

## CREATING OF CONTENTS FOR ROBOTS PROGRAMMING FIELD IN E-LEARNING STUDY FORM

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### ABSTRACT

*The present modernizing of education at universities is the reflection of the knowledge society requirements. Our department of Automation and Production Systems is the participant on the project of EU Operational Programme – Education: "A Flexible and Attractive Study on University of Žilina for Both Employment Market and Knowledge Society Requirements". We take part in solution of specific tasks solved in the framework of the activity "The Creating of Contents for e-Learning". The article presents current information about solution of tasks specified for the field of robots programming. The attention is focused on the applied methods and aids that were used for preparing bases for e-Learning study form with goal to improve the education quality at our department.*

**Keywords:** e-learning, LMS systems, robot programming

### 1. INTRODUCTION

The raising of a learning quality is of a different intensity and quality level at the different world countries. The one is given by the teacher's skills and his pedagogical mastery most of all. Besides these, there is a need to realise the next three base tasks too:

- to provide a sufficient volume of theoretical information,
- to provide a possibility to verify obtained information practically and
- to provide an availability of suitable advanced learning means for students.

Modern information and communication technologies ("IKT") bring the massive changes into the educational system in the whole world. Knowledge is perceptive through the multiple senses and it enables to reach the higher educational efficiency in comparing with a traditional educational form. At the present the next educational forms are applied in the learning practice: e-Learning, distance education, open learning, flexible learning (Bates, A., W., 2005), on-line/off-line learning etc. However, the term E-learning is the most known one in the world. "E-Learning comprises all forms of electronically supported learning and teaching. The information and communication systems, whether networked or not, serve as specific media to implement the learning process" (Tavangarian et al., 2004). The multitude definitions of e-Learning are sufficient in the present literature. One of them includes new and different aspects of e-Learning as comparing with traditional learning:

*E-Learning "[is] all forms of electronic supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner.*

*Information and communication systems, whether networked or not, serve as specific media (specific in the sense elaborated previously) to implement the learning process” (Tavangarian et al., 2004).*

E-Learning brings a new possibility into an educational process at its every level. The teacher can devote his attention only to the explanation of more difficult problems, to improve his courses, to create new ways for better communication with students and to do the next other activities for which he hadn't an ample time in frame of the traditional learning process. Just the communication between teacher and student is very important part of the learning process that has been utilised the electronic media.

E-Learning courses can utilise a different modern tools for the information better transfer to a student. They are for example: multimedia presentations, simulations and combination of all animation, video and text explication. In the end of course the test of the student knowledge verification can be integrated too.

The Learning Management systems (“LMS”) are “systems that offer a unified platform for delivering educational content in the most effective way possible (Bates, A., W., 2005). LMS provide a unified framework comprising of educational modules so that content can be accessed in different sequences which are adapted to the individual user. Several LMS are available. The most world-wide one is called Moodle. Moodle (acronym for **M**odular **O**bject-**O**riented **D**ynamic **L**earning **E**nvironment) is open-source LMS. It is a free web application that educators can use to create effective online learning sites (<http://moodle.org/>, 2011). Moodle's adaptive feature called lesson customizes the learning path by a question at the end of every page. Depending on the answer, the appropriate educational material is selected which makes the learning experience more dynamic (<http://www.medien.ifi.lmu.de/>).

## 2. E-EDUCATION SYSTEM AT THE UNIVERSITY OF ŽILINA

University of Žilina has the centralised information system (see Figure 1) equipped with the database that is updated regularly.

