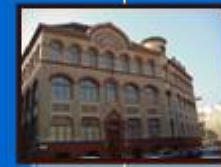
Óbuda University

Predecessor : Budapest Tech

Faculties

Rejtő Sándor Faculty of Light Industries & Environment Engineering



Keleti Károly Faculty of Economics

Teaching Robotics

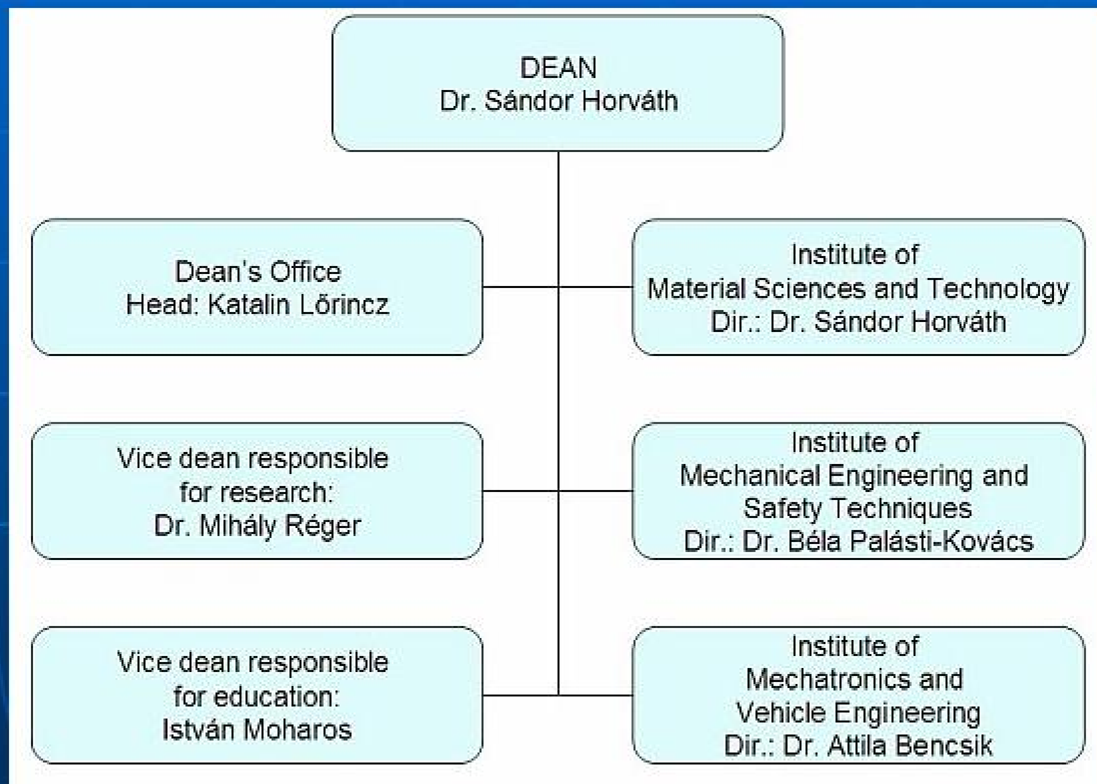
Kandó Kálmán Faculty of Electrical Engineering

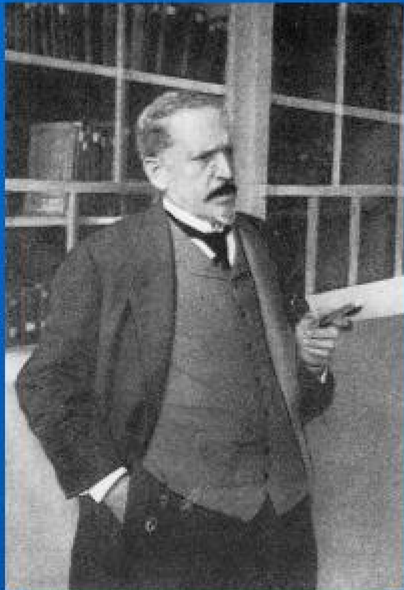
John von Neumann Faculty of Informatics

Bánki Donát Faculty of Mechanical Engineering & Security Technology

Donát Bánki Faculty of Mechanical Engineering and Security Technology

Organisation





1859 - 1922

1881 - 1955

Donát Bánki

Lot of developments:

-in fluid techniques,

-Gear level of vehicles

–Carburetor

–water turbine

-Lot of books and patents

József Galamb (student):

In 1905 at the Detroit (Ford) Vehicle Factory has been developed the *Ford T-model*

Donát Bánki Faculty
of Mechanical Engineering
& Security Technology

Institutions

Material Sciences & Technology

Mechanical Engineering & Safety Techniques

Mechatronics & Vehicle Engineering

Institute of Mechatronics & Vehicle Engineering

The history and future of the Mechatronic Course at the Institute

- **1987** – has been introduced the **new *Teaching Plan***
- 1995 - **Integrated** (Mechanical and Electrical) **Engineering** BEng education
- **1997** – starting date of the project: **Mechatronic Course** at the Budapest Tech.
- **2005/06** – The first entrance interviews to the **BSc** Mechatronic Course at the Budapest Tech
- **2008/09** - The first entrance interviews to the **MSc** Mechatronic Course at the Budapest Tech

