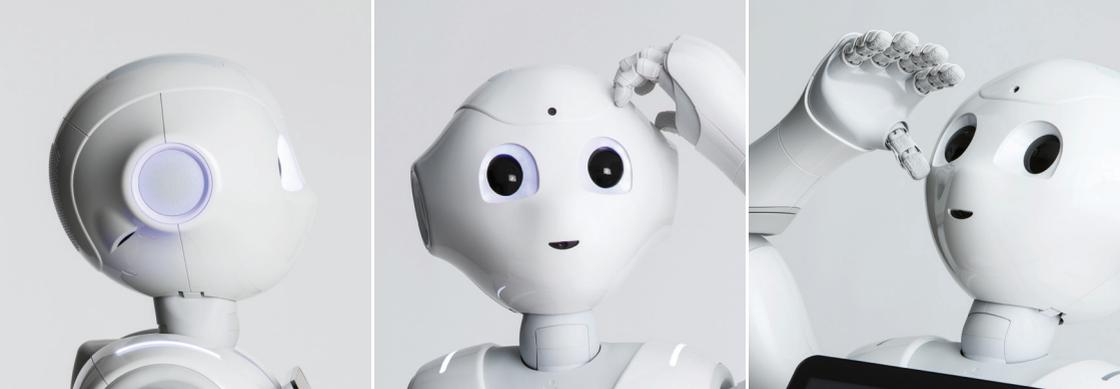
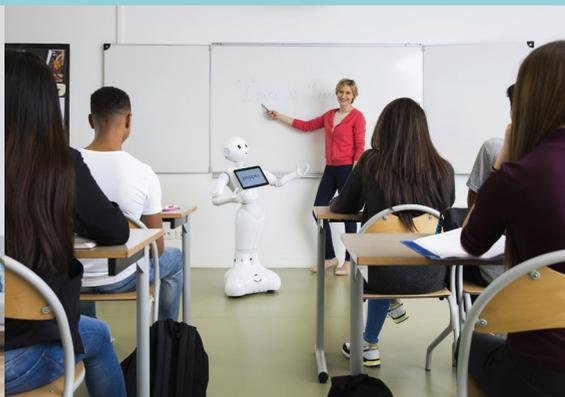




**LET'S
DESIGN
THE FUTURE
TOGETHER**



Pepper is a high performance robotic platform designed for a wide range of multimodal expressive gestures and behaviors, making it ideal for researchers and educators.



FOR RESEARCHERS

HRI, perception, cognition, navigation and localization are some of the fields that can be explored with Pepper.

Pepper was selected to become the standard platform for the **RoboCup@Home league** (<http://www.robocupathome.org/>). A dozen of teams from all around the world will use Pepper's set of skills and compete in the next two RoboCup events.

FOR EDUCATORS

Studying robotics-related fields with Pepper has already proven its relevance to educators with clear benefits for students. Using a robotic platform like Pepper:

- ▶ **Enhances creative problem-solving techniques.**
- ▶ **Promotes active learning.**
- ▶ **Encourages a multidisciplinary approach.**

