

**Automatic Control and Robotic (KSD)  
Proposals for Group Projects – Master 2011**

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|-------------------|---|
| <b>Subject</b>    | <b>Java Chess engine</b>  |
| <b>Supervisor</b> | <b>prof. dr hab. inż. Zdzisław Kowalczyk</b>  |
| <b>Consultant</b> | <b>mgr inż. Michał Czubenko</b>   |
| <b>Purpose</b>    | <b>A chess engine in the Java language.</b>   |
| <b>Tasks</b>      | <b>Create and implement of a chess engine, which is based on artificial intelligence methods in Java.</b> |
| <b>Students</b>   | <b>ZKa1</b>   |

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| <b>Team Project</b>       | A dedicated high-level language for programming the DSM-51 education tool   |
| <b>Supervisor</b>         | dr inż. Janusz Kozłowski  |
| <b>Consulting</b>         | dr inż. Janusz Kozłowski  |
| <b>Aim of the project</b> | Realization of the project involves programming in C++. The team has to be familiar with the 8051 microcontroller and must learn specification of the DSM-51 education tool.  |
| <b>Tasks</b>              | <ul style="list-style-type: none"> <li>- prepare a detailed specification of the dedicated high-level language (the syntax can resemble C);</li> <li>- implement a compiler of the designed language (compilation should result in a text file containing sequences of the 8051 assembly language instructions);</li> <li>- create a library of useful procedures (e.g. keyboard scanning, control of LCD and LED displays);</li> </ul> |
| <b>Literature</b>         | <ul style="list-style-type: none"> <li>- Kernighan B.W., Ritchie D.M.: The C programming language. Prentice-Hall Inc., Englewood Cliffs, New Jersey 1978.</li> <li>- Philips Semiconductors: 80C51 8-bit microcontroller family. Data handbook 2000.</li> <li>- Gałka P., Gałka P.: Podstawy programowania mikrokontrolera 8051. Wyd. Naukowe PWN S.A. Warszawa 2006.</li> </ul>  |
| <b>Remarks</b>            | JKa1 (project for 2 persons)  |
| <b>Students</b>           |   |

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| <b>Subject</b>    | Simulator of the VersaMax Nano / Micro programmable logic controllers made by GE Fanuc  |
| <b>Supervisor</b> | dr inż. Henryk Kormański  |
| <b>Consultant</b> |   |
| <b>Purpose</b>    | The aim of the work is to create the software simulator of programmable logic controllers (PLC), for testing programs written in ladder diagrams.   |
| <b>Tasks</b>      | A program that simulates the work of the programmable logic controller VersaMax Nano / Micro; creating a library of simple objects that can unite with the PLC; interface for the simulator user. |
| <b>Remarks</b>    | HKa1  |
| <b>Student</b>    |   |

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| <b>Subject</b>               | A physical model of inverted pendulum   |
| <b>Supervisor</b>            | dr inż. Krystyna Rudzińska-Kormańska  |
| <b>Consultant</b>            |   |
| <b>Purpose</b>               | The project aims to create a physical model of the mobile inverted pendulum and to control its stability. The pendulum is to move in a straight-line trajectory while maintaining balance. One of the elements of the project is to design an operator interface for communication with the model . |
| <b>Tasks to be performed</b> | - a mobile platform on two wheels on one axle ;<br>- inclination angle sensor ;<br>- control system ;<br>- wireless communication interface.  |
| <b>Remarks</b>               | KRa1  |
| <b>Students</b>              |   |

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| The title of the group project. | Distributed Internet based measurement system for remote monitoring.   |
| Supervisor.                     | prof. dr hab. inż. Zdzisław Kowalczyk  |
| Advisor                         | mgr inż. Mariusz Domżański   |
| Goals and tasks.                | The goal of the project is to develop a distributed measurement system for acquisition and transfer of monitoring data over the Internet network. Such a system is comprised of a set of nodes working in remote locations, each equipped with some sensors performing measurements. Each node (based on inexpensive and commonly available embedded devices) should be capable of accessing the server using the Internet network and sending data from its sensors to the server. Data on the server should be stored in an open source database engine. Using a web based interface, an administrator of the system should have access to the data and should be able to perform some simple maintenance tasks. |
| Remarks                         | ZKa2   |
| <b>Students</b>                 |  |

