

Types of robots

Robotics is the engineering science and technology which involves the conception, design, operation and manufacture of robots. Electronics, mechanics and software are brought together by robotics. Robots are used for jobs that are dirty, dull and dangerous. Today robotics has many different application areas. Some of those are:

Outer Space Applications

Robots are playing a very important role for outer space exploration. The robotic unmanned spacecraft is used as the key of exploring the stars and planets. The most famous robots used in the outer space applications are the Mars rovers of NASA. In 1997 The Pathfinder Mission landed on Mars. Its robotic rover Sojourner, rolled down a ramp and onto Martian soil in early July. It continued to broadcast data from the Martian surface until September.

Sojourner performed semi-autonomous operations on the surface of Mars as part of the Mars Pathfinder mission; equipped with an obstacle avoidance program. Sojourner was capable of planning and navigating routes to study the surface of the planet. Sojourner's ability to navigate with little data about its environment and nearby surroundings allowed the robot to react to unplanned events and objects. After Sojourner's mission NASA sent twin robots Spirit and Opportunity to the Red Planet.

Spirit and Opportunity are solar powered robots with six wheels included their own motors. Both of the Mars Rovers are 1.5 m high, 2.3 m wide and 1.6 m long and weighing 180 kg. Spirit and Opportunity have many science instruments in order to perform their missions on Mars. They have a robotic arm, that contains a spectrometer to investigate the mineralogy of the rocks and soils on Mars, an Alpha particle X-ray spectrometer for analysis of elements found in rocks and soils, a rock abrasion tool used to expose the fresh material for examination, a microscopic imager and magnets to collect magnetic particles. The twin Mars Rovers have a panoramic camera used for examinations of the texture, color, mineralogy, and structure of the local terrain, a miniature thermal emission spectrometer for identification promising rocks and soils which is useful to determine the formation processes of them. There is also a navigation camera on both Mars rovers in order to take view with a higher field but lower resolution for driving and navigation.

Military Applications

In today's modern army robotics is an important factor which is researched and developed day by day. Already remarkable success has been achieved with unmanned aerial vehicles like the Predator drone, which are capable of taking surveillance photographs, and even accurately launching missiles at ground targets, without a pilot. Other applications include bomb disposal, transportation and reconnaissance. Equipped with sensors, they can react more rapidly than humans in emergency and hazardous situations.

Intelligent home applications

We can monitor home security, environmental conditions and energy usage with intelligent robotic home systems. Door and windows can be opened automatically and appliances such as lighting and air conditioning can be pre programmed to activate. This assists occupants irrespective of their state of mobility. This type of robots includes many different devices such as robotic vacuum cleaners, robotic pool cleaners, sweepers, gutter cleaners and others.

Industrial applications

From the beginning of the industrial revolution robotics and automation becomes the most important part of manufacturing. Robotic arms which are able to perform multiple tasks such as welding, cutting, lifting, sorting and bending are used in factories. The most commonly used configurations of the industrial robots are:

Articulated Robots: An articulated robot is one, which uses rotary joints to access its work space. Articulated robots can range from simple two-jointed structures to systems with 10 or more interacting joints. The six-axis, articulated robot is the most versatile industrial robot which allows for a high level of freedom.

Cylindrical Coordinate Robots: These robots have three degrees of freedom and they move linearly only along the Y and Z axes with a cylindrical work envelope.

Scara Robots: It stands for Selective Compliant Assembly Robot Arm or Selective Compliant Articulated Robot Arm. SCARA robots usually have four axes as any X-Y-Z coordinate within their work envelope and a fourth axis of motion which is the wrist rotate (Theta-Z).

Spherical Coordinate Robots: The spherical arm, also known as polar coordinate robotic arm, has one sliding motion and two rotational, around the vertical post and around a shoulder joint.

Cartesian Coordinate Robots: Rectangular arms are sometimes called "Cartesian" because the arm's axes can be described by using the X, Y, and Z coordinate system. It is claimed that the cartesian design will produce the most accurate movements.

Delta Robots: A Delta robot consists of three arms connected to universal joints at the base. The key design feature is the use of parallelograms in the arms, which maintains the orientation of the end effector. The Delta robot has popular usage in picking and packaging in factories.

EXERCISES

I. What are the functions of outer space robots' instruments?

1. spectrometer
2. particle X-ray spectrometer
3. rock abrasion tool
4. imager
5. magnets
6. panoramic camera
7. thermal emission spectrometer
8. navigation camera

II. Match the words (1-15) with their Polish translations (a-o).

- | | |
|-----------------|--------------------------|
| 1. application | a. cząsteczki |
| 2. manufacture | b. przegubowy |
| 3. rover | c. zastosowanie |
| 4. ramp | d. rozdzielczość |
| 5. abrasion | e. inwigilacja |
| 6. particles | f. prostokątny |
| 7. texture | g. oś |
| 8. surveillance | h. precyzyjny, dokładny |
| 9. resolution | i. montaż |
| 10. versatile | j. struktura, faktura |
| 11. articulated | k. przegub |
| 12. assembly | l. produkcja, produkować |
| 13. axis | m. wszechstronny |
| 14. rectangular | n. ścieranie |
| 15. accurate | o. pojazd, pochylnia |
| 16. joint | p. włącząca |

