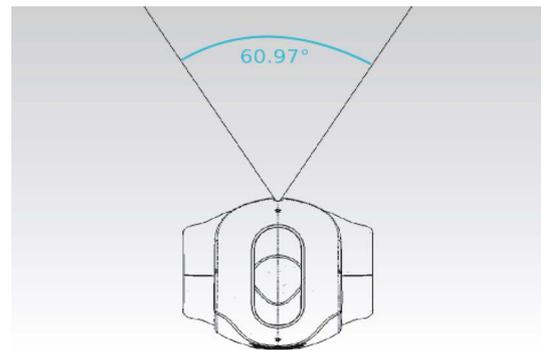
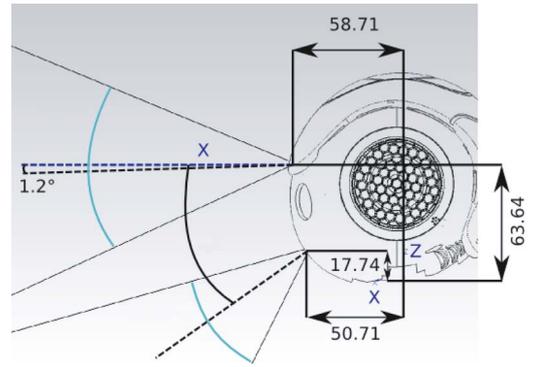
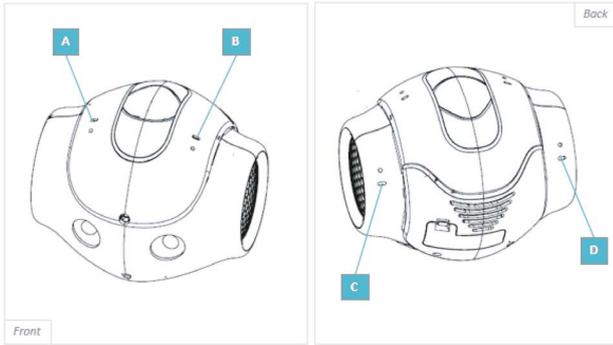
Loud Speakers	Left & Right	
	Diameter	40 mm
	Impedance	4 Ω
	Audio power	87 dB +/- 3 dB
	Freq range	up to ~20 kHz
Input	2 W	

Microphones	×4 omnidirectional on the head	
	Sensitivity	-12dBV/PA @1KHZ
	Frequency range	100HZ to 10KHZ

LEDS

Placement	Quantity	Description
Tactile Head	12	16 White levels
Eyes	2×8	RGB FullColor
Ears	2×10	16 Blue levels
Chest button	1	RGB FullColor
Feet	2×1	RGB FullColor

NAO⁶



2D CAMERAS

Cameras	2 front of head	
Sensor model	OV5640	
Sensor type	SoC - CMOS Image Sensor	
Imaging array	Resolution	5 MP
	Size	1/4 in
	Active Pixels (H×V)	2592 x 1944
Sensitivity	Pixel size	1.4 x 1.4 μm
	Dynamic range	68 dB @8x gain
	Signal/Noise ratio (max)	36 dB
	Responsivity	600 mV/lux-sec
Output	Camera output	640 x 480 @30 fps
	Data Format	YUY & RGB
	Shutter type	Rolling Shutter/ frame exposure
View	Field of view	67.4° DFOV (56.3° HFOV, 43.7° VFOV)
	Focus range	10 cm - ∞ ≈ 4 in - ∞
	Focus type	Auto focus

ENVIRONMENT SENSORS

INERTIAL UNIT

Gyrometer	1	
	Axis	3
	Precision	5%
	Angular speed	500° /s approx.
IMU	1	
	Axis	3
	Precision	10%
	Nominal acceleration	2g approx.

FRAMERATES

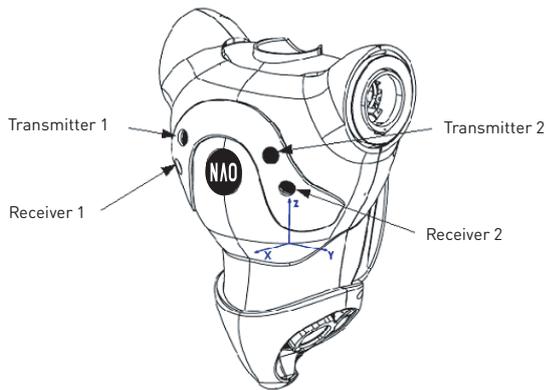
	Top Camera	Bottom Camera
Resolution		
320×240 px	@15, 30 fps	@15, 30 fps
640×480 px	@15, 30 fps	@15, 30 fps
1280×960 px	@15, 30 fps	@10, 15 fps
1920×1080 px	@15, 30 fps	-
2560×1920 px	@15 fps	-

Note: The rate of the video stream will depend on the network and the video resolution chosen. All frame rates depend on the CPU usage. Values are measured with a CPU fully dedicated to image gathering.