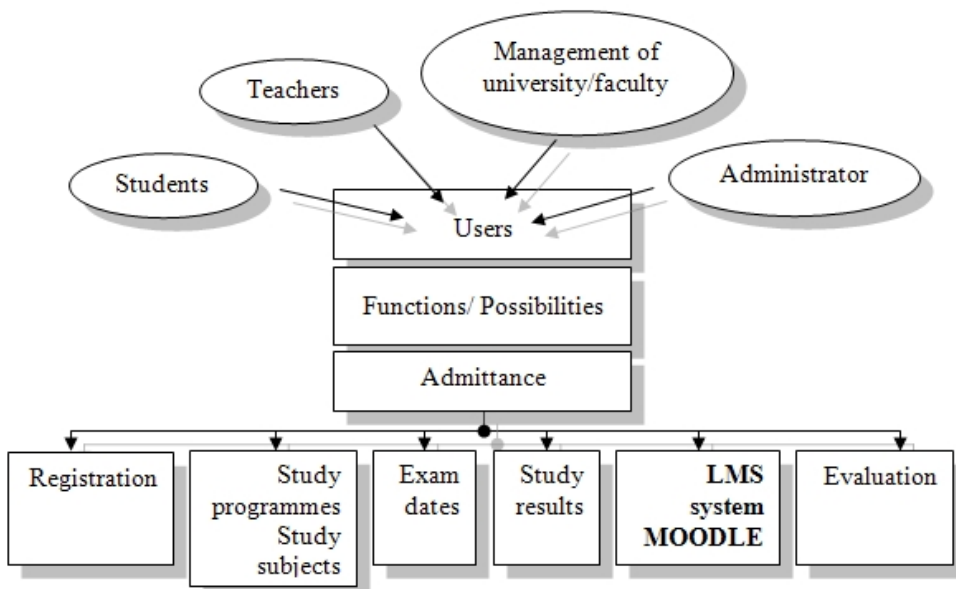


Figure 1. Scheme of Academic Information System of e-Education at University of Žilina

The one is the system for aid of e-Education and consists of two single spheres utilising the same database ([www.utc.sk](http://www.utc.sk)):

- Total data about a student.
- Data and functions for the aid of e-learning – admittance into LMS (MOODLE) and the next supplementary functions as: exam dates announcing, applying for exam, subject evaluation, filling in e-form for the student study results, etc.

The logic structure of the system functions is derived from the processes connected with the providing of the university learning. E-Education system is utilised in both attendance and distance study forms. The system is equipped with tools for quality control too.

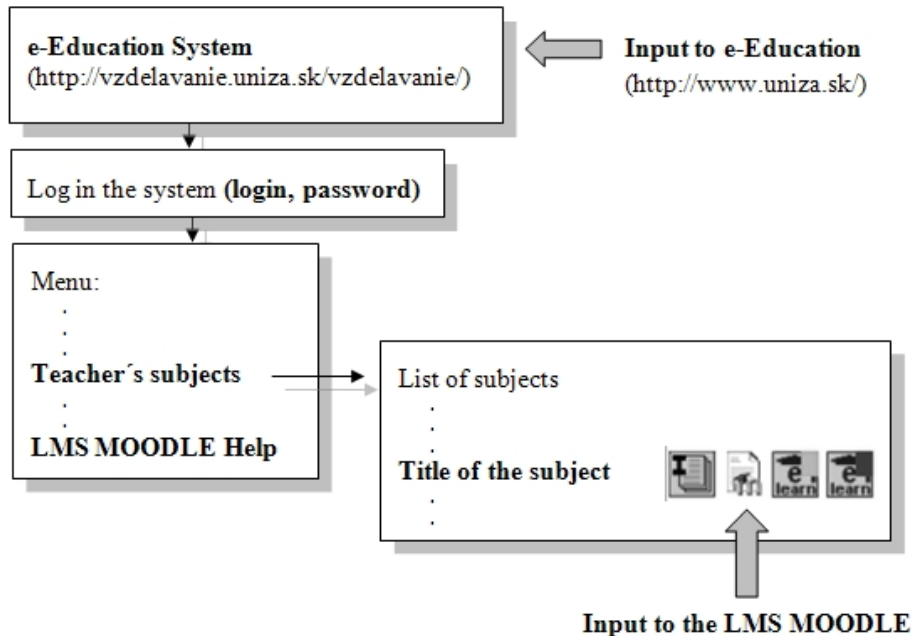


Figure 2. Teacher's access to LMS MOODLE

Every teacher or student has admittance in the university e-Education system on the base own login and password. The teacher can create or actuate his/her courses for subjects he/she has been teaching (Figure 2). The student has admittance only to the subjects which he has been studying. Input in the LMS MOODLE is possible through the university web site "<http://www.uniza.sk/>" by activation of the folder - "eVZDELÁVANIE" (= e-Education).

