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PROJECT OF LABORATORY OF SYSTEMS WITH ARTIFICIAL INTELLIGENCE

PROJEKT LABORATÓRIA SYSTÉMOV S UMELOU INTELIGENCIOU

### Abstract

Artificial intelligence provides techniques for flexible, non-numerical problem solving. These techniques include symbolic information processing, heuristic programming, knowledge representation, and automated reasoning. No other fields or alternative technologies exist with comparable capabilities. And nearly all complicated problems require most of these techniques. Accordingly so systems can be faster, cheaper, and more effective and viable than rigid ones. AI can be considered like the top layer of control on the road to autonomous machines and systems. Important areas of AI application and research include: expert systems, natural language processing, computer vision, robotics, intelligent computer-assisted learning, automatic programming, planning and decision support. In artificial systems knowledge is most often provided by means of appropriate hardware equipment and software programming.

### Abstrakt

Umelá inteligencia poskytuje techniky pre pružné nenumerné riešenie. Tieto techniky zahŕňujú symbolické spracovanie informácií, heuristické programovanie, reprezentáciu poznatkov a automatické rozpoznávanie. Žiadne iné oblasti alebo alternatívne technológie neposkytujú porovnateľné možnosti. Väčšina zložitých úloh si vyžaduje použitie týchto techník. Takéto systémy môžu byť rýchlejšie, lacnejšie, účinnejšie a životaschopnejšie ako rigidné systémy. UI môže byť považovaná za vrcholovú úroveň riadenia na ceste k autonómnym strojom a systémom. Dôležité oblasti aplikácie a výskumu umelej inteligencie zahŕňujú: expertné systémy, prirodzený jazyk a jeho spracovanie, počítačové vizuálne systémy, robotiku, inteligentný učenie, automatické programovanie, plánovanie a rozhodovanie. V umelých systémoch je znalosť najčastejšie realizovaná pomocou technického vybavenia strojárstvo a software programovanie.

## 1 INTRODUCTION

Machine and robot intelligence is scope of many sciences that we usually name like Artificial Intelligence. On theoretical basis of Artificial Intelligence many technical systems with artificial intelligence were made. These systems are like subsystems of many smart products or advanced machines or equipments. Therefore education systems offering education in frame of automation and control have to answer to this challenge about advances in technology and they have to adapt their study programs and laboratory equipments to practice needs accordingly.

Generally concern on Artificial Intelligence (AI) is application of computers and computing technologies for solving so problems that frequently need knowledge, perception, reasoning, learning, understanding and other similar cognitive capabilities [1]. Systems able to think, to learn and to

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realize selection of required actions can be cheaper, more effective, more universal and more available like rigid systems [2, 3, 4, 5].

AI is possible to consider like the top solution of autonomous machines and equipments and this solution represents wider range like same of traditional automation. AI offers flexible techniques for nonnumeric problem solving. Processing of symbolic information, heuristic programming, knowledge representation and automatic thinking represent these techniques. For solution of much all these complicated problems we need one from above mentioned access. To this time we have no alternative technologies with comparable results.

## **2 CHOSEN ACCESS AND METHODS**

At present time from point of view of computing two principal forms of intelligence implementation exist [6, 7, 8, 9, 10]:

**1. Symbolic access.** In this access we assume that in the frame of cognitive processes there is some regularity that we can understand in so far that we are able to model and program them. AI is concerned to intelligent behavior, solve nonnumeric processes mainly with complexity, uncertainty, non-explicitness for that there are no known algorithmic solving. Compared to classical computing this is based on knowledge for problem solving. Typical application areas of symbolic access are expert systems, systems for understand of natural language, systems image processing, systems for problem solving and planning, systems for automatic programming, systems of machine learning, systems of ICAI, robotics systems etc.

**2. Sub-symbolic access.** This access is based on copy of nature and assume that intelligence is made by great number of inter-network elements of processing. Neural nets solve problems by learning and self-organizing. Their common intelligence is divided from collaboration of elementary neurons. Typical application areas of neural nets application are analyze and processing of signals, image processing, signal noise filtering, control, data analyze and knowledge systems, optimizing.