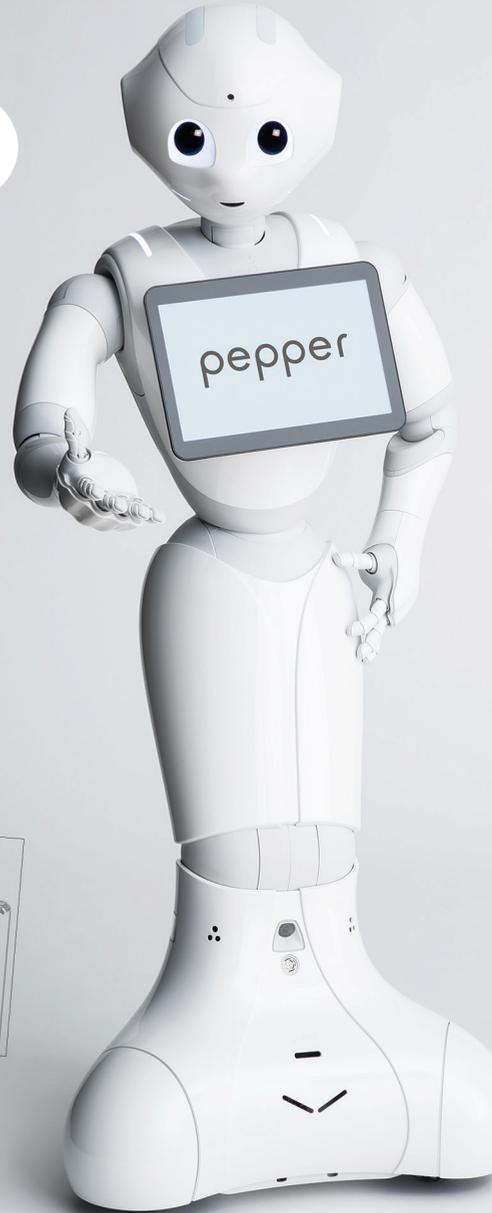
FEATURES

**PEPPER
IS AN OPEN
HUMANOID
PLATFORM**

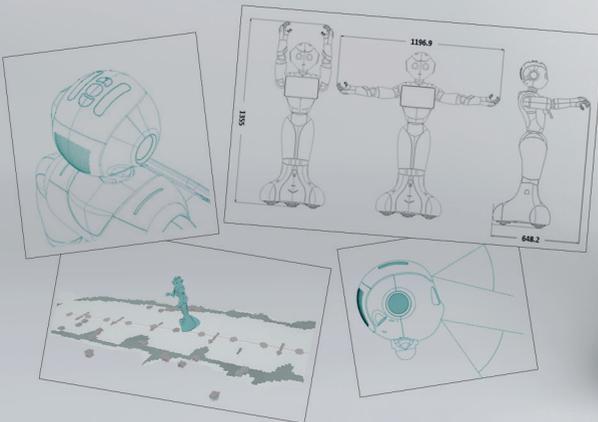
**3
OMNIDIRECTIONAL
WHEELS**

**12 HOURS
OF AUTONOMY**

**1.20 M
TALL**



- **20 degrees of freedom** for natural movement and gestures.
- **A tablet** to facilitate human-robot interactions.
- Speech Synthesis and Speech-to-Text available in **12 languages***.
- **People Perception modules** to recognize and track humans.
- **Various tactile areas**, LEDs, sensors and microphones for multi-modal interactions.
- **Infrared sensors**, bumpers, an inertial unit, **2D and 3D cameras** and **sonar sensors** for omnidirectional navigating capability.



SOFTWARE & RESOURCES

Pepper comes with all the foundational software required for researchers and educators.

NAOqi OS



Pepper -like the other SoftBank Robotics' robots NAO & Romeo- runs on NAOqi OS, a Unix based proprietary OS. The NAOqi Framework provides a programming base to develop applications on the robot. It corresponds to common robotics needs including: parallelism, resources, synchronization, events, etc.

Pepper is fully open and programmable. Several SDKs are provided to control and develop with Pepper :



C++



Java



Android



Python



Libqi C++ & Python



ROS bridge

A dedicated Simulator SDK package is also provided to simulate with any 3D simulator. It includes libraries, data, assets and examples.

We offer API with:

- **Low level methods** enabling sensor reading and precise piloting of any motor;
- **High level methods** giving access to a list of services like automatic detection of humans, obstacles avoidance, vocal synthesis.

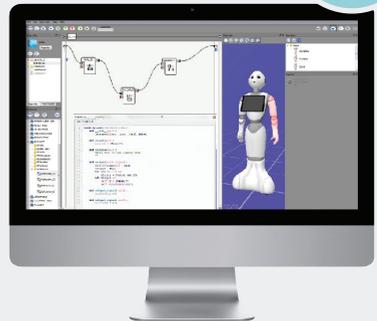
CHOREGRAPHE©



Choregraphe is a graphical robotics programming software created by SoftBank Robotics, that allows developers to:

- Develop and package complete applications,
- Design animation in interactive mode, without the need to pilot the robot's motors one by one,
- Design verbal interaction with QiChat, our human-robot dialogue design language.

Several tutorials are available on Choregraphe for a quick and effective understanding of the tool.



DOCUMENTATION



To assist users in their application development and research, **several resources are available online at www.doc.aldebaran.com.**

FEATURES

PHYSICAL CHARACTERISTICS

CONSTRUCTION

Dimension	1208.5 x 477.2 x 424 mm
Weight	28 kg
Standby mode autonomy	19 hours
Intensive use autonomy	12 hours

BRAIN SYSTEM

MOTHERBOARD

Processor	ATOM E3845
CPU	Quad core
Clock Speed	1.91 GHz
RAM	4 GB DDR3
Flash Memory	32 GB eMMC (of which 24 GB available for users)
GPU	Intel HD graphics up to 792 MHz

HUMAN INTERACTION

TABLET

Model	LG CNS Tablet
Dimensions	246 x 175 x 14.5 mm
Bluetooth	4.0

VISION

2D cameras	Location	1 in the mouth + 1 in the forehead
	Model	OV5640
3D Cameras	Location	1 in the eyes
	Model	ASUS XTION

IR SENSORS

Number	2
Position	1 on both sides
Wavelength	808 nm
Range	0 - 50 cm at 27 cm above the ground
Angle	2°