The basic subjects of Mechatronics

Compulsory

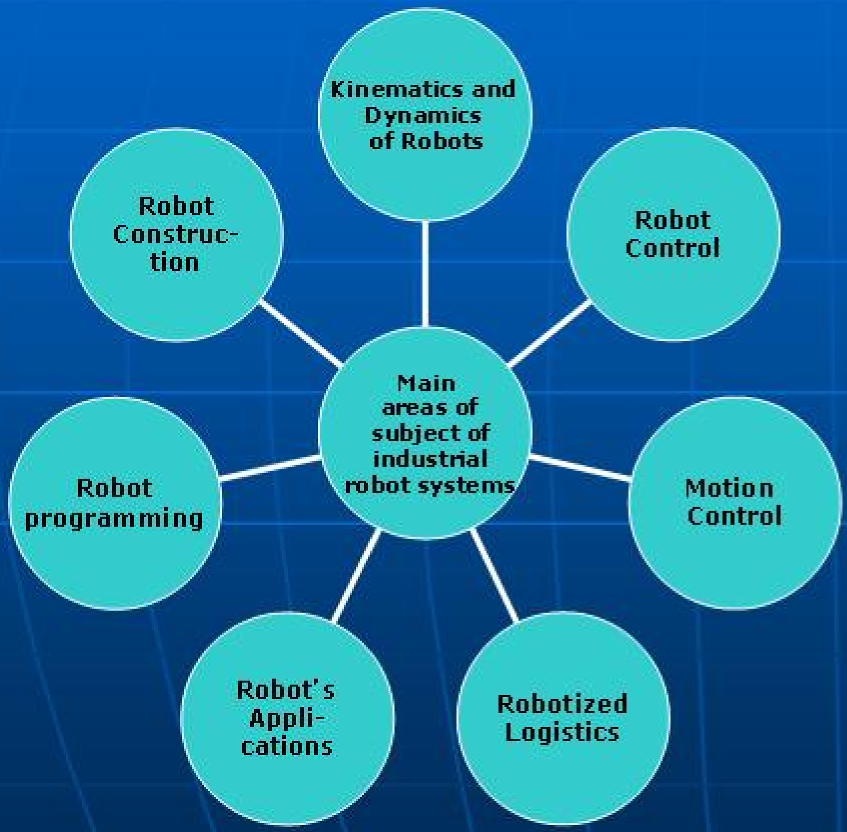
- Basic of Informatics
- Basic of Mechatronics
- Analog & Digital Circuits
- Control Engineering
- Pneumatics & Hydraulics
- Electronics
- Interfaces
-
-
- **Industrial Robot systems 1,2**

Facultative

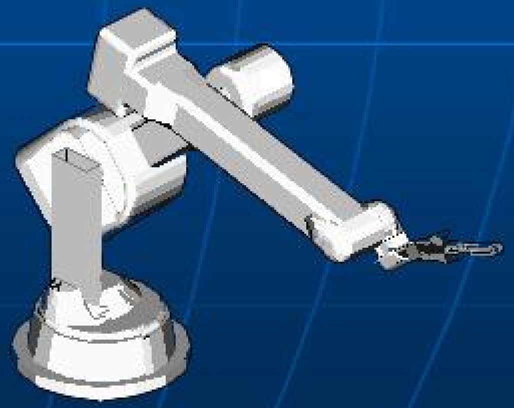
- PLC programming
- PIC programming
- Mobile Robotics
- PLA programming
- Intelligent Robot's systems
-
-

The subject of Industrial Robot Systems 1, 2:

Main areas belonging to the subject of industrial robot systems:



Through applications students acquire the principles and phenomena of mechanical systems, mechanical micro-drivers, the ability of micro-manipulation, intelligent functions, the various strategies of regulation and control engineering, as well as movement control and path planning techniques and robot's kinematics and dynamics.



The Laboratories and Courses :

