International Journal of Engineering Research and General Science Volume 3, Issue 1, January-February, 2015
ISSN 2091-2730

Design and analysis of Autonomous Robots

A.Rethinavelsubramanian

[1]Assistant Professor & Head , Department of Mechanical Engineering
K.S.K College of engineering & Technology,Kumbakonam
Email:rvsm_me@yahoo.co.in

Abstract— An autonomous robot is a robot that performs behaviors or tasks with a high degree of autonomy, which is particularly desirable in fields such as space exploration, cleaning floors, moving lawns, waste water treatment and delivering goods and services. An autonomous robot may also learn or gain new knowledge like adjusting for new methods of accomplishing its tasks or adapting to changing surroundings.

Keywords— UAVs, AUVs

INTRODUCTION

Autonomous robots have the ability to gain information about their environments, and work for an extended period of time without human intervention. Examples of these robots range from autonomous helicopters to robot vacuum cleaners. These self-reliant robots can move themselves throughout the operation without human assistance, and are able to avoid situations that are harmful to themselves or people and property. Autonomous robots are also likely to adapt to changing surroundings.

A fully autonomous robot can:

- Gain information about the environment (Rule #1)
- Work for an extended period without human intervention (Rule #2)
- Move either all or part of itself throughout its operating environment without human assistance (Rule #3)
- Avoid situations that are harmful to people, property, or itself unless those are part of its design specifications (Rule #4)

FEATURES OF AUTONOMOUS ROBOTS

Autonomous robots use infrared or ultrasound sensors to see obstacles, allowing them to navigate around the obstacles without human control. More advanced robots use stereo vision to see their environments; cameras give them depth perception, and software allows them to locate and classify objects in real time.Autonomous robots are helpful in busy environments, like a hospital. Instead of employees leaving their posts, an autonomous robot can deliver lab results and patient samples expeditiously. Without traditional guidance, these robots can navigate the hospital hallways, and can even find alternate routes when another is blocked. They will stop at pick-up points, and collect samples to bring to the labAnother place autonomous robots are useful is in our natural environment. In 2013, researchers at Virginia Tech developed an autonomous robotic jellyfish with the intent of one day conducting undersea military surveillance or monitoring the environment. The 5 foot 7 inch jellyfish has a long duration and range of operation.

TYPES OF AUTONOMOUS ROBOT

Manipulation of robotic system is classified into three types.

1. Autonomous control robots.

2. Remote controlled robots.

3. Manually controlled robots.

Autonomous robots are mainly used in industrial areas. where as the remote controlled robots are used in environments that are restricted for human beings. manually controlled robots are widely used for handing goods and also for transportation.

Types of autonomous robotic system:

Out of three types of manipulation robotic system, the autonomous system is further classified into 4 types.

i). Programmable.

ii). Non-programmable.

iii). Adaptive

iv). Intelligent.

i).Programmable autonomous robot

It is a first generation robot with a actuator facility on each joint. The robots can be reprogrammable based on the kind of application they are commissioned to.The main drawback of this autonomous robot is that once programmed it persist operation even if there is a need to change its task.

ii).Non-Programmable autonomous robot

This robot is one of the basic types of robot , infact, a non programmable robot. This robot is not even considered as a robot, but is an exploiter lacking reprogrammable

iii).Adaptive robots

Adaptive robots are also industrial robots that can be adapted independently to various ranges in the process. Adaptive robots are mainly used in applications such as spraying, and welding system.

iv). Intelligent robot

Intelligent robot as the name suggest are the most intelligent of all other types of robots with sensors and microprocessor for storing and processing the data. These robots find their applications in the fields like medical, military applications and home appliance control system etc.

4. Applications of autonomous robots:

For real world applications the robot must be sold in numerous copies to customer, who will read a short set of recommendations, power the robot, and check from time to time that the work is being properly done. customers are not willing to spend time in instructing their robot, letting it carefully explore the environment, and buy the risk of sub-optimal performance. Current limitations in energy autonomy naturally favour "white-collar" applications of autonomous robots, such as surveillance.

Autonomous robots find numerous applications in diverse fields such as defense, medical, surveillance, security, and space exploration. These applications are rapidly growing in scope and implementation, and will include environmental membrane filtration

and medical treatment. Researchers are developing autonomous unmanned aerial vehicles (UAVs) that can fly and work together in groups. They would have invented functionally improved surveillance and rescue-bots, pets that double up as security guards, elderly care robots, robotic public transportation, and multipurpose home-cleaning robots.CSIRO autonomous robotic systems can assist or replace people in tasks that are repetitive, difficult, unpleasant, or performed in hazardous environments. They can be used across a wide range of industries.