AUDIO

Loudspeakers	Location	1 in each ear
	Sensitivity	78 dB 1w/1m @1kHz
	Frequency response (-10 dB)	70 Hz / 7.2 kHz
Microphone	Location	4 on the head
	Sensitivity	300 mV/Pa +/- 3dB at 1 kHz
	Frequency range	100 Hz - 10 kHz [-10 dB relative to 1 kHz]

LEDS

Eyes, ears and shoulders

ENVIRONMENT SENSORS

INERTIAL UNIT

1 inertial unit composed of	3-axis gyrometer with an angular speed of ~500°/s
	3-axis accelerometer with an acceleration of ~2g

POSITION SENSORS

MRE (Magnetic Rotary Encoder)	30 using Hall effect sensor technology
	Precision 0.1°

SONARS

Position	1 in front and 1 at the back on the base
Frequency	42 kHz
Sensitivity	-86 dB
Resolution	0.03 m
Detection range	0* - 5m depending on object type* Closer than 0.3m will range as 0,3m
Effective cone	60° depending on the object type

LASERS

Number	3 horizontal lasers: 1 in the front and 1 on both sides 3 others in the base front casing
Class	1M
Wavelength	808 nm
Mode of Operation	Pulsed
Framerate	6.25 Hz per laser
Global shutter camera	Auto-exposure control
Emission	15 dots projected at 60°E
Detection range	20 cm to 2.8 m at 3 cm above the ground

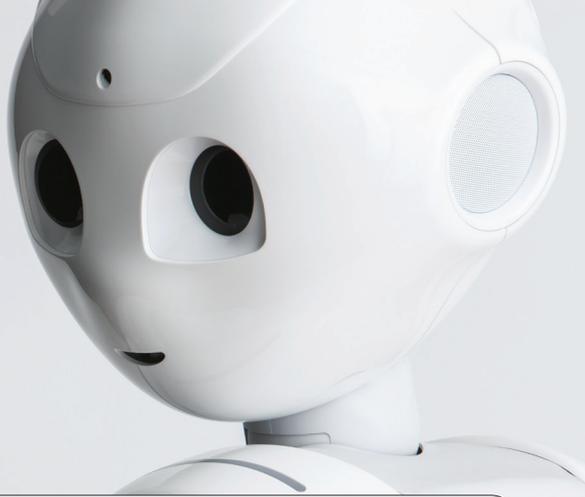
CONNECTIVITY

WI-FI	802.11 a/b/g/n
SECURITY	64/128 bit: WEP, WPA/WPA2
ETHERNET	1xRJ45 - 10/100/1000 base T

ENERGY

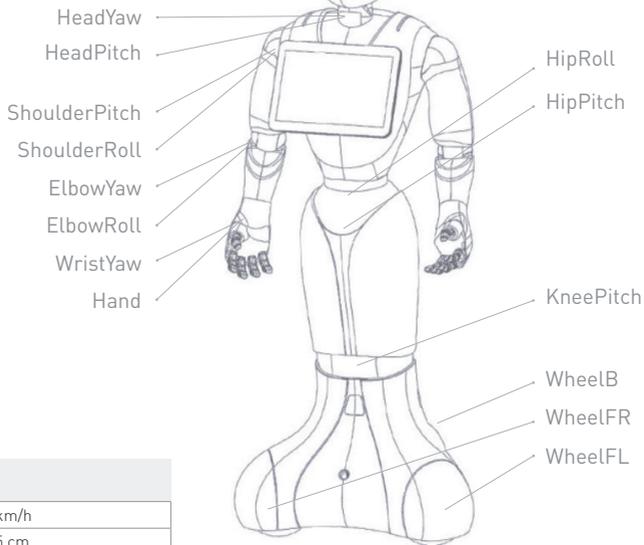
BATTERY

Type	Lithium-Ion
Nominal Voltage	26.46 V Battery robot protection: 22.5V-24.2 V (depending on temperature) Battery under voltage protection: 17.5 V Battery voltage lockout: 11.9 V
Max. charge voltage	29.4 V
Max. charge current	8 A



MOTION

POSITION OF MOTORS



MOTORS POWER

Motion speed	Up to 2 km/h
Climbing	Up to 1,5 cm
Max. slope	5°

ABOUT SOFTBANK ROBOTICS

SoftBank Robotics is driving technology forward by becoming a worldwide leader brand in robotics. SoftBank Robotics regroups more than 500 employees working in Paris, Tokyo, San Francisco, Boston and Shanghai. Over 20 000 SoftBank Robotics robots, NAO, Pepper and Romeo, are used in more than 70 countries worldwide and offer innovative applications relevant for the fields of research, education, retail, healthcare, tourism, hospitality and entertainment.

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