### 3. CREATION OF E-CONTENTS FOR ROBOT PROGRAMMING

Generally, study materials for e-Learning are electronic texts and static pictures most of all. But specialised study subjects from the engineering field required the different approach to the information presentation. Application of multimedia and implementation of interactivity principles into e-Learning courses promote the student creativity. Our Department of Automation and Production Systems has a good experience with creation of multimedia learning programmes already from the year 2003 (Čuboňová, et al: 2004, 2008; Kumičáková, et al: 2003). The specialised programmes present information from areas of: computer aided process planning based on the Group Technology principles, computer simulation and

animation of manufacturing technology and NC machines and robots programming. The first programmes had utilised special tools for simulation, animation and interactivity and they were used as the isolated aids for the learning support. Therefore they were available for students only in the department specialised laboratories in frame of the stated learning process. The new multimedia programmes are created with regarding of possibilities of their utilisation in frame of e-Learning study form.

Teaching of robot programming is the special problem for e-Learning study form because the one cannot be without the robot real programming. The one requires the combination of both “computer-based” and “traditional” teaching forms. This way of learning is called *Hybrid or Blended learning*. “*Blended learning* is the term used to describe learning or training events or activities where e-Learning, in its various forms, is combined with more traditional forms of training such as "class room" training” (<http://derekstockley.com.au/>). This way of modern learning expands at technical universities increasingly.

**3.1. Methodology of e-Course creating**

The creation of thematically comprehensive courses is present trend in e-Learning. The newly prepared robot programming e-Course is accommodated to demands and conditions of our university (/faculty) education process only. Its scheme and content have to go out from the robot type and program software which are available in the department laboratory and from the accredited teaching programmes too.

The process of the robot programming e-Contents creation is divided into two directions:

- Preparation, creation and accessing of lectures for students in the server of the department specialised laboratory. The tools of LMS Moodle will be used for the created texts inserting and/or modifying.
- Preparation, creation and accessing of study material for Fanuc robot LR MATE 200iC programming. Work with “off-line” programme RoboGuide (programming with virtual TeachPendant – see Figure 4) and work with the “real” robot (programming with real TeachPendant – see Figur 3).