Aerial

Autonomous robotic systems can be used to carry out hazardous or difficult missions that until now have been performed by people. CSIRO, collaborating with the Queensland University of Technology, Boeing Research and Technology Australia, and Insitu Pacific, are developing autonomous unmanned aircraft for use in a range of applications including invasive species surveying over tropical rainforests.

CSIRO developed technology for the Smart Skies Project, a multi-award winning international research project that developed an electro-optical mid-air collision avoidance system, a static obstacle avoidance system, a mobile ground-based aircraft

Unmanned aircraft system

Mining

Remote telerobotic systems increase efficiency, productivity and profitability, and remove people from hazardous and inhospitable working environments by allowing them to remotely control mining equipmentTraditionally, remote operation in the mining industry involved a human operator relying only on video streaming to make decisions. CSIRO has developed technologies that improve mining operations by using a variety of sensors to provide additional information to the human operator in real-time, thus allowing better control over the equipment while reducing human fatigue and errors

Rockbreaker at RioTinto's West Angelas iron ore mine

Underwater monitoring

CSIRO Autonomous Underwater Vehicles (AUVs) use video cameras as one of the primary sensors for navigation, and are ideal for data collection, inspecting and cataloguing natural habitats. CSIRO is developing technologies that allow the underwater robot to immediately and autonomously recognise objects in the video stream and make decisions accordingly. This enables adaptive mission planning with the vehicle changing its survey plan based on data obtained in real-time

CSIRO robotic submarine

Education

CSIRO, partnering with National Museum education experts and the Department of Broadband, Communications and the Digital Economy, has developed an autonomous robot that allows remote visitors, such as school students in rural Australia, to virtually visit the National Museum through a high-speed broadband connection. The robot navigates itself around the museum alongside an educator, and remote visitors can talk to the educator through a video chat session and see the museum gallery through the robot cameras

Mobile telepresence robot

5. CONCLUSION:

The primary aim is to provide the robot with the ability of automatic interpretation of scenes in order to understand and predict the actions and interactions of the observed objects based on theinformation acquired by its sensors. One limitation of the presented system is that object and people detection are accomplished at pre-defined goal positions where the robot stops and stays still in order to process data.Other wireless technologies like Wi-Fi or Bluetooth can be used as communication protocol instead of Zigbee technology. Touch screen/Voice based robot control can also be used in future to make the system sophisticated.

REFERENCES:

1. Sharma, Toshendra K. Robotics with AVR. 2nd ed. Noida:Robosapiens India Publications, 2011. Print.

2. Gupta, Sabuj D., Arman R. Ochi, Mohammad S. Hossain, and Nahid A. Siddique. "Designing & Implementation of Mobile Operated Toy Car by DTMF" International Journal of Scientific and Research 3.1 (2013): n. pag. Web. 12 July 2013. <http://www.ijsrp.org/>.

3. Singh, Surinder, Mr. "DTMF-Tester." Electronics for You 2003: n. pag. Web.

4. "Infrared Sensor Designing- Basic." Robosense. N.p., n.d.Web. 14 July 2013.

5. Hector of SCP. "Dual Tone Multiple Frequency A Guide to Understanding and Exploiting Australia's Most Common Telecommunications Signaling Method." N.p., n.d. Web. 12 July 2013. <http://www.pogden.co.uk>.

6. V. Ramya and B. Palaniappan; "Web based embedded Robot for safety and security applications using Zigbee"; *International Journal of Wireless & Mobile Networks (IJWMN) Vol. 4, No. 6*, December 2012 .

7. Krishnaswamy Kannan, Gowtham S and Adithya R; *"*Intelligent Personal Assistant and Surveillance Robot using Zigbee Communication"; *International Journal of Engineering Science and Technology Vol. 4 No.10* October 2012

8. Premkumar .M, "Unmanned multi-functional Robot using Zigbee adopter network for Defense Application"; *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 1*, January 2013

9. Bandaru Venkata Ramanaiah and Mohammed Abdul Aziz; "RFID based mobile Robot in industries using Zigbee"; *Advances in Intelligent Transportation Systems (AITS) Vol. 1, No. 2*, 2012