System with artificial intelligence is interdisciplinary branch. Research and realisation of particular technical systems with artificial intelligence require collaborative cooperation of experts from various science and technical areas. As object of solving are artificial systems the technical branches are fundamental - mainly electrical engineering, mechanical engineering, computing but also system engineering or knowledge engineering. On the other hand as this new branch is mainly technical branch knowledge and experiences from other sciences are necessary – from biology, cognitive sciences or applied mathematics.

Using intelligent systems at products like consumer electronics or other goods signalise that it is not exclusive technology for space science only but new line of industry branch and systems with artificial intelligence profile like new technical branch. therefore all world known universities have this branch at their education plans [11, 12].

## **3 PROJECT OF LABORATORY OF SYSTEMS WITH ARTIFICIAL INTELLIGENCE**

At present time Department of Automation and Control of Mechanical Engineering Faculty from Technical University of Košice prepares and realizes of Laboratory of systems with artificial intelligence like fundamental component of department. Project is based on above mentioned knowledge and model access of solution and their combination. Characteristic tasks for solution at education conditions for Laboratory of systems with artificial intelligence are:

- Capability of perception of environment and to recognize what is relevant and important for algorithm control statement
- Capability to predict changes in environment with help of model of environment and knowledge acquired by learning

- Capability to evaluate received information and knowledge and used them for decision making
- Capability to plan operations with reference to recognize situation and knowledge
- Capability to communicate with other intelligent systems (artificial or nature) in time of solving problem
- To learn on the base of historical solutions and to generalize where it is useful
- To adapt of system behavior with regard to situation to fulfill specified goal.

In frame of first stage of above mentioned project plan (2004) so tasks were solved like:

- Study and collection of information about applied systems with artificial intelligence and software for specific problems.
- Transfer methods, techniques, and tools to education process in frame of study program Automation and Control.

At present time so tasks are realized:

- Integration of software modules with technical laboratory equipment
- Implementation and testing.

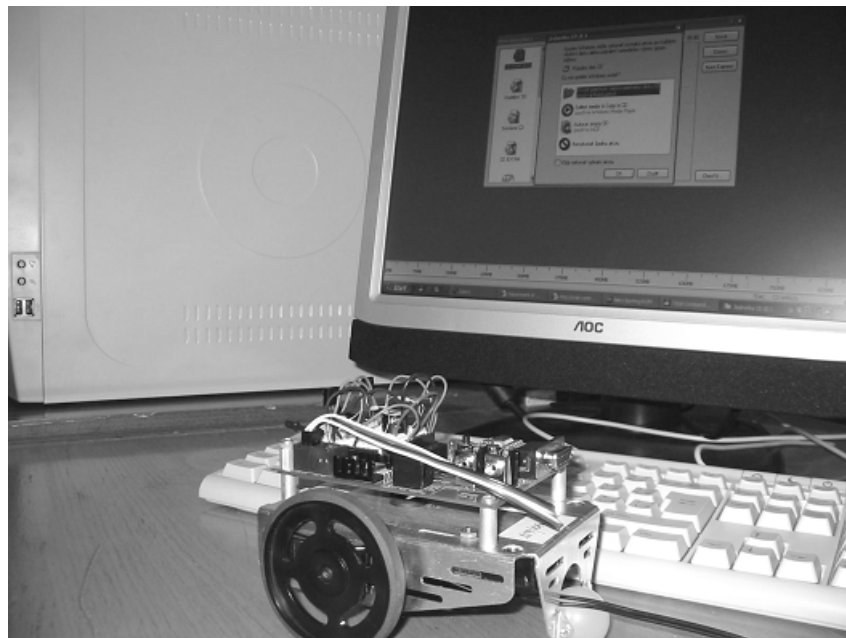


Figure 1 – Example of autonomous robot programming

#### 4 CONCLUSIONS

Laboratory of systems with artificial intelligence represents the main workplace for postgraduate students (in third level of study) Technical equipment is used for undergraduate students partly for semester projects and diploma projects solving. For wider using of systems would be suitable to found so access to used systems by “remote way” in distance learning that would help to students more better developed their programs from private computers [13, 14], regardless of technical equipment of laboratory.

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