

# Robotics and its Applications, Progression and Challenges

## OPEN ACCESS

Volume: 13

Special Issue: 3

Month: February

Year: 2026

P-ISSN: 2321-788X

E-ISSN: 2582-0397

Citation:

Karthiga, J., et al.  
“Robotics and its Applications, Progression and Challenges.” *Shanlax International Journal of Arts, Science and Humanities*, vol. 13, no. 3, 2026, pp. 296–300.

DOI:

<https://doi.org/10.34293/sijash.v13iS3-i2-Feb.10294>

**Mrs. J. Karthiga**

*Assistant Professor, Department of Computer Science  
Thiruthangal Nadar College, Chennai*

**Dr. PT. Kasturi Bai**

*Head & Associate Professor, Department of Computer Science  
Thiruthangal Nadar College, Chennai*

**Dr. S. Janakiraman**

*Associate professor Department of Mechatronics Engineering  
Hindustan Institute of Technology and Science Padur, Chennai*

## Abstract

*Robotics is an interdisciplinary field that integrates mechanical engineering, electronics, computer science, and artificial intelligence to design, develop, and operate intelligent machines capable of performing tasks autonomously or semi-autonomously. Over the past few decades, robotics has transformed industries, healthcare, agriculture, defense, and domestic environments. This paper presents an overview of robotics, its core components, classifications, and major applications across various sectors. The study also highlights recent advancements, benefits, challenges, and future trends in robotics, emphasizing its role in improving efficiency, precision, and quality of human life.*

**Keywords:** Robotics, Automation, Artificial Intelligence, Industrial Robots, Service Robots

## Security

One of the top applications of robotics is in the field of security. Imagine a world where all security guards are robots. Even thieves would think twice before committing a crime! That’s why robotics is being considered as a solution to enhance security measures. Robots can serve as security agents, protecting humans without being vulnerable to danger like human security guards.

One prominent company leading the way in this field is Knightscope in the United States. They have developed autonomous security robots equipped with cutting-edge features to assist human security guards effectively. These robots are capable of providing real-time, actionable intelligence, helping to prevent and address various crimes such as armed robberies, burglaries, domestic violence, fraud, hit-and-runs, and more.

## **Space Exploration**

Many things in space are very dangerous for astronauts to do. Humans can't roam on Mars all day to collect soil samples or work on repairing a spaceship from the outside while it's in deep space! In these situations, robots are a great choice because there are no chances for the loss of human life. So space institutions like NASA frequently use robots and autonomous vehicles to do things that humans can't. This can be one of the top applications of robotics.

For example, Mars Rover is an autonomous robot that travels on Mars and takes pictures of Martian rock formations that are interesting or important and then sends them back to Earth for NASA scientists to study.

## **Entertainment**

Another top application of robotics is robots are also a big draw in the entertainment industry. While they cannot exactly become actors and actresses, they can be used behind the sets in movies and serials to manage the camera, provide special effects, etc. They can be used for boring repetitive tasks that are not suitable for a human as cinema is, after all, a creative industry. Robots can also be used to do stunt work that is very dangerous for humans but looks pretty cool in an action movie. Theme parks like Disney World are also using autonomous robots to enhance the magical experience of their customers.

## **Agriculture**

Agriculture is the sector that is the basis of human civilization. However, agriculture is also a seasonal sector that is dependent on ideal weather conditions optimal soil, etc. One of the top applications of robotics in agriculture is for harvesting crops. Robotic harvesters streamline the harvesting process, allowing farmers to complete tasks more efficiently. An exemplary robot used for weed removal in farms is the Ecorobotix. This innovative robot is powered by solar energy and equipped with a sophisticated camera system. It precisely targets and sprays weeds, minimizing the need for manual labor and chemical usage while optimizing crop health.

## **Health Care**

One of the top applications of robotics is robots have changed healthcare a lot. And all for the better! They can help doctors in performing operations more precisely, be used as prosthetic limbs, provide therapy to patients, etc. The possibilities are limitless. One example of this is the da Vinci robot that can help surgeons in performing complex surgeries relating to the heart, head, neck, and other sensitive areas. Other robotic devices are created like exoskeletons that can be used to provide additional support for people undergoing rehabilitation after spinal injuries, strokes, etc.

## **Underwater Exploration**

Robots are a great option for exploring places that humans cannot reach easily, like the depths of the ocean! There is a lot of water pressure deep in the ocean which means humans cannot go that down and machines such as submarines can only go to a certain depth as well.

A deep underwater is a mysterious place that can finally be explored using specially designed robots. These robots are remote-controlled, and they can go into the depths of the ocean to collect data and images about aquatic plant and animal life.

## **Food Preparation**

Don't want to cook? Don't worry, some robots can even cook and create complete meals for you! This can be a top application of robotics for people who don't like to cook. These robot chefs can create food using hundreds of different recipes. Moley Robotics is one such robotics company that has created

a robotic kitchen with a robot that can cook like a master chef! So no worries if you can't cook food. Because now a robot can!

### **Manufacturing**

One of the top applications of robotics in the manufacturing industry is automating repetitive tasks. Many repetitive and common tasks in the manufacturing industry don't require any usage of the mind like welding, assembly, packing, etc. These tasks can be easily done by robots while leaving the mentally challenging and creative tasks to humans. These robots can be trained to perform these repetitive and monotonous tasks with precision under the guidance and supervision of a human. This option is also best for manufacturing processes that are dangerous and may be harmful to humans.

