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Course Quick View with Full TOC

Algorithms for Intelligent Systems and Robotics

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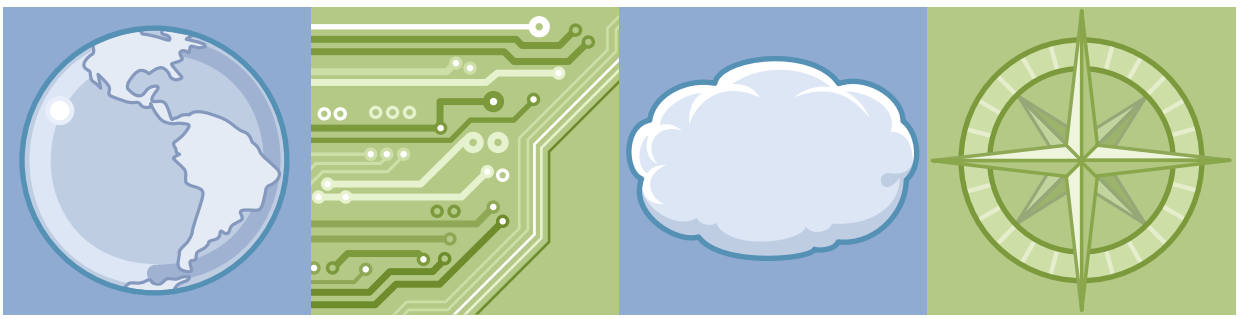

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Appendix A. Checkpoint solutions A-1

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Course description

Algorithms for Intelligent Systems and Robotics

Purpose

This course is designed to explain the concepts of system modeling and principles of control systems. The course embeds the concept of artificial intelligence in robotics. The course gives the concepts of various components of intelligent robotic system. The introduces the concept of Robotic Operating System (ROS), navigation, speech recognition and synthesis.

Audience

B.Tech in computer science engineering.

Prerequisites

Basic programming skills, basic knowledge on artificial intelligence.

Objectives

After completing this course, you should be able to:

- Gain knowledge on the process of system design
- Gain an insight into the AI problems and techniques
- Learn about the kinematic and dynamic control concept with a focus on intelligent gripping systems
- Understand the operating system concepts for robotics
- Understand the concept of Speech Recognition and Synthesis and implement it

References

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Unit 1. System Modeling

What this unit is about

This unit aims at gaining knowledge on system modeling and how it has evolved over the years. This unit dwells upon how various AI concepts are being used for developing systems, which mimic biological processes and cognitive processes for achieving desired goals.

What you should be able to do

After completing this unit, you should be able to:

- Understand the concept of system modeling
- Gain knowledge on the process of system design
- Understand the goals and principles of intelligent systems
- Gain an insight into various types of robots as systems

How you will check your progress

- Checkpoint

References

IBM Knowledge Center

Unit 2. Artificial intelligence for robotics engineering

What this unit is about

This unit helps to provide an understanding on the basics of artificial intelligence (AI). This unit helps to gain knowledge on the AI problems and techniques. The concept of state space search and production systems is also presented here. This unit provide an understanding on heuristic search techniques and knowledge representation.

What you should be able to do

After completing this unit, you should be able to:

- Gain knowledge on the basics of Artificial Intelligence (AI)
- Gain an insight into the AI problems and techniques
- Learn about the state space search and production systems
- Understand the concept of problem characteristics and search paradigm
- Learn about heuristic search techniques and knowledge representation

How you will check your progress

- Checkpoints

References

IBM Knowledge Center

Unit 3. Components of an Intelligent Robotic System

What this unit is about

This unit helps to gain knowledge on the basic concepts of robotics and its components. The role of machine learning in modern day robotics industry are discussed and hence the details on how machine learning concept is embedded in robotics is presented. This unit helps to gain an insight into the design and development of robotic components. This unit helps to learn about environment capturing sensors like CCD cameras and also helps to gain knowledge on the integration of these sensors with real time robotic system. The generic model of machine vision system along with functional components is also presented here. This unit provides an understanding on the role of neural networks for tool condition monitoring systems.

What you should be able to do

After completing this unit, you should be able to:

- Gain knowledge on the basic concepts of robotics and its components
- Gain an insight into the role of machine learning in modern day robotics industry
- Learn about the kinematic and dynamic control concept with a focus on intelligent gripping systems
- Gain an insight into the design and development of robotic components
- Learn about environment capturing sensors like CCD cameras
- Gain knowledge on the integration of sensors with real time robotic system
- Learn about the fuzzy classification and uncertainties in tool condition monitoring system

How you will check your progress

- Checkpoints

References

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Unit 4. Robot Operating System (ROS)

What this unit is about

This unit covers the concept of Robot Operating System (ROS). This unit also covers debugging and visualization under ROS. 3D modeling and simulation using ROS and some concepts will be discussed. The last section deals with computer vision applications.

What you should be able to do

After completing this unit, you should be able to:

- Understand the operating system concepts for robotics
- Gain knowledge on debugging and visualization
- Understand the concept of 3D modeling and simulation
- Gain an insight into computer vision applications for robotics

How you will check your progress

- Checkpoint

References

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Unit 5. Navigation, SLAM and Speech Recognition and Synthesis

What this unit is about

This unit covers robot navigation. Simultaneous localization and mapping (SLAM) is another problem during developing a fully functional mobile robot, which will also be covered in this unit. This unit will also cover the concept of Speech recognition and synthesis. Some insight into how ROS could be used for such application development will also be briefly discussed.

What you should be able to do

After completing this unit, you should be able to:

- Understand the Simultaneous Localization And Mapping problem (SLAM)
- Gain knowledge on developing solution for the SLAM problem and implement it
- Understand the concept of speech recognition and synthesis and implement it
- Gain an insight into how ROS could be used for such application development

How you will check your progress

- Checkpoint

References

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