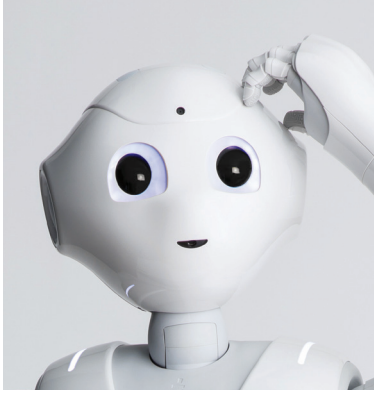
LET'S DESIGN THE FUTURE TOGETHER

Génération ROBOTS

SoftBank Robotics


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.**

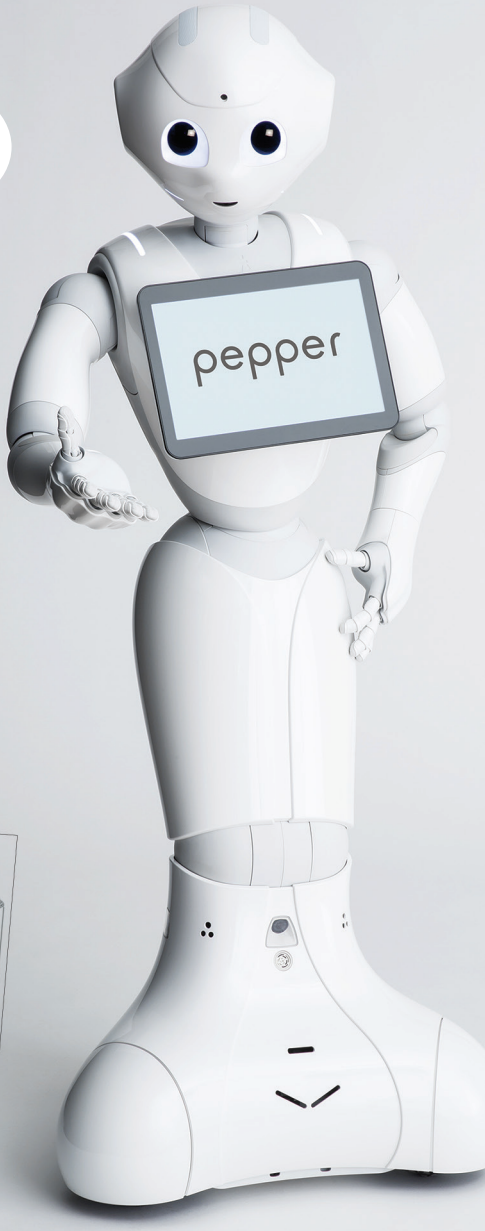
FEATURES

PEPPER IS AN OPEN HUMANOID PLATFORM

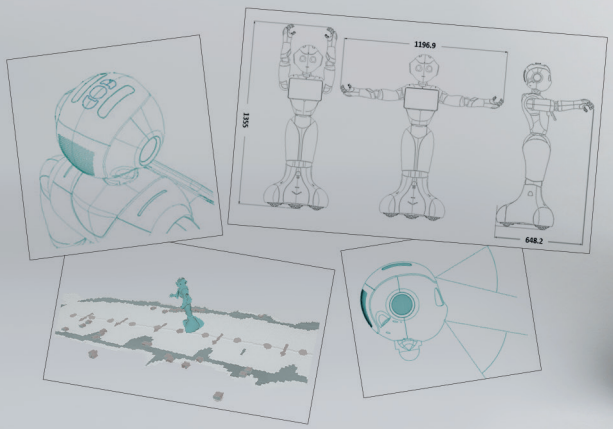
3 OMNIDIRECTIONAL **WHEELS**

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.



* Arabic, Chinese, Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Spanish and Polish.

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++
- Python
- Java
- Libqi C++ & Python
- Android
- ROS bridge

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

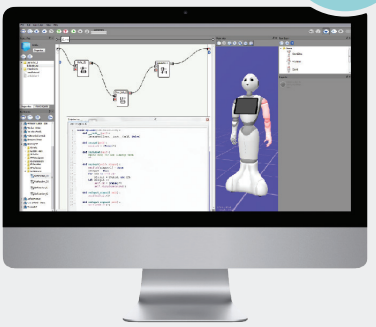
We offer API with:

- **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 developement 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
Wavelenght	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

ENVIRONEMENT 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 ~2q

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
Wavelenght	808 nm
Mode of Operation	Pulsed
Framerate	6.25 Hz per laser
Global shutter camera	Auto-exposure control
Emission	15 dots projected at 60°£
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

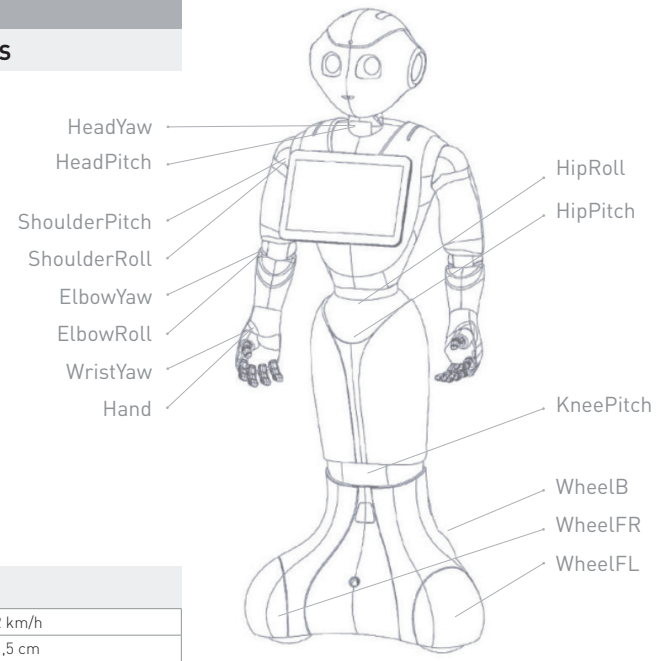
ENERGY

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

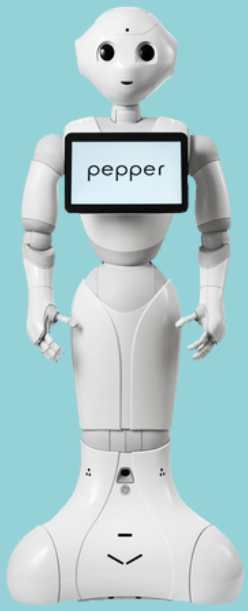
MOTION

POSITION OF MOTORS



MOTORS POWER

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



Génération ROBOTS

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