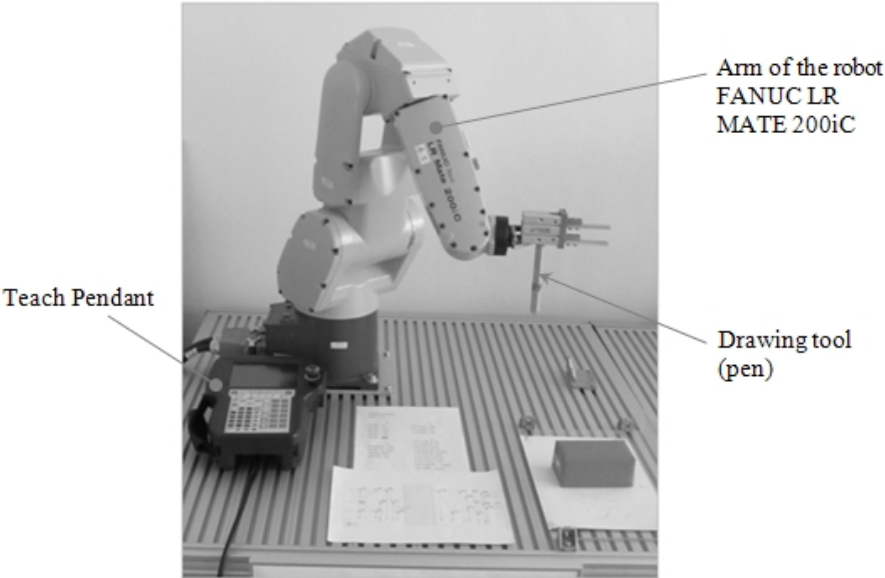


Figure 3. Programming of the real robot Fanuc LR MATE 200iC

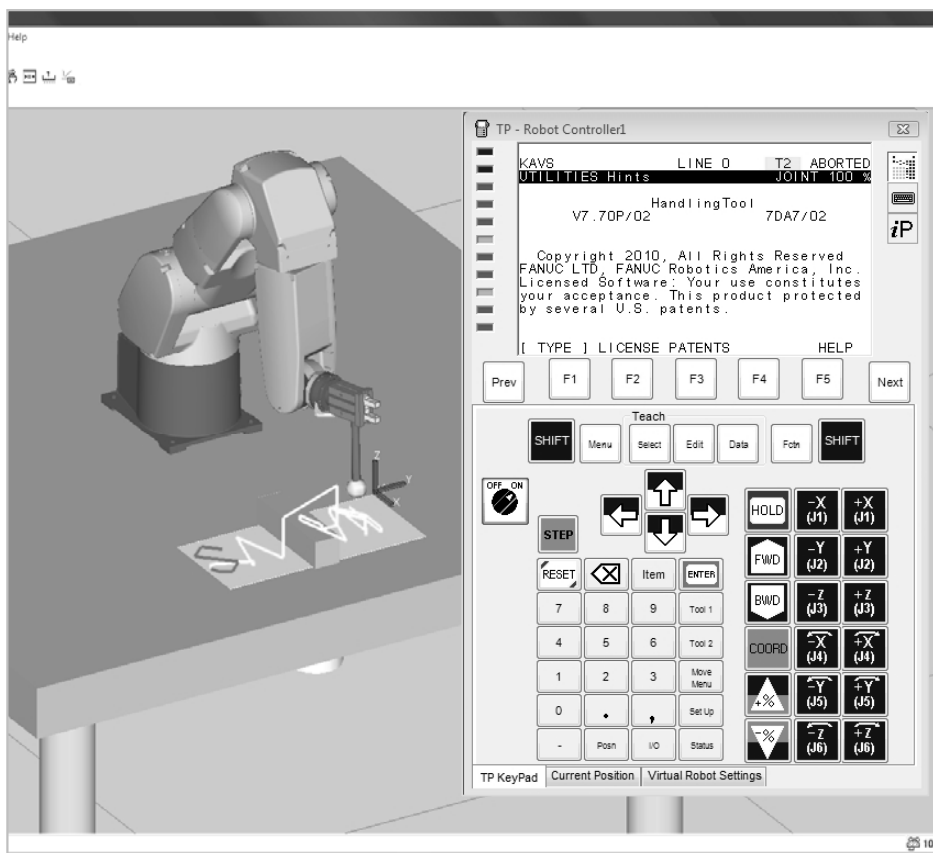


Figure 4. The robot programming in frame of “off-line” programme RoboGuide

The course “creator” (the teacher) is “a builder” of the main structure (scenario) of the complex robot programming course. He/she prepares texts of lectures and suggests the application of innovative educational technologies too. The frame scenario of e-Course of industrial robot programming is created. This one will consist of:

- Set of lectures of chosen topics.
- Set of study materials for the robot FANUC programming.
- Set of solved examples of the robot programming.

The three main topics for lectures were chosen: Introduction into the robotics (the base definitions and information about robots – namely about industrial robots), Aspects of industrial robots classification (a view on industrial robots from a several viewpoints – applications fields, construction, controlling, programming, etc.) and Industrial robots programming. Contents of the first two lectures are completed. They consist of texts and static pictures only. The third lecture (“Industrial robots programming”) is still in a process of creation.

The study materials for the robot programming are creating with active help of students because their view on the way how to present information to learner is very important too. The first training example of the robot programming we have already specified. The programme was created in frame of virtual environment of RoboGuide programme (see

Figure 4) and verified at the real workplace conditions. Now a set of specified study materials is completing step by step.

Close cooperation among the course scenario creator on the one hand and programmer, administrator and other cooperating persons on the other hand can bring the higher quality into the process of e-Learning course creation. Therefore the all partial solutions will be actually consulted in frame all participants of the solvers group.

#### 4. CONCLUSION

The technical university education quality improvement is not easy problem. This one requires a lot of money and spent time. At the first, the departments have to provide its laboratories with the most modern machines and technologies to be with the present time. After this, the process of implementation of these advanced technologies into the educational process is beginning. The utilisation of the LMS Moodle opens the new possibilities for creating of the specialised education courses and their controlled access for learners.

Now our Department of Automation and Production Systems is in a phase of both preparation and creation of e-Contents for e-Learning study form in the several fields. One of them is a field of the robots programming. The article presents the starting points, partial results and some future plans for creation of e-Learning course of robots programming.

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