### **Military**

Applications of Robotics in the military can be vast. They can be used as drones to keep surveillance on the enemy, they can also be used as armed systems to attack the opposing forces or as Medicare agents to help friendly forces.

Some of the popular robots used in the Military sector include MAARS (Modular Advanced Armed Robotic System) which looks like a tank and contains tear gas and lasers to confuse enemies and even a grenade launcher for desperate situations. DOGO is also a tactical combat robot that has a camera for spying on the activities of the enemy and a 9-millimeter pistol for emergencies!

### **Customer Service**

Some robots are developed to look exactly like humans for cosmetic purposes. These robots are primarily used in the field of customer service in high-visibility areas to promote robotics.

One such example is Nadine, a humanoid robot in Singapore that can recognize people from previous visits, make eye contact, shake hands, continue chatting based on previous meetings, etc. Another customer service robot is Junko Chihira in Japan, a humanoid robot working at the tourist information center in Aqua City Odaiba, a shopping center on Tokyo's waterfront.

### **Components of a Robotic System**

A typical robotic system consists of the following components:

#### **Mechanical Structure**

This includes the robot's body, arms, joints, and end-effectors. The mechanical structure determines the robot's movement and workspace.

#### **Sensors**

Sensors Allow robots to perceive their environment. Common sensors include proximity sensors, vision sensors, temperature sensors, and force sensors.

#### **Actuators**

Actuators convert electrical energy into physical motion. Motors and hydraulic systems are commonly used actuators.

#### **Controller**

The controller acts as the brain of the robot, processing sensor data and executing programmed instructions.

## **Power Supply**

Robots require energy to operate, which may be supplied through batteries, electrical power, or hydraulic Systems

## **Classification of Robots**

Robots can be classified based on application and functionality:

- Industrial Robots Used in manufacturing processes such as welding, painting, assembly, and material handling.
- Service Robots Designed to assist humans in non-industrial environments, including domestic and professional services.
- Medical Robots Used in surgery, rehabilitation, diagnosis, and patient care.
- Mobile Robots Capable of moving in an environment using wheels, legs, or tracks. Examples include autonomous vehicles and drones
- Humanoid Robots Robots designed to resemble human form and behavior

## **Applications of Robotics**

- Industrial Automation Robots increase productivity, precision, and safety in manufacturing industries by performing repetitive and hazardous tasks.
- Healthcare Robotics is widely used in minimally invasive surgeries, robotic prosthetics, rehabilitation therapy, and hospital assistance.
- Agricultural robots are used for planting, harvesting, irrigation, and monitoring crop health, improving efficiency and yield.
- Defense and Security Robots are deployed for surveillance, bomb disposal, reconnaissance, and rescue operations in dangerous environments
- Space Exploration Robots such as rovers and robotic arms are used to explore planets, repair satellites, and conduct scientific experiments.
- Education and Research Educational robots help students learn programming, engineering, and problem-solving skills.

## **Advantages of Robotics**

Increased efficiency and productivity High precision and accuracy Enhanced safety in hazardous environments Reduced human error Continuous operation without fatigue.

## **Challenges and Limitations**

- High initial cost
- Technical complexity
- Lack of flexibility in unstructured environments
- Ethical and employment concerns
- Dependence on power and maintenance

## **Future Trends in Robotics**

The future of robotics includes advancements in AI-driven autonomous systems, collaborative robots (cobots), soft robotics, and human-robot interaction. Integration with IoT and machine learning will further enhance robotic capabilities, making them more adaptive and intelligent.

## **Conclusion**

Robotics has become an essential technology shaping modern society. Its applications span across numerous sectors, offering improved efficiency, safety, and innovation. Despite challenges, continuous research and development promise a future where robots work seamlessly alongside humans to enhance productivity and quality of life

## **References**

1. J. J. Craig, Introduction to Robotics: Mechanics and Control, Pearson Education. M. Siciliano and O. Khatib, Springer Handbook of Robotics, Springer. R. Siegwart, I. R. Nourbakhsh, and D. Scaramuzza, Introduction to Autonomous Mobile Robots, MIT Press
2. Nagaraju, Vankayalapati, Arun Raaza, V. Rajendran, and D. Ravikumar. "Deep learning binary fruit fly algorithm for identifying SYN flood attack from TCP/IP." Materials Today: Proceedings 80 (2023): 3086-3091.
3. Ganesh, E. N., V. Rajendran, D. Ravikumar, P. Sai Kumar, G. Revathy, and P. Harivardhan. "Detection and route estimation of ship vessels using linear filtering and ARMA model from AIS data." International Journal of Oceans and Oceanography 15, no. 1 (2021):
4. Ravikumar, D., Dr Ramesh Subramaniam, B. Ebanazer Abishek, and V. Devi. "Non-Radiating Edges Gap Coupled Microstrip Antenna for Wireless Body Area Communications. International Journal of Advanced Science and Technology 29, no. 3 (2020): 9596-9603.
5. Manohar, Gunaselvi, V. Kamatchi Sundari, Antonitta Eileen Pious, A. Beno, LD Vijay Anand, and D. Ravikumar. "IoT based automation of hydroponics using node MCU interface." In 2021 Third international conference on inventive research in computing applications (ICIRCA), pp. 32-36. IEEE, 2021.