

MASSIVE OPEN ONLINE COURSES IN EDUCATION OF ROBOTICS

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DOI: 10.7906/indecs.14.2.7
Regular article

Received: 20 February 2016.
Accepted: 7 March 2016.

ABSTRACT

Recently, the requirement for learning is constantly increasing. MOOC – massive open online courses represent educational revolution of the century. A MOOC is an online course accessible to unlimited number of participation and is an open access via the web. Mayor participants in the MOOCS are: Coursera, Udacity (Stanford, since 2012) and edX (Harvard, MIT, since 2012). In this paper two MOOCs are considered: Introduction for Robotics and Robotics Vision, both from the Queensland University of Technology, Brisbane, Australia.

KEY WORDS

MOOC, massive open online courses, robotics, Coursera, Udacity, edX

CLASSIFICATION

ACM: D.1.1.

JEL: O31

PACS: 89.70.Hj

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INTRODUCTION

Recently, the requirement for learning is constantly increasing. MOOC – massive open online courses represent educational revolution of the century. A MOOC is an online course accessible to unlimited number of participation and is an open access via the web.

Major participants in the MOOCs are:

- 1) Coursera, Stanford, since 2012, with 17 180 422 students, 1754 courses, 147 partners, [1],
- 2) Udacity, Stanford, since 2012, [2],
- 3) edX, Harvard, MIT, Berkeley, since 2012, [3].

The paper is organized as follows: In Section 1 is given the Introduction; in Section 2 the MOOC Introduction for Robotics is considered, Section 3 considers the MOOC Robotics Vision and in Section 4 is given conclusions of the paper.

INTRODUCTION TO ROBOTICS

This course [4] contains an introduction to the exciting world of robotics and the necessary mathematics and algorithms. You will develop an understanding of the representation of pose and motion, kinematics, dynamics and control [5-19] of robot. You will also be introduced to the variety of robots [20-25] and the diversity of tasks to which this knowledge and skills can be applied, the role of robots in society, but also associated ethical issues.

If you have access to a LEGO Mindstorms robotics development kit you will be able to build a simple robot arm and write the control software for it.

COURSE STRUCTURE

The course content will be released weekly.

- *Lecture 1:* Introduction to robotics,
- *Lecture 2:* Where things are in 2D,
- *Lecture 3:* Where things are in 3D,
- *Lecture 4:* Time varying coordinate frames,
- *Lecture 5:* Measuring the motion of things,
- *Lecture 6:* Robot arms and forward kinematics,
- *Lecture 7:* Inverse kinematics and robot motion,
- *Lecture 8:* Robot velocity in 2D,
- *Lecture 9:* Robot velocity in 3D,
- *Lecture 10:* Robot joint control,
- *Lecture 11:* Rigid body dynamics, and
- *Lecture 12:* Robots and the future.

This course combined with the Robotic Vision MOOC.

Course author is Prof. Peter Corke, Queensland University of Technology, Brisbane, Australia.

ROBOTIC VISION

Robotic vision introduces you to the field of computer vision and the corresponding mathematics and algorithms [26]. We would learn how to interpret images and how to determine the color, size, shape and position of objects in the space. It gives us a possibility to build an intelligent vision system that can recognise objects of different colors and shapes.

This course and the Introduction to robotics MOOC are based on a 13 weeks lasting undergraduate course Introduction to robotics. Course author is Prof. Peter Corke.