NAO⁶

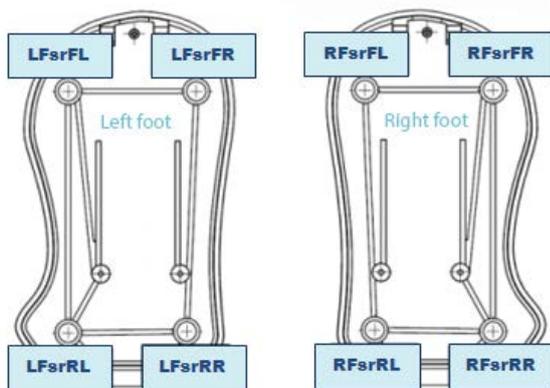
SONAR

Transmitters	2 on front
Receivers	2 on front
Frequency	40 kHz
Resolution	1 cm @50 cm
Detection Range	0.20 m to 0.80 m
Effective Cone	60°



FORCE SENSITIVE RESISTORS (FSR)

Range	0 to 25 N
Location	4 in each foot
Sensitivity	40 g approx.



BUTTONS & SENSORS

Chest Button	✓
Foot Bumper	✓
Tactile Head	✓
Tactile Hand	✓

ENERGY

ROBOT BATTERY

Battery	Type	Lithium-Ion
	Nominal voltage/capacity	21.6 V / 2.9 Ah
	Max charge voltage	25.2 V
	Recommended charge current	1.8 A
	Max charge / discharge current	2.1 A / 2.0 A
	Energy	62.5 Wh
	Charging duration	90 min
	Run time	60 min (Active use) 90 min (Normal use)

BATTERY CHARGER

Input	100 to 240 VAC – 50/60 Hz – Max 1.2 A
Output	25.2 VDC – 2 A

MOTION

DEGREES OF FREEDOM

Head	2
Arm (in each)	5
Pelvis	1
Leg (in each)	5
Hand (in each)	1

NAO⁶

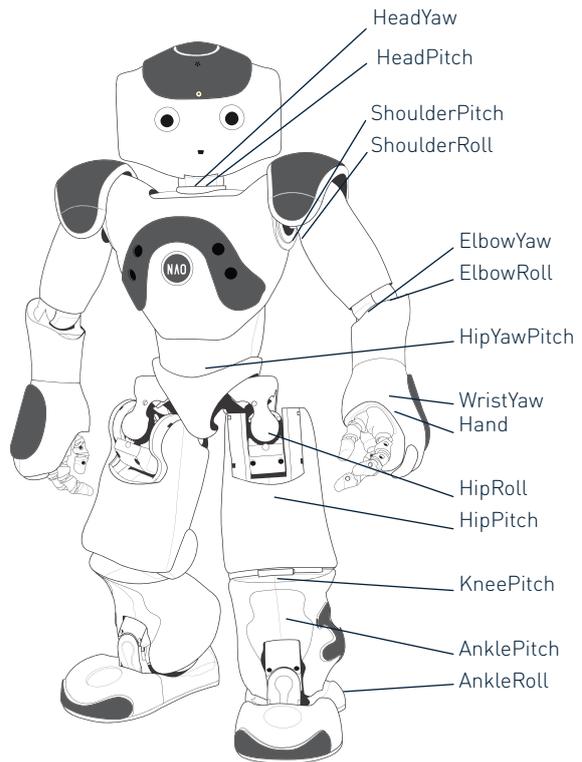
MOTOR SPECIFICATIONS

Motor type Brush DC Coreless

POSITION OF MOTORS

		Gear Ratio	Motor type
Head joints	HeadYaw	150.27	3
	HeadPitch	173.22	3
Arm joints	ShoulderPitch	150.27	4
	ShoulderRoll	173.22	3
	ElbowYaw	150.27	3
	ElbowRoll	173.22	3
Hand joints	WristYaw	50.61	2
	Hand/ Fingers	36.24	2
Leg joints	HipYawPitch	201.3	1
	HipRoll	201.3	1
	HipPitch	130.85	5
	KneePitch	130.85	5
	AnklePitch	130.85	5
	AnkleRoll	201.3	1

For details of type and gear ratio, see below.



MOTOR TYPE

	Motor type 1	Motor type 2	Motor type 3	Motor type 4	Motor type 5
Make	22NT82213P	17N88208E	16GT83210E	DCX 16S	22NT Z20
No load speed (rpm)	8700 ±10%	8400 ±12%	10700 ±10%	11400 ±10%	8700 ±10%
Stall torque (mNm)	65 ±8%	9.4 ±8%	14.3 ±8%	22.4 ±10%	65 ±10%
Continuous torque (mNm)	17.8 max	4.9 max	6.2 max	2.6 max	17.8 max

JOINT MOVEMENT ENCODERS

MRE (Magnetic Rotary Encoder)	36 Using hall effect sensor technology Precision: 12 bits / 0.1°
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NAO⁶

