

Future Trend Forum – Key Technology Template

1 Description

The objective of this template is to provide a common structure to document the key technologies identified by the Future Trend Forum group. The idea is that this content will be published on a common website served by the PTA.

Each webpage should provide sufficient information to gain a basic understanding on the technology for a layman, and to provide additional resources and key pointers for specialized companies to further their knowledge.

The contact person for each key technology is responsible for keeping the content up to date.

2 Template Fields

2.1 Technology Name

Robotics

2.2 Contact company/person

Aeorum España S.L.

Manuel Ruiz de Quintanilla (manuel@aeorum.com)

2.3 Technology Overview

Brief description and benefits of the technology [2 pages max]

Robotics is an interdisciplinary field that integrates computer science and engineering. Robotics involves design, construction, operation, and use of robots. The goal of robotics is to design machines that can help and assist humans. Robotics integrates fields of mechanical engineering, electrical engineering, information engineering, mechatronics, electronics, bioengineering, computer engineering, control engineering, software engineering, among others.

Robotics develops machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for many purposes, but today many are used in dangerous environments (including inspection of radioactive materials, bomb detection and deactivation), manufacturing processes, or where humans cannot survive (e.g. in space,

underwater, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics.

Certain robots require user input to operate while other robots function autonomously. The concept of creating robots that can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century. Throughout history, it has been frequently assumed by various scholars, inventors, engineers, and technicians that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion. Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots are built to do jobs that are hazardous to people, such as defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks. Robotics is also used in STEM (science, technology, engineering, and mathematics) as a teaching aid.

2.4 History and major achievements

Technology timelines, when did it start, how has it evolved [2 pages max]

Date	Significance
Third century B.C. and earlier	One of the earliest descriptions of automata appears in the <i>Lie Zi</i> text, on a much earlier encounter between King Mu of Zhou (1023–957 BC) and a mechanical engineer known as Yan Shi, an 'artificer'. The latter allegedly presented the king with a life-size, human-shaped figure of his mechanical handiwork.
First century A.D. and earlier	Descriptions of more than 100 machines and automata, including a fire engine, a wind organ, a coin-operated machine, and a steam-powered engine, in <i>Pneumatica</i> and <i>Automata</i> by Heron of Alexandria
c. 420 B.C	A wooden, steam propelled bird, which was able to fly
1206	Created early humanoid automata, programmable automaton band
1495	Designs for a humanoid robot
1560's (Unspecified)	Mechanical Monk that had machinal feet built under it's robes that imitated walking. The Robot's eyes, lips and head all move in lifelike gestures.
1738	Mechanical duck that was able to eat, flap its wings, and excrete
1898	Nikola Tesla demonstrates first radio-controlled vessel.

1921	First fictional automatons called "robots" appear in the play <i>R.U.R.</i>
1930s	Humanoid robot exhibited at the 1939 and 1940 World's Fairs
1946	First general-purpose digital computer
1948	Simple robots exhibiting biological behaviors
1956	First commercial robot, from the Unimation company founded by George Devol and Joseph Engelberger, based on Devol's patents
1961	First installed industrial robot.
1967 to 1972	First full-scale humanoid intelligent robot, and first android. Its limb control system allowed it to walk with the lower limbs, and to grip and transport objects with hands, using tactile sensors. Its vision system allowed it to measure distances and directions to objects using external receptors, artificial eyes and ears. And its conversation system allowed it to communicate with a person in Japanese, with an artificial mouth.
1973	First industrial robot with six electromechanically driven axes
1974	The world's first microcomputer controlled electric industrial robot, IRB 6 from ASEA, was delivered to a small mechanical engineering company in southern Sweden. The design of this robot had been patented already 1972.
1975	Programmable universal manipulation arm, a Unimation product
1978	First object-level robot programming language, allowing robots to handle variations in object position, shape, and sensor noise.
1983	First multitasking, parallel programming language used for a robot control. It was the Event Driven Language (EDL) on the IBM/Series/1 process computer, with implementation of both inter process communication (WAIT/POST) and mutual exclusion (ENQ/DEQ) mechanisms for robot control.

2.5 Hot Topics & Key challenges

Challenges associated with the technology. Current hurdles the community is trying to overcome [3 pages max]

2.6 Market

Global market opportunity and trends [2 pages max]

2.7 TechPark companies involved in this research line

List of TechPark companies that are leveraging this technology. Differentiate between adopters (companies that use the technology to solve a problem) and leaders (companies that

are working on improving the technology or tackling some of the key challenges associated with the technology).

Include a brief description about how they are using (for adopters) or improving (for leaders).

2.8 University departments actively involved in this research line

List of University departments and key professors that are using or investigating this technology. Include a brief description of their related research line.

2.9 Relevant discussion forums

Include a list of the most relevant discussion forums (conferences, events, local meetups, ...) where the community is sharing progress around this technology

- Worldwide
- National
- Local

2.10 Key reference companies & people

Include a list of the top companies that are a reference in terms of pushing this technology forward

- Worldwide
- National (if any)
- Local (if any)

2.11 Strategic Initiatives linked to the technology

Current European, Spanish or Andalusian strategic projects and guidelines

2.12 List of Current Projects

Active projects from TechPark companies related to this technology

2.13 Additional resources

Links to gain deeper knowledge on the technology

<https://en.wikipedia.org/wiki/Robotics>

<https://www.wikihow.com/Learn-Robotics>

<https://www.udemy.com/topic/robotics/>

<https://www.edx.org/learn/robotics>