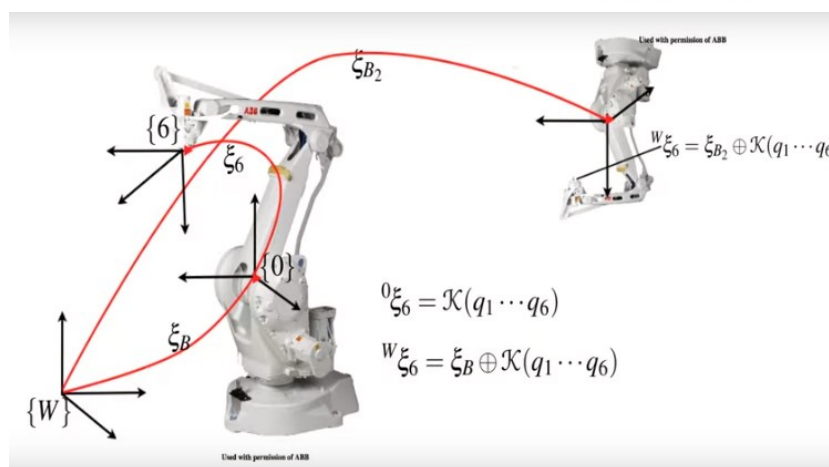


Figure 1. Excerpt from Introduction to Robotics.



Figure 2. MOOC Introduction to Robotics.

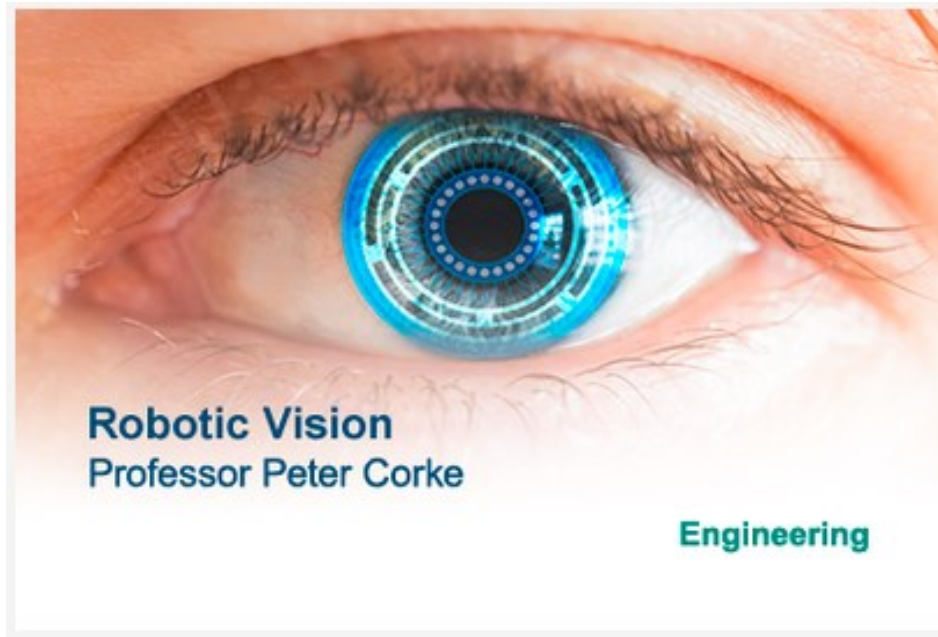


Figure 3. Robotic Vision.

By the end of this course you should be able to:

- describe and explain what robots are and what they can do,
- describe mathematically the position and orientation of objects and how they move,
- describe mathematically the relationship between robot joint coordinates and tool pose,
- reflect on the future role and development of robots in human society,
- compute the rigid-body forces in a robot and design a joint control system (optional advanced material),
- apply the mathematical, algorithmic and control principles of robot arm manipulators to implement a working robot through physical construction and software development (applies to optional project) [26, 27].

CONCLUSIONS

In this paper new trends – MOOC – in education of robotics are considered. MOOC – massive open online learning courses represent educational revolution of the century. A MOOC is an online course accessible to unlimited number of participants and is an open access via the web. Major participants in the MOOCs are: Coursera, Udacity (Stanford, since 2012) and edX (Harvard, MIT, since 2012). In this paper two MOOCs are considered: Introduction to Robotics and Robotics Vision, both from the Queensland University of Technology, Brisbane, Australia.

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