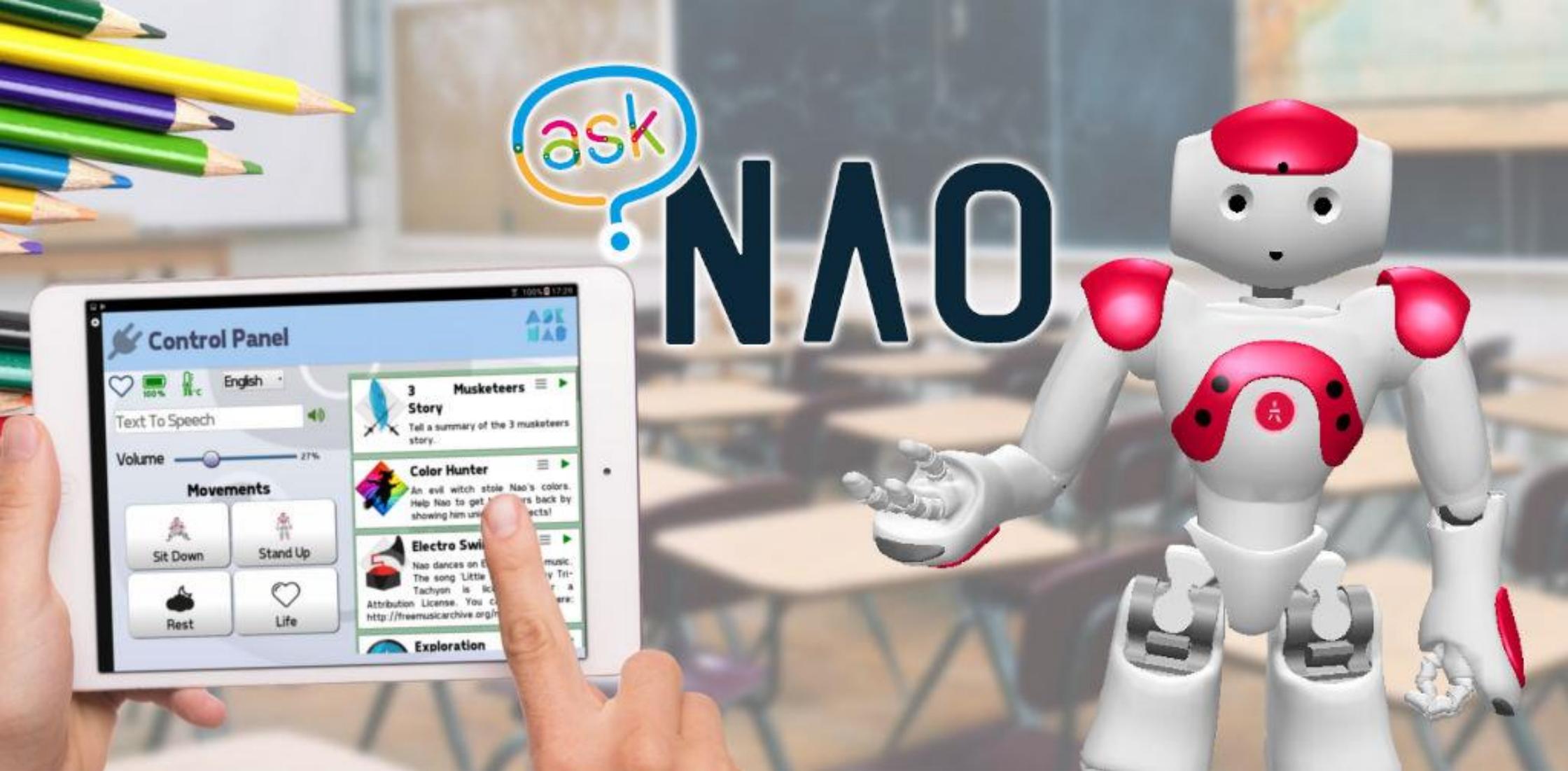
CONNECTIVITY

CONNECTION

Ethernet	1xRJ45 - 10/100/1000 BASE T
WIFI	IEEE 802.11a/b/g/n
WPAN IEEE 802.15.1 (Bluetooth)	4.0 (LE)

SOFTWARE

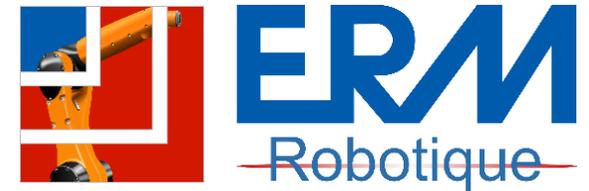
Open Nao	Embedded GNU/Linux Distribution based on Gentoo
Architecture	86
Programming	Embedded: C++ / Python Remote: Java



AskNAO Tablet & Blockly

Robotics serving children

NAO, education assistant robot



NAO, The humanoid robot

Designed in Paris by Softbank Robotics Company, NAO is the most famous humanoid robot in the world, with nearly 10,000 copies distributed worldwide, used in **research, technological training, point-of-sale animation, education...**

ERM Robotique use its remarkable features and charming design to make it a companion and assistant in robotics and healthcare.



Education & Digital technology

AskNAO Tablet, authored by ERM Robotique makes the robot even easier to use and program, so that everyone can benefit from NAO's power for young pupils' education.

Three main lines of work have been developed:

- 1 Use NAO to introduce students to programming and skills development through the manipulation of innovative items, such as custom Choreograph boxes.
- 2 Use NAO as an education assistant to instill knowledge and skills in one or more students with autonomous mini-educational sessions. NAO is, therefore, the support of a differentiated teaching playful and captivating within the class.
- 3 Nao is also a unique tool for specialized education, including the autism treatment, as evidenced by a growing number of studies. ERM Robotique offers a software suite developed in collaboration with several specialized centers, with a content designed to suit children with specific needs.

AskNAO Tablet

The easy NAO control solution
« Learn and have fun »

AskNAO Blockly

The easy NAO programming solution
« Learn computer code / create easily new activities »

Become partners

The activities offered by ERM are available in many languages. To help us translate them in new languages, become our partners !