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|---------------------------|---|
| <b>Team Project</b>       | A dedicated high-level language for programming the DSM-51 education tool   |
| <b>Title in Polish</b>    | Dedykowany język wysokiego poziomu do programowania zestawu dydaktycznego DSM-51  |
| <b>Supervisor</b>         | dr inż. Janusz Kozłowski  |
| <b>Consulting</b>         | dr inż. Janusz Kozłowski  |
| <b>Aim of the project</b> | Realization of the project involves programming in C++. The team has to be familiar with the 8051 microcontroller and must learn specification of the DSM-51 education tool.  |
| <b>Tasks</b>              | - prepare a detailed specification of the dedicated high-level language (the syntax can resemble C);<br>- implement a compiler of the designed language (compilation should result in a text file containing sequences of the 8051 assembly language instructions);<br>- create a library of useful procedures (e.g. keyboard scanning, control of LCD and LED displays); |
| <b>Literature</b>         | - Kernighan B.W., Ritchie D.M.: The C programming language. Prentice-Hall Inc., Englewood Cliffs, New Jersey 1978.<br>- Philips Semiconductors: 80C51 8-bit microcontroller family. Data handbook 2000.<br>- Gałka P., Gałka P.: Podstawy programowania mikrokontrolera 8051. Wyd. Naukowe PWN S.A. Warszawa 2006.  |
| <b>Remarks</b>            | JKa2: project for 2 persons   |
| <b>Students</b>           |   |

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|-------------------|---|
| <b>Subject</b>    | <b>Project BrainBow- synthesis and visualization of tomocomputer scanner data</b>   |
| <b>Supervisor</b> | prof. dr hab. inż. Zdzisław Kowalczuk   |
| <b>Consultant</b> |   |
| <b>Purpose</b>    | Implementation of a system for synthesis and visualization of data gained from a thin-layer tomo-computer scanning of brain.  |
| <b>Tasks</b>      | Review of literature. Forming the system assumptions. Problem solving. Realization of the necessary package for 3D synthesis based on thin-layer tomo-computer data gained from a (simulated) scanner of a human brain (harvard method) in two versions (color maps and graph structure. System implementation, tests, and conclusions. |
| <b>Sources</b>    | Books on artificial intelligence, signal processing, and visualization.   |
| <b>Remarks</b>    | ZKa3  |
| <b>Student</b>    |   |

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| <b>Subject</b>    | <b>Mathematical modeling of the elements of transportation pipe networks</b>  |
| <b>Supervisor</b> | prof. dr hab. inż. Zdzisław Kowalczuk   |
| <b>Consultant</b> | mgr inż. Krzysztof Oliński  |
| <b>Purpose</b>    | Simulation comparison of mathematical models of transportation pipes for liquid and gas. With a special attention paid to reducer and diffusors, as well as three-way elements. |
| <b>Tasks</b>      | Review of literature. Forming the system assumptions. Problem solving. Realization of the necessary algorithms and packages. System implementation, tests, and conclusions.     |
| <b>Literature</b> | Process Diagnostics (ZK&co., Springer 2004); books on artificial intelligence   |
| <b>Remarks</b>    | ZKa4  |
| <b>Students</b>   |   |

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| <b>Subject</b>    | <b>Texture Detection and Classifications</b>   |
| <b>Supervisor</b> | prof. dr hab. inż. Zdzisław Kowalczuk  |
| <b>Consultant</b> | dr inż. Tomasz Białaszewski  |
| <b>Purpose</b>    | A Matlab package for detection and classification of texture.  |
| <b>Tasks</b>      | Detection of non-homogeneous image regions of small size (e.g. 16x16 pixel) by designing some homogeneity criterion. Reducing the number of pixel values. Computation of the intensity co-occurrence matrix for blocks in 4 directions. Computation of a set of statistic features on basis of intensity connection matrices. Creation of a minimum-distance (or other) classifier for recognition of textures from 10 classes. Detection of regions in the image of similar texture. Review, making assumptions, designing the algorithms, Matlab implementation. |
| <b>Remarks</b>    | ZKa5   |
| <b>Student</b>    | M. Hosseini  |

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| <b>Team Project</b>       | Universal tool program for compiling the assembly language routines and testing the microprocessor systems  |
| <b>Title in Polish</b>    | Uniwersalne narzędzie programistyczne do kompilacji programów asemblerowych i testowania systemów mikroprocesorowych  |
| <b>Supervisor</b>         | dr inż. Janusz Kozłowski  |
| <b>Consulting</b>         | dr inż. Janusz Kozłowski  |
| <b>Aim of the project</b> | Realization of the project involves programming in C++. Additionally, the team has to be familiar with specific laboratory models which cooperate with 8-bit microprocessors systems.   |
| <b>Tasks</b>              | - implement a dedicated emulator for the selected 8-bit microprocessors (e.g. 8051 and 8085); - create a graphical interface for tracking the performance of assembly language programs; - prepare a library of educational assembly language routines to be used in the laboratory of microprocessors systems.                                 |
| <b>Literature</b>         | - Kernighan B.W., Ritchie D.M.: The C programming language. Prentice-Hall Inc., Englewood Cliffs, New Jersey 1978.<br>- Philips Semiconductors: 80C51 8-bit microcontroller family. Data handbook 2000.<br><br>- Pieńkos J., Moszczyński S., Pluta A.: Układy mikroprocesorowe 8080/8085 w modułowych systemach sterowania. WKiŁ Warszawa 1988. |
| <b>Remarks</b>            | JKa3: project for 2 persons   |
| <b>Students</b>           |   |