III. Match the words to make collocations.

- | | |
|-----------------|----------------|
| 1. outer | a. situations |
| 2. unmanned | b. success |
| 3. obstacle | c. movement |
| 4. surveillance | d. spacecraft |
| 5. aerial | e. joints |
| 6. hazardous | f. system |
| 7. rotary | g. photographs |
| 8. accurate | h. avoidance |
| 9. key | i. effector |
| 10. remarkable | j. vehicles |
| 11. coordinate | k. feature |
| 12. end | l. space |

IV. Match the verbs (1-7) with the nouns (a-g).

- | | |
|-----------------|---------------|
| 1. to broadcast | a. missiles |
| 2. to perform | b. tasks |
| 3. to launch | c. operations |
| 4. to perform | d. success |
| 5. to achieve | e. missions |
| 6. to determine | f. data |
| 7. to perform | g. process |

V. Complete the sentences with the following prepositions. They can be used more than once.

about, of, for, to, with, along, from

1. Applications of robots can range _____ military to industrial ones.
2. The articulated robot is the most versatile industrial robot allowing _____ a high level of freedom.
3. Cylindrical coordinate robots have three degrees of freedom and they move linearly _____ the X and Y axes.
4. As they are equipped _____ sensors, robots are capable _____ reacting more rapidly than humans.
5. Robots' ability to navigate _____ its environment and nearby surroundings allowed them to react _____ unplanned events.
6. One of the tasks of outer space robots is to collect material _____ examination.
7. All industrial robots are equipped _____ some form of joints, irrespective _____ the task they perform.

VI. Make nouns out of the given words.

1. high – _____
2. long – _____
3. wide – _____
4. weigh – _____
5. deep – _____

VII. Describe the objects using the given data.

Example

1. How high is the building?
It's 23 meters high.
 2. What is the height of the building?
It's 23 meters.
-
1. monument – 14 meters high
 2. corridor – 17 meters long
 3. window – 7 meters wide
 4. car – 780 kilograms
 5. pool – 3 meters deep

VIII. Explain the difference between the following words.

1. rotate, rotary, rotational
2. axis, axes
3. robot, robotic, robotics

IX. Translate the sentences into English.

1. Ramię robotyczne jest zdolne do wykonywania wielu zadań takich jak cięcie, spawanie, podnoszenie oraz wyginanie.

2. Najbardziej wszechstronnym robotem przemysłowym jest sześćoosiowy robot przegubowy, ponieważ pozwala na szerokie wykorzystanie w procesie produkcji.
3. Ten robot ma zwykle 4 osie ruchu pozwalające na różne rodzaje ruchu – obrotowy oraz przesuwny.
4. Współczesny przemysł coraz częściej sięga po tanie roboty: ramiona robotyczne oraz lekkie manipulatory.
5. Manipulator robotyczny jest to mechaniczne ramię, stosowane głównie w fabrykach samochodów, automatycznych liniach produkcyjnych, i w fabrykach, w których istnieje zagrożenie dla zdrowia ludzi.

X. Find examples of sentences in the passive voice in the article.

XI. Change the following sentences into the passive voice.

1. Sojourner performed semi-autonomous operations on the surface of Mars.
Semi-autonomous operations _____ on the surface of Mars.
2. We can monitor home security, environmental conditions and energy usage with intelligent robotic home systems.
Home security, environmental conditions and energy usage _____ with intelligent robotic home systems.
3. An articulated robot is one which uses rotary joints to access its work space.
Rotary joints _____ by an articulated robot to access its work space.
4. After Sojourner's mission NASA sent twin robots Spirit and Opportunity to the Red Planet.
After Sojourner's mission twin robots Spirit and Opportunity _____ to the Red Planet.
5. This type of robots includes many different devices such as robotic vacuum cleaners, robotic pool cleaners, sweepers and gutter cleaners.
Many different devices such as robotic vacuum cleaners, robotic pool cleaners, sweepers and gutter cleaners _____ in this type of robot.
6. Aerial vehicles like the Predator drone, which are capable of accurately launching missiles at ground targets, have already achieved remarkable success.
Remarkable success _____ by aerial vehicles like the Predator drone, which are capable of accurately launching missiles at ground targets.

XII. Match the words with their pronunciation. Then practice reading them.

- | | |
|-----------------|--------------------------|
| 1. vehicle | a. /vɜ:sətɑɪl/ |
| 2. surveillance | b. /tekstʃə/ |
| 3. versatile | c. /eəriəl/ |
| 4. texture | d. /vi:əkl/ |
| 5. accurate | e. /sferɪkl/ |
| 6. feature | f. /tekstʃə/ |
| 7. aerial | g. /sɜ:veɪləns/ |
| 8. spherical | h. /ækjərət/ |
| 9. missile | i. /ɪniə/ |
| 10. texture | j. /fi:tʃə/ |
| 11. linear | k. /mɪsaɪl/ /mɪs(ə)l/ |

XIII. Match the pictures with the names of robots.

cartesian robot, Sojourner, spherical robot, Scara robot, articulated robot, Opportunity, Delta robot



2. _____



1. _____



3. _____



4. _____



5. _____



6. _____



7. _____

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Mgr Dorota Kulas