Support & Educate children with autism

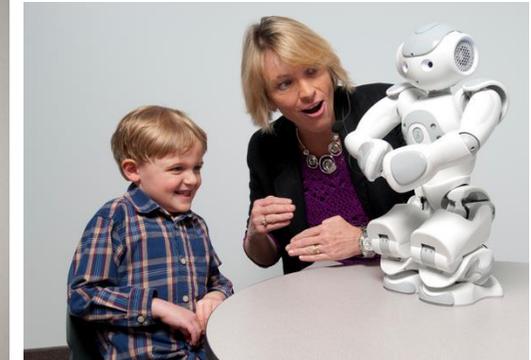
Learning companion for children with autism

AskNAO Tablet for autism is a complete **solution to assist educators in supporting children with autism troubles**. The solution includes NAO robot with a set of educational and playful applications written specifically for the needs of children with autism.



What are the benefits of having NAO in a classroom ?

NAO has demonstrated qualities adapted to the special-needs education context: NAO is captivating, predictable, tireless and multi-interactive. NAO is a technology humanoid interface that naturally attracts children. It helps to create communication bridges between the child and his entourage. It is easy to decrypt, helps to reduce children's anxiety and minimizes the overstimulation risks. NAO constantly encourages the child and repeat instructions. Thus, he feels confident and continues his efforts. Whether through touch, voice or sight, NAO also offers many possibilities of interactions.



What is the AskNAO Tablet environment purpose for autism?

Even without computer and robotic knowledge, this environment allows you to take control of the robot easily and at any time. AskNAO Tablet for autism allows to customize sessions according to each child profile. These educational applications are directly inspired by proven approaches and behavioral models. They are customizable, and you can select and personalize activities according to each child's learning objectives, motivation and personality. These applications cover a range of complementary and varied skills: interpersonal communication, everyday activities knowledge, emotions recognition ...



Activities developed for autism

ERM Robotique develops educational activities suitable to autistic children. We find 2 types of activities :



Spécifics

Imagined and designed for autistic children.



Suitables

Can be used by autistic children and children

Some activities with NAO for autistic children



- Activity «Point out objects on the ground»
- Activity «question / object selection in a closed list (tablet, oral)»
- Activity «Body schema, point out body parts»
- Activity «Visual stimulation with card games»
- Activity «Social ability and greetings»

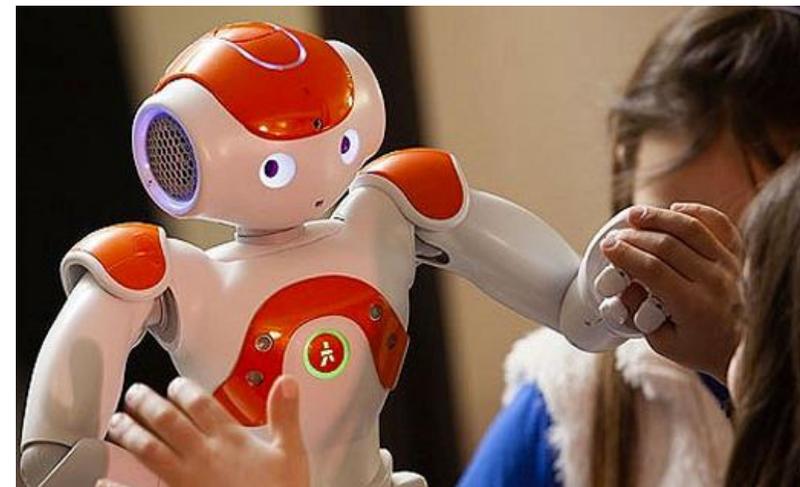
These activities have many goals aiming to help children :

- Use the « acquisition / restitution » method
- Limit parasitic words
- Use instructions with action verbs
- Develop motor skills

ERM develops specific contents on autism in the French experimental research program called NaotismIA.

Development of skills targeted for children with autism from 3 to 5 years-old:

- Imitation
- Sound orientation
- Look
- Comprehension



AskNAO Tablet, learning while having fun

ERM Robotique provides several ready-to-use games with the AskNAO Tablet solution. With this pre-installed content, the user has a turnkey solution and can start working with the robot right away. AskNao Tablet is a software suite that includes:

- ❑ **The tablet application** to control the robot very easily and launch “*apptivities*” on the robot.
- ❑ **Several pedagogical “*apptivities*”** developed in connection with teachers.



The tablet application

The tablet application is essential to benefit fully from AskNAO suite. Thanks to it, NAO robot has an additional media to show and describe, which increases its possibilities with exercises that can not be satisfied with oral answers, such as questions on conjugation or forms choice.

Moreover, you may control the robot: use the application to launch programs on NAO and control the volume, movements and speech.

Open to programming (SDK)

Create your own NAO programs: tools are at your disposal for easier creation!