The PLC Laboratory - pneumatic valve control, PLC programming course

The Robot Laboratory: Mitsubishi, Yamaha, Serpent, Bosch 3D Robot Manipulator

The Robot Programming Laboratory – Fanuc, Yamaha (Cosirop) on MELFA Language

The PIC Programming Course: PIC Mechatronic Board

The PLA Programming Course

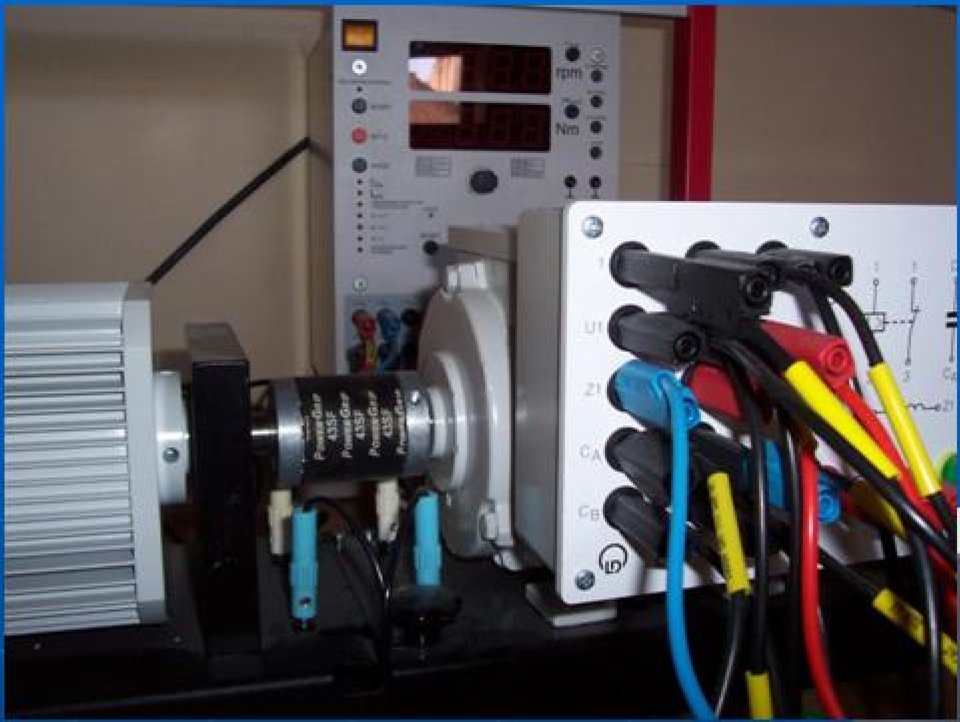
The Mobile Robot's Developing and Programming Course

Circuit Design by TINA, Course

- Digital Circuits
- Analog Circuits

Measurements on Mechatronical Units - Leybold

Measurements on Mechatronical Units



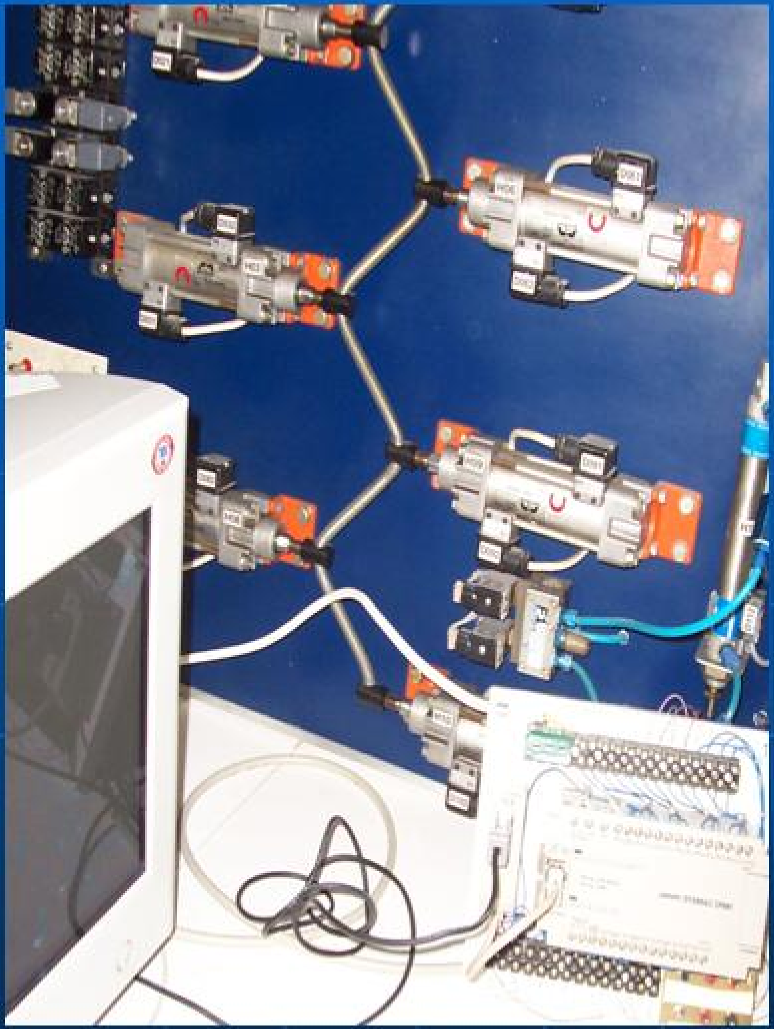
The Basic Mechatronical Units:

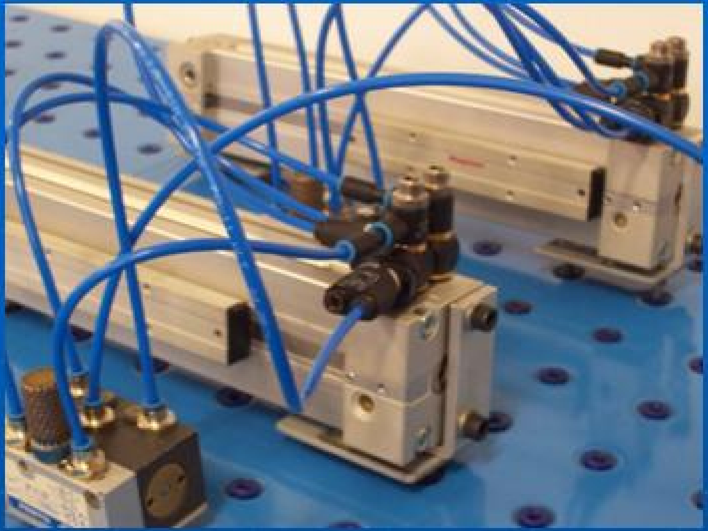
- DC Motor Units (Serial and parallel configuration)
- AC Motor Units
- universal motor unit (repulsive)
- **3-phase motor unit**

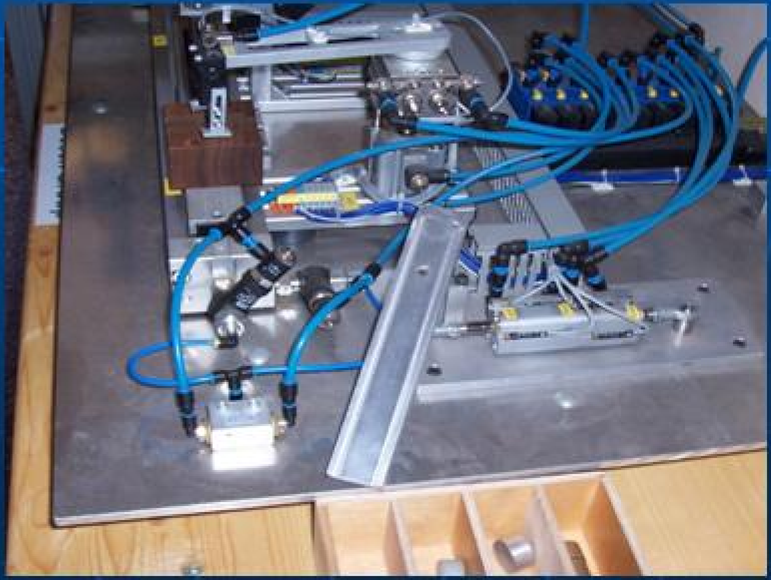
On these Mechatronical units we are providing measurements and analysis's.

Usually we are setting up the starting parameters (*input voltage*) and then we are displaying and measuring the outputs (*torque, RPM, and different characteristics, …*)

Pneumatic valve Control by PLC:



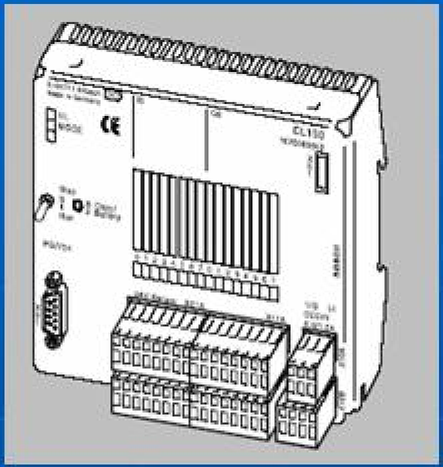




Teaching Robots at the Mechatronic Laboratory

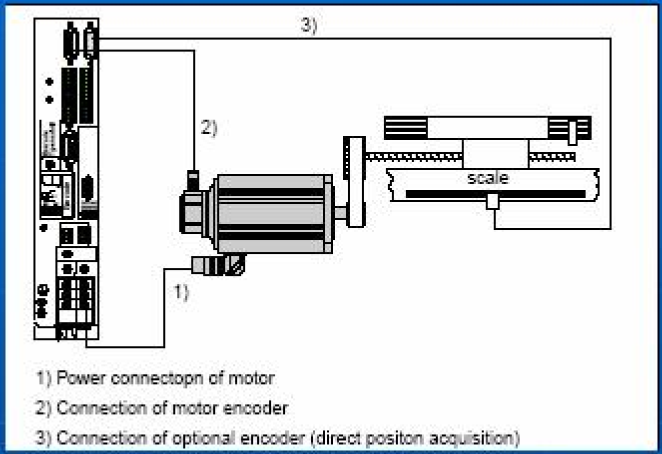
PLC Controlled Bosch Robot Manipulator:

BOSCH PLC

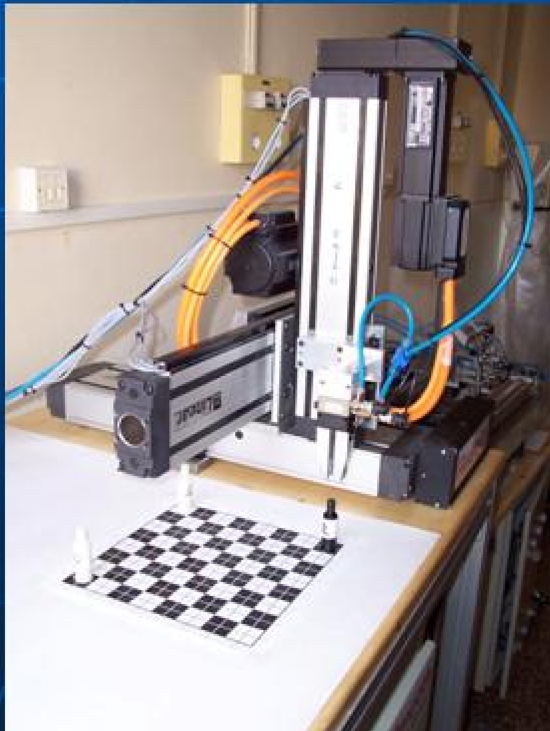


ECO Drive

3-phase synchronous motor



Pick & Place operations by chess figures



PLC Controlled Separator:

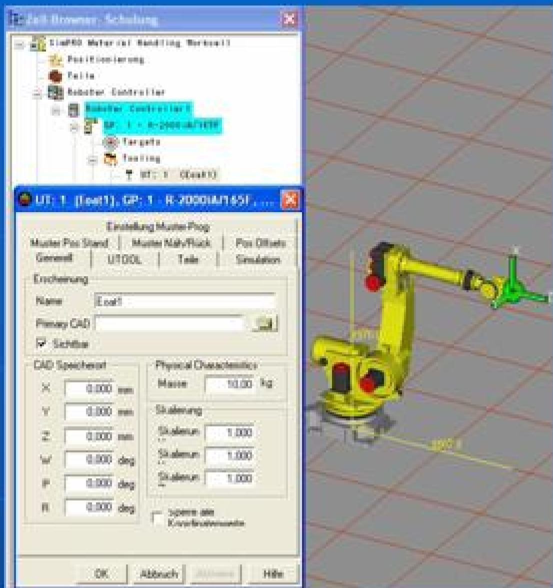
The whole system:

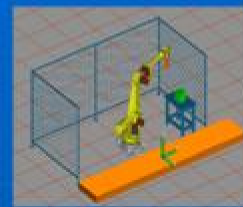
Sensing of the material of the sample:

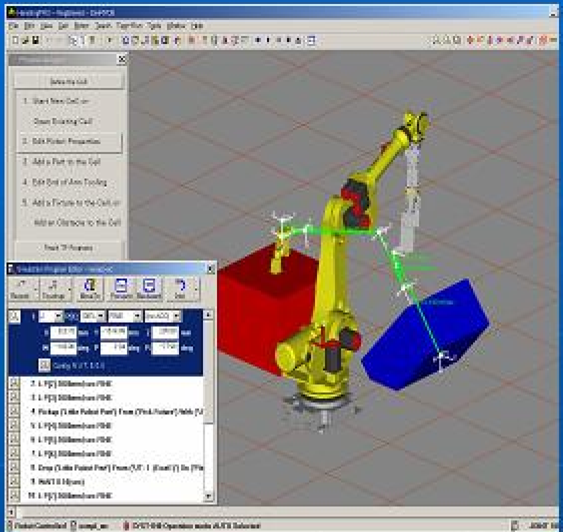
Sample gripping:

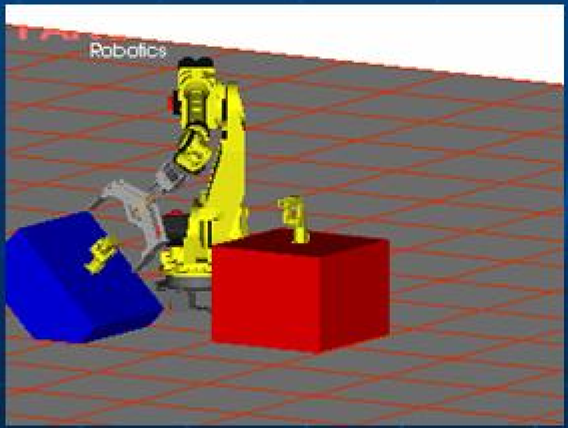
Sorting, based on sample material:

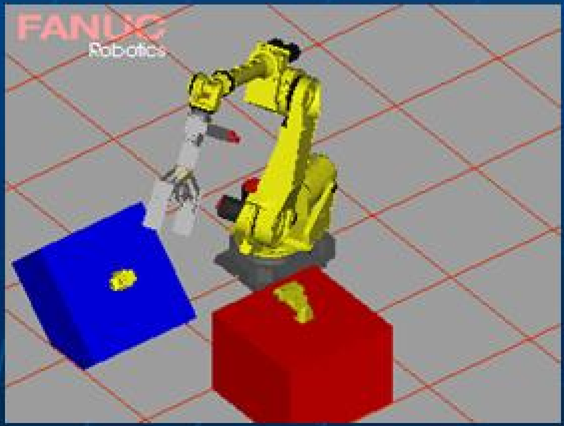
Fanuc: Robot simulation software for Robot Manipulator - RoboGuide:





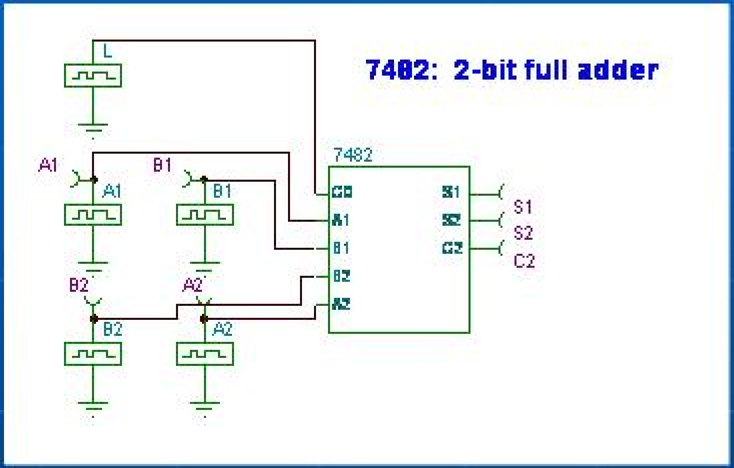


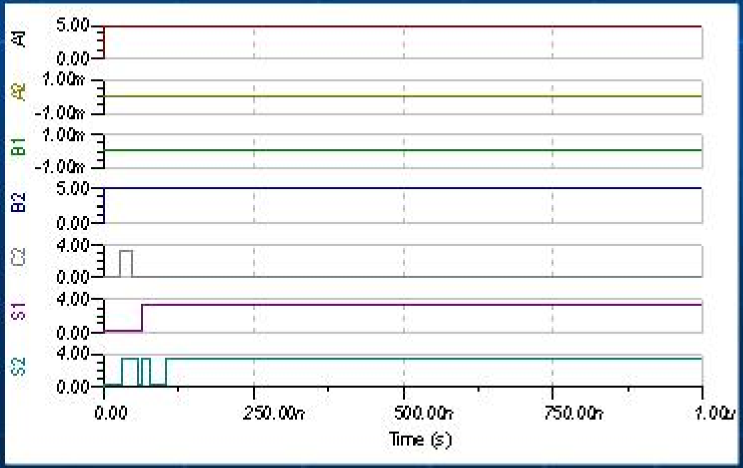




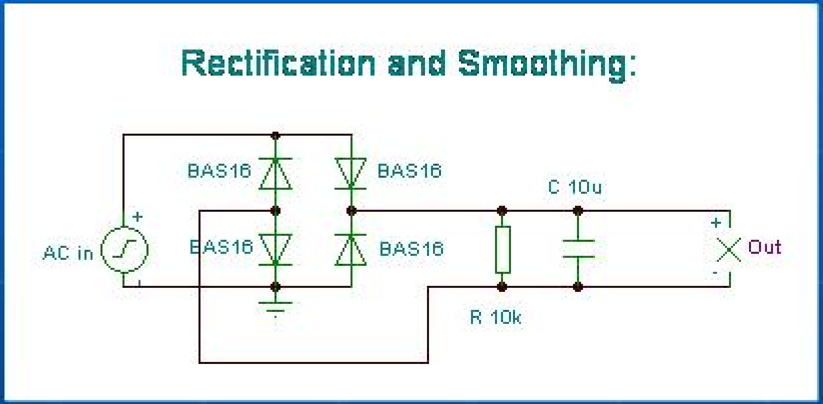
Electrical Circuit Design by Tina:

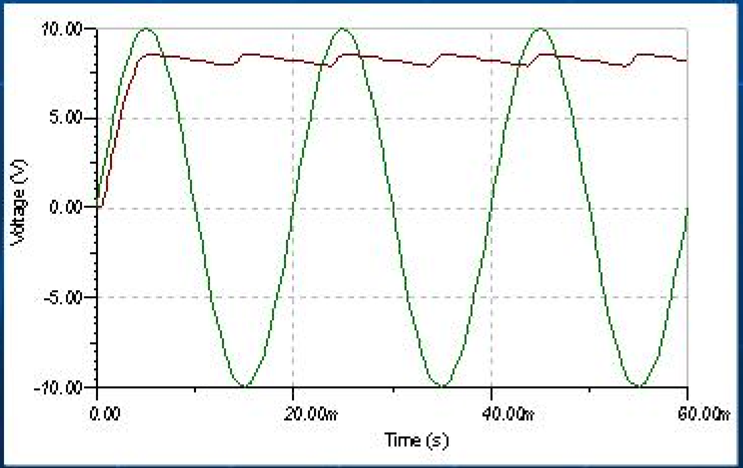
Logic IC design & analysis





Analog circuit design & analysis

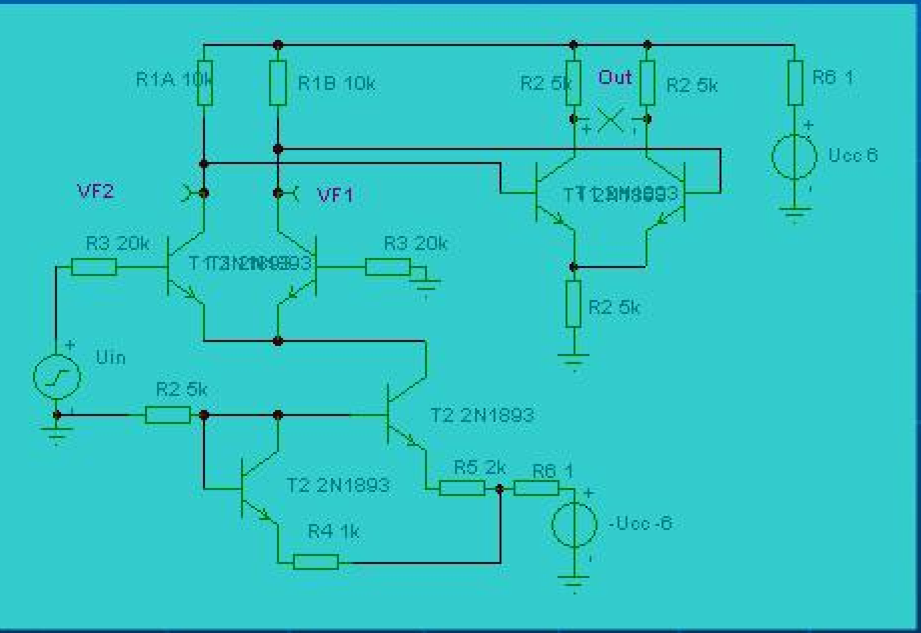




Electrical Circuit optimization by Tina:

DC Optimization

of a Differential Amplifier



This example illustrates how to use Optimization to set the operating point of a differential amplifier.

1. Run Analysis/DC Analysis/Calculate Nodal Voltages to see the original VF1, VF2 collector voltages (3.78V).

2. Run Analysis/Optimization/DC Optimization... TINA will find new R1A, R1B values in order to reach the predefined VF1=2.5V, VF2=2.5V collector voltages (Optimization Target/DC Goal Function/Value).

3. Run Analysis/DC Analysis/Calculate Nodal Voltages again to check the new colletor voltages

4. Select Analysis/Optimization Target and click on the VF1, VF2 voltage pins or select Analysis/Control Object and click on R1A, R1B then press the Select button to see the settings for this optimization.

5. Note that the value of R1A, R1B are changed after optimization.

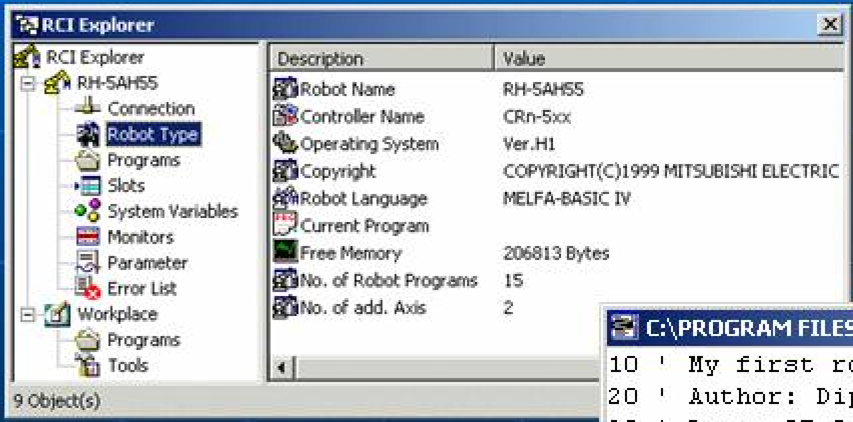
Mitsubishi Robot Manipulator:

Two work-desks:

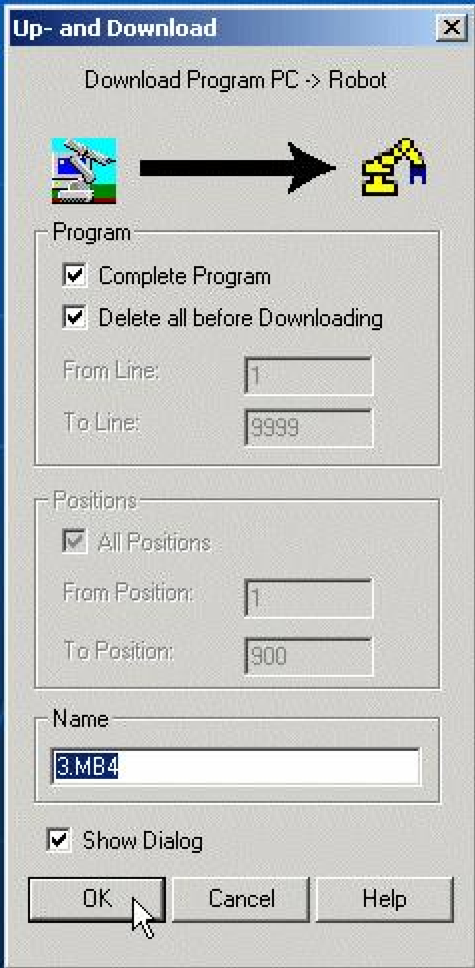
- For assembly operations
- Picture processing and pick and place operations

The program developing is provided through *COSIROP* program editor:

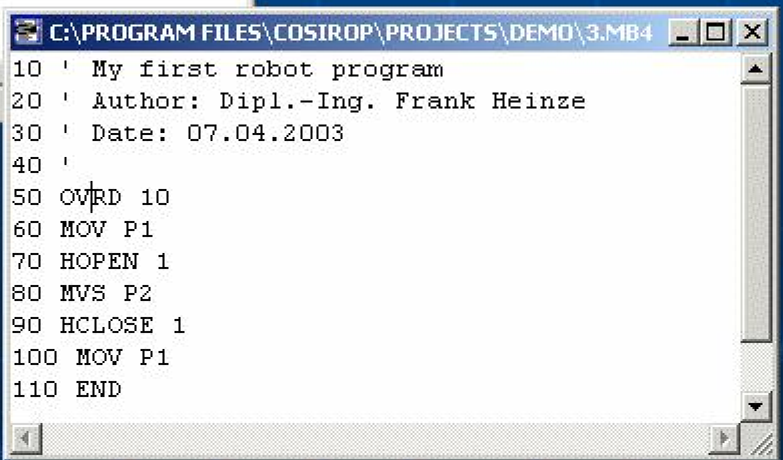
Robot & Workcell configurations:



Download and Debugging:



Programming:



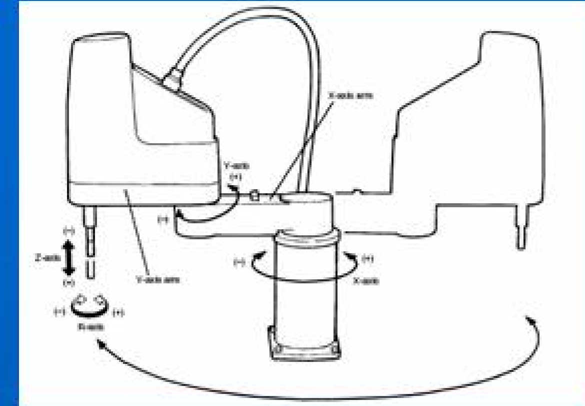
Yamaha Robot Manipulator:

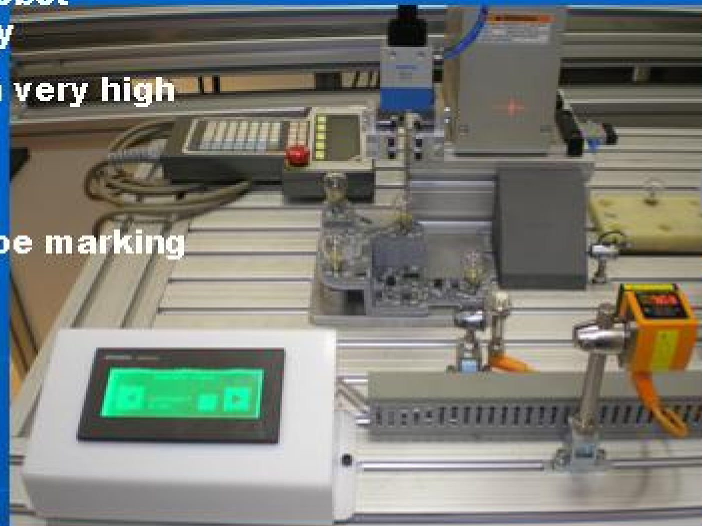
-Controlled by PLC and robot controller simultaneously

-A SCARA robot arm with very high speed and torques

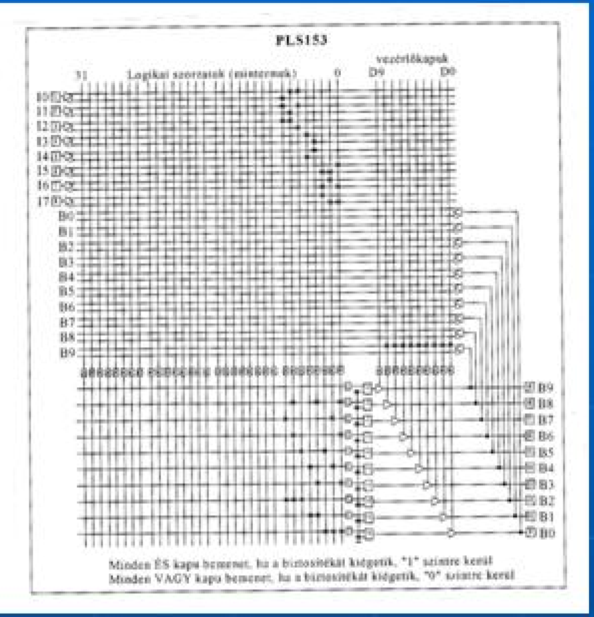
The task is:

- separation based on type marking





