# Humanoid robots in the world

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Humans have been trying to build robots that look like humans for hundreds of years. Baked clay figurines of people in Europe and China made 7,000 years ago have been found. Egyptian civilization 3000 years ago, created articulated statues that could be controlled by hidden operators. For the selection of the new king at Thebes, an articulated statue of Amun - one of the major Egyptian gods, who was depicted as a man with a ram's head - was used. This statue was secretly controlled by the priests when male members of the royal family walked in front of it. Other creators of humanoid robots from the past include - Leonardo da Vinci (designed the mechanical equivalent of man - early 18th Century), Jacques de Vaucanson (constructed in 1737-1738 a flute player, and a tambourine player), Pierre Jacquet-Drooz with son (constructed several humanoids, e.g. a female organist who simulated breathing and direction of gaze to look at the audience and at her hands during music - in the 18th century), Henri Maillardet (built a boy humanoid robot that was able to write text in both French and English, and could also draw different landscapes - in 1815. Today we have new knowledge about mechatronic systems and artificial intelligence. This is why humanoid robots are now being designed by companies to be able to use artificial intelligence - to categorise people in close contact, to process sound, to perform a certain task, etc. Companies and universities creating humanoid robots – Hanson Robotics (Sophia), University of Geneva (Nadia), Osaka University (Erica), Honda Motor Company, Shadow Robot Company,  Samsung Electronics, Google etc.

## The use of humanoid robots

Humanoid robots, in their design and functions, are similar in appearance to ordinary humans. They should also behave like humans and have similar means of communication to humans. The pace of robotics development is rapid, and individual countries often encourage this development because of its potential to bring economic benefits to the country. For example, the workforce in Japan is declining significantly, seriously threatening Japan's economy, and it is robots that are seen as the current solution. In addition to using robots to produce goods, the aim is to use robots as cleaners, sales assistants, museum guides, carers for the young and old, presenters of TV programmes, and they could also work as teachers.

*Some uses of humanoid robots:*

a) Robotic Avatar - The T-HR3 is a humanoid robot that, like a real-world avatar, mimics the actions of its human operator.

b) Robotic Ambassador

c) Delivery Robot - The headless humanoid is equipped with agile limbs and a slew of sensors. It is capable of navigating stairwells, various obstacles, and varied terrains. It has the ability to pick up and stack boxes weighing up to 40 pounds

d) Robotic Bartender - Robotic Bartender Kime, who has been tested at gas stations around Europe and in a Spanish brewery, is reported to be quite good at pouring beer and can serve up to 300 glasses each hour.

e) Robonauts - Humanoids for space exploration are being developed by a number of countries. Microgravity tests will be conducted by the robot in order to help prepare for future crewed trips

f) Educational Robot

g) And others...



The majority of the research is in the field of medicine. Humanoid robots were most commonly utilized to treat autism (65%), diabetes (15%), cancer (10%), and cerebral palsy (10%). Humanoid robots reduced the severity of autism in youngsters and improved their social behavior and communication skills. Furthermore, using humanoid robots increased autistic children's collaborative behavior and learning ability, and interacting with robots made them feel entertained and at ease. Aside from successfully treating autism, humanoid robots have shown to be effective in diabetic education and reducing stress in pediatric cancer patients. Interacting with humanoid robots boosted the spirits of cerebral palsy patients. The robot's use also improved therapy efficiency by causing the patient and the therapist to pay attention to each other.
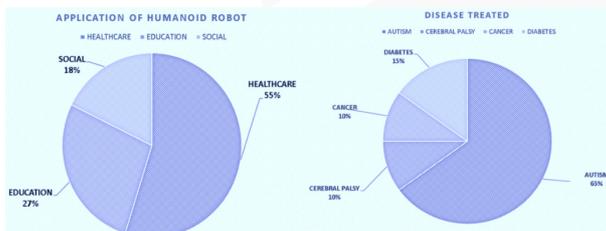


## Sensors for mobile robots

If monitoringHumanoid robots contain a number of different sensors for acquiring data in the robot's environment and from its internal devices.

To categorize sensors using two key functional axes: and passive/active.

a) Proprioceptive sensors - Internal values of the system (robot) are measured, such as motor speed, wheel load, robot arm joint angles, and battery voltage.

b) Exteroceptive sensors - Obtain data from the robot's surroundings, such as distance measurements, light intensity, and sound amplitude. As a result, the robot interprets exteroceptive sensor signals in order to extract significant environmental information.

c) Passive sensors – detect the amount of energy that enters the sensor from the environment. Temperature probes, microphones, and CCD or CMOS cameras are examples of passive sensors.

d) Active sensors - Sensors release energy into the environment and then measure the response. Active sensors frequently outperform passive sensors because they can manage more regulated interactions with the environment.

## Most advanced social humanoid robots

Nowadays, many companies and universities are involved in the production of humanoid robots. The subsections below, show a few humanoid robots that have the most advanced capabilities.



The project we are currently working on at the Department of Automation and Production Systems is the design of humanoid eyes. Humanoid eyes are used in the creation of humanoid robots as a means of perceiving the surrounding world in which the robot finds itself. By placing cameras in humanoid eyes, the control unit (RPi) and through machine vision, it is possible to control the devices by gestures, categorize the sensed objects, track the object, etc. The design of the humanoid eye structure is shown bellow. The components used in the design are: 2x SG90 servomotors; 7x M3x15 screws; 1x M2x30 screw; printed components from 3D models on a 3D printer.
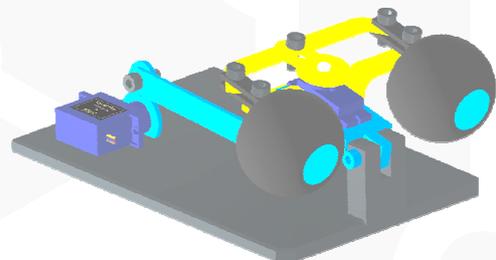


## Conclusion

The article deals with humanoid robots and their use in everyday life. It is expected that humanoid robots will be increasingly implemented in people's daily lives. These robots can replace living humans in certain applications and, in some cases, save human lives. Due to the continuous development of humanoid robots, we decided to create a stereovision mechatronic system - humanoid eyes. This project is still in the design phase - we are still working on this project.