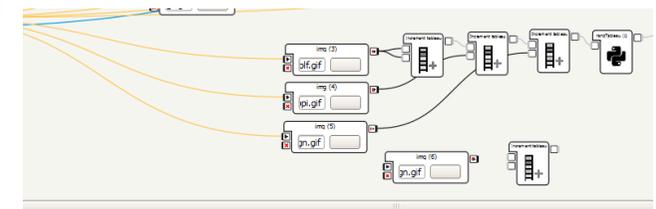
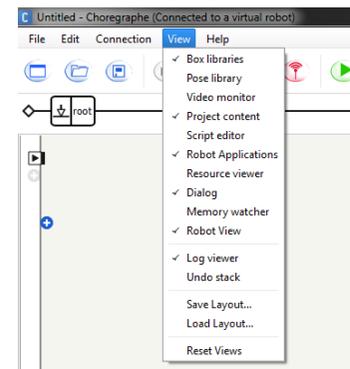
First tool is AskNAO Blockly. Interaction with the robot is allowed through this software.

Choregraphe libraries

Second tool is the Choregraphe libraries. Users with some algorithmic knowledge will be able to use the Choregraphe graphical programming environment and its potential. The program structure appears while the action boxes command the robot. To go further, these boxes are open with creation, modification and injection of Python code possibilities.

An actions boxes librarie is dedicated to communication with tablets, to display text or images. Some of them automates tasks like button screen management, configuration, quizz (questions, answers, multiplayer, awards...).

These tools are used by our developpers.



The « Apptivités »

ERM Robotic provide lots of educational activities «ready to use» with the AskNAO Tablet solution. **Those activities can be fun, therapy and sometimes both!** Through this pre-install content, the user have a turnkey solution and can start working straightaway with the robot. The applications are head towards 4 axes :

- ✓ Educational games
- ✓ Physicals activities for which the child has to imitate or guide NAO
- ✓ Stories which develop the children listening abilities
- ✓ Rewards



Physical activities



NAO's 25 degrees of freedom give him a great agility, allowing it to perform many positions and movements. The list of available activities is the following:

- ❖ **Yoga adventure:** NAO practices Yoga, and the child imitates its positions (Tablet version),
- ❖ **Follow me:** The child takes NAO by the hand, and the robot follows him.

Available in :



Awards

Awards are usually used to congratulate the child after an activity. It can be dances or movements to watch, in which the child is passive and therefore has no action to provide. Some of the AskNAO Tablet awards are:

- ❖ **Electroswing** dance: NAO dances on Little Lilly Swing by Tri Tachyon.
- ❖ **Zombie Disco** dance
- ❖ **Mister Funk** dance
- ❖ **Taichi Dance:** NAO makes Taichi movements



The playful solution for education: AskNAO Tablet

Educational games

NAO games usually take place as follows: the robot presents a situation, then it asks a question and pronounces an award sentence if successful. Answers can be given either orally, by showing an object, a map, or using the tablet. For special needs, the teacher can control the rollout of the game manually.

The list of available games is the following:



Colors game : The robot asks the child to recognize objects, by name and/or color, and possibly perform actions with (Customizable – For very young children).

Available in :



Goals :

- Build the first tools to structure the thinking.
- Receptive communication

*In collaboration et fund
by the Dijon Local
Education Authority*



Colors Hunt: NAO has lost his colors. The student must help him to find them by showing him the colors he named.

Disponibles en :



Images Game (Animals, Transportation...) : NAO asks the children to show him animals, transportation and other objects (customizable).

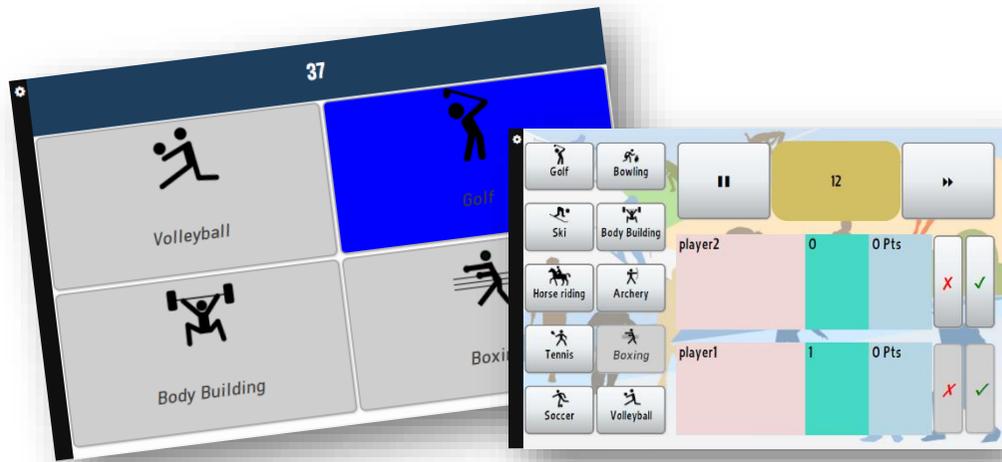
Available in :



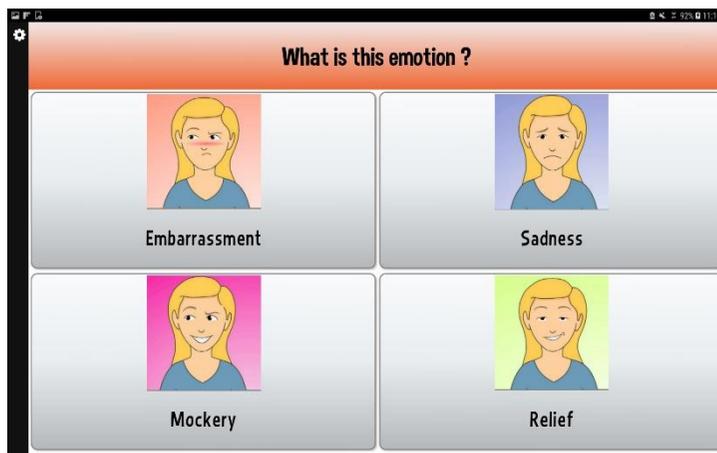
The playful solution for education: AskNAO Tablet



Guess a sport: The robot mimes a sport, and the children have to guess which one it is.



Guess my emotions: The robot mimes the emotions that the student must guess.



Stories

To stimulate children's attention and work on oral comprehension:

Available in :



The three musketeers: NAO tells the three musketeers story and mimes gestures

Time : 1 minute 15 seconds



Christmas eve: A little story for good children

Time : 4 minutes 30 seconds

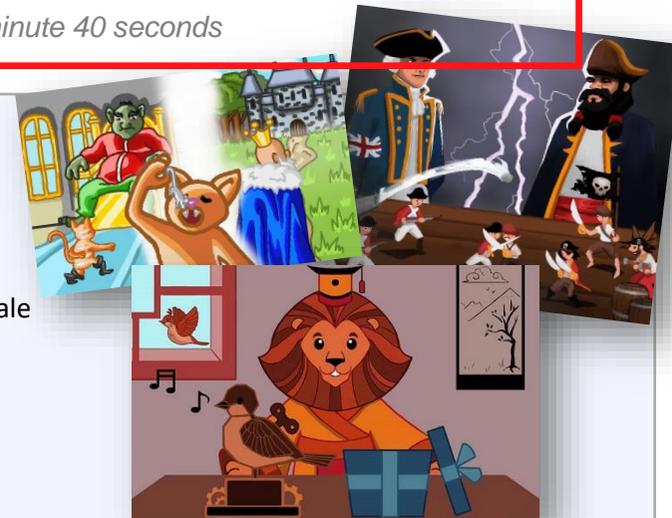


Pirates story: A story that involves sailors, parrots and a treasure

Time : 1 minute 40 seconds

In due course...

- ❖ The puss in boots
- ❖ The princess and the pea
- ❖ The king and the nightingale
- ❖ Ansel & Gretel
- ❖ The wolf and the snail
- ❖ Black beard
- ❖ The ugly Duckling



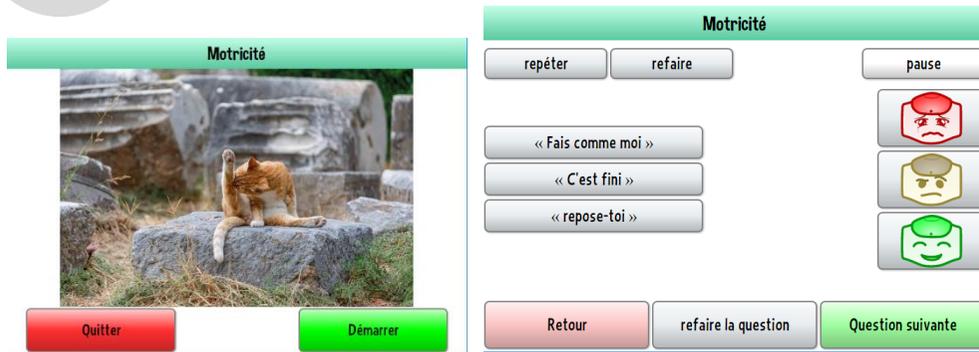
The playful solution for education: AskNAO Tablet

To come in 2020...

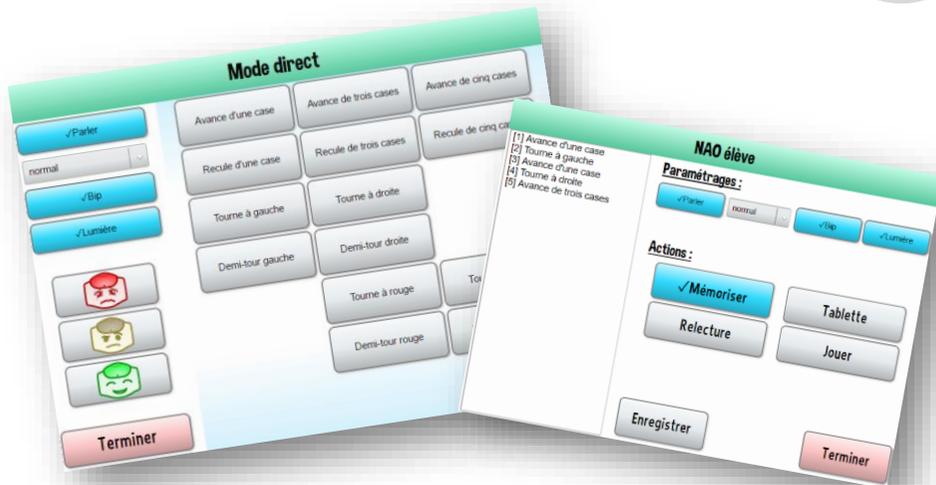
News activities are under development:



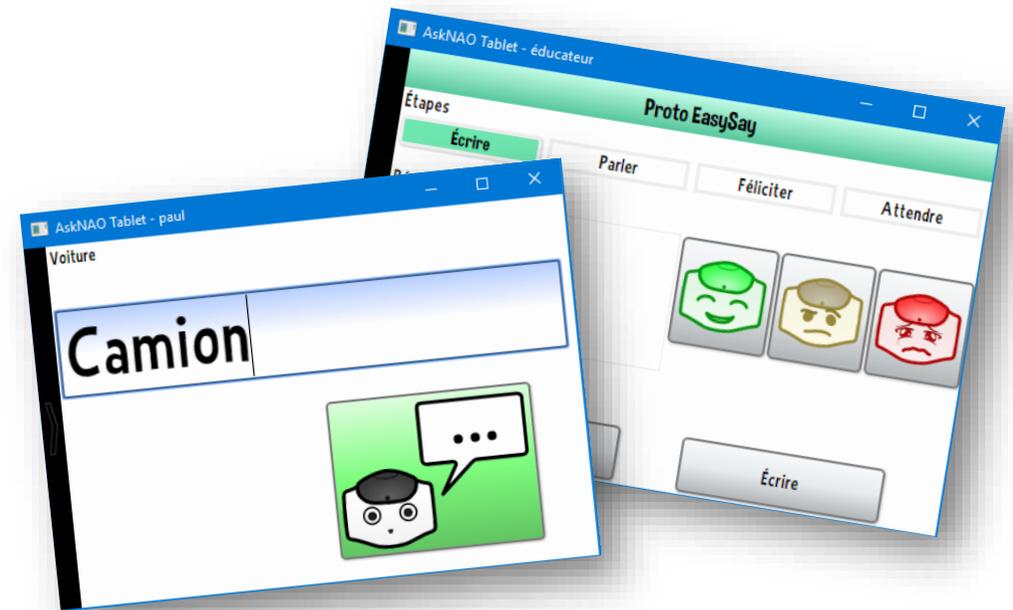
Motor function (with Dijon local education authority) : NAO realize simple or combined movement. The child has to imitate him at best. The aim: retain an education line and moving with a landmark.



Do a route (with DSDEN84) : NAO is programmed by children. With cards, they can give orders that will be memorized and replay by the robot. The roles can be reversed. Those physics activities allows children move their bodies.



Phoneme – Write (with Thierry LE BUHE, Saint Maurice Hospital) : The child makes the NAO robot speak. The educator asks the child to write a word that will be read aloud by NAO. The word archive is available by the educator.



Phoneme – Listen (with Thierry LE BUHE, Saint Maurice Hospital) : The aim is to distinguish phonemes. The educator prepares a letter, syllable, word line and an action verb that will be next asked by NAO near children. It is possible to record the words in cards. Then, NAO will say the content aloud that ones as soon as a child will show him the card.



Ask NAO Blockly : apprendre le code informatique

AskNAO Blockly: Learn coding

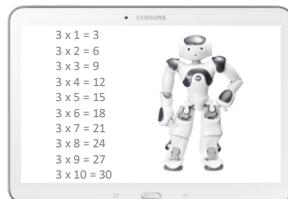
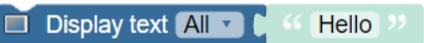
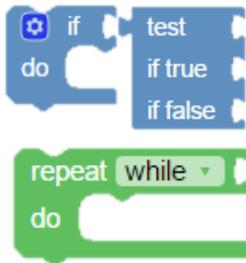
AskNao Blockly is a software suite that includes:

- ❑ A free online version (www.erm-robotique.com/blockly)
- ❑ A full offline version (school licence) with extended features like the control of tablets, the handling of media files (videos, sounds, images) and the generation of movements

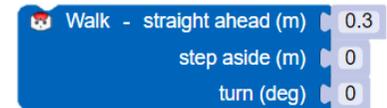
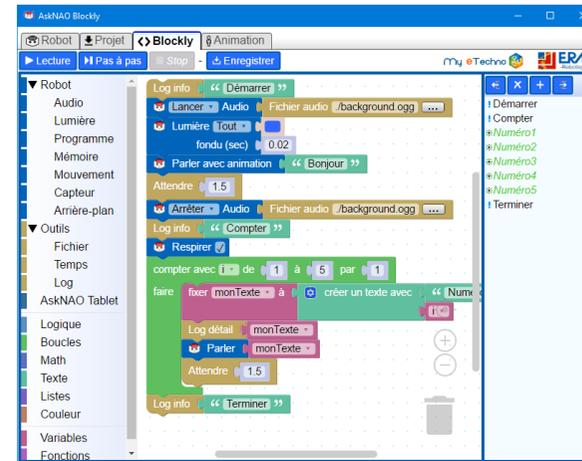
Thanks to Blockly, the children learn coding by programming NAO and the Tablet interface.

Functions with media files and communication with the Tablet

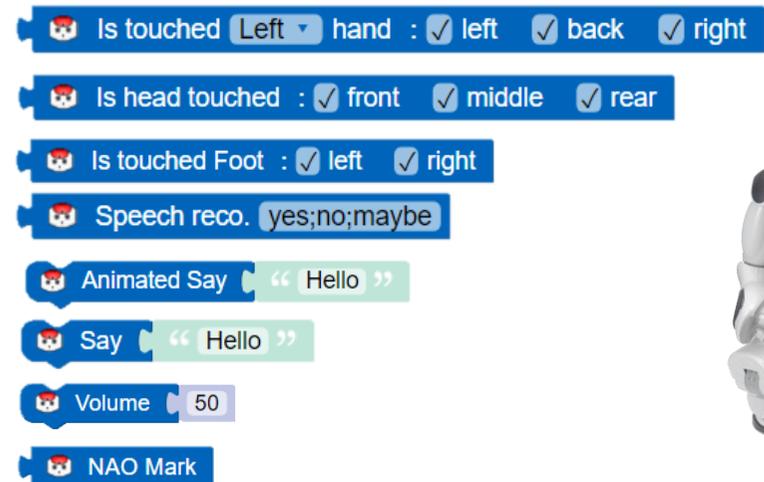
- Logic
- Loops
- Math
- Text
- Lists
- Color
- Variables
- Functions



Basic functions of the robot



Basic functions of Blockly



AskNAO Blockly, create easily

Thanks to Blockly, all teachers can create their own educative activities (capsules) and use them with their pupils.

Easy-to-create activity

- **Oral comprehension → Story telling**

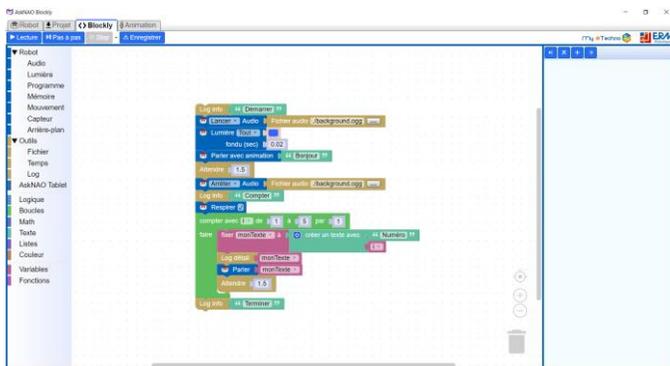
The NAO robot tells a story and, simultaneously, performs movements, displays images associated to words or sentences on the companion Tablet... It is also possible to complete the story with questions and answers...

- **Oral comprehension → Phonem recognition**

The NAO robot asks: «In which word do you hear the sound [u]?». NAO proposes several words and/or displays images associated to words on the companion Tablet. The child answers by repeating the word, proposing a card or selecting the right answer on the Tablet...

- **Human body and Gymnastics**

The NAO robot performs gymnastic movements or dances. Simultaneously, he gives explanations on the interest for the human body, on anatomy...



Activities examples

- ❖ **Tale of a Mischievous Cat**: NAO tells the beginning of a story where a cat breaks dishes at night, which wakes up its owners.
- ❖ **Review a SVT lesson**: The robot explains that a tree is a living being. Then he asks questions about their eating habits.
- ❖ **Count to three and do an ola**: Making the robot count is a very simple task. The little animation at the end is to make the exercise more fun.
- ❖ **Mental math**: NAO itself creates addition, subtraction, multiplication and division. He asks the question, waits a bit and gives the correct answer.
- ❖ **Finding the order**: NAO would like to brush his teeth but forgot in which order if to precede. The child has all of the response cards. He needs to find order and show the robot the cards. It is a fun way to teach everyday tasks.



Be creative and share your education capsules with the community

Native and foreign languages (20 languages supported by NAO), mathematics, history, geography, sports...



NAO & Accessories



- **Humanoid robot NAO (For Academic Edition)** with programming software suite (SDK, Choregraphe, Monitor) under site license and 2 years warranty - 2 languages pack (English + choice)
| **Réf. AR//NAOEUUK-B2A-2Y**
- **Humanoid robot NAO (For Academic Edition)** with programming software suite (SDK, Choregraphe, Monitor) under site license and 3 years warranty - 2 languages pack (English + choice)
| **Réf. AR//NAOEUUK-B2A-3Y**
- **Additional battery for NAO** | **Réf. AR//AC-NABT**
- **2A Li battery charger** | **Réf. AR//AC-NACH**
- **10 inch Android Tablet for AskNAO Tablet** | **Réf. ER//TabAndroïd10**
- **Router WiFi/Ethernet** | **Réf. ROUWIETH**
- **NAO transport case, small** | **Réf. AR//AC-NATC**



Softwares Suite

- **AskNAO Tablet** (Educational Games, Stories, Physical Activities, Rewards) for use in multi-tablets (1 Teacher and up to 4 students)
| **Réf. AskNAOtablet**
- **AskNAO Blockly** for Learning Coding and Creating Educational Activities Quickly
| **Réf. AskNAOBlockly - Licence établissement**

Expansions & Training

- Additional language for NAO | **Ref. AR // AC-NAAL**
- One year warranty extension for NAO H25, excluding battery | **Ref. AR // SP-H2504-05**
- User training, 1 day on site | **Ref. FO1JCLIENT**
- 1 day user training at ERM | **Ref. FO1JERM**
- Choregraph programming training, 2 days at ERM | **Ref. FO2JERM**
- Remote technical support for use and programming over 1 year, based on 20 hours of support | **Ref. SUPPORT1AN**



Dokumentą elektroniniu parašu pasirašė DOVILĖ ANDRIJAUSKAITĖ
Data: 2022-11-03 16:51:07
Paskirtis: Pirkimo nr. 633702
Vieta:
Energetikų g. 8, LT-52461, Kaunas
Kontaktinė informacija:
Viešųjų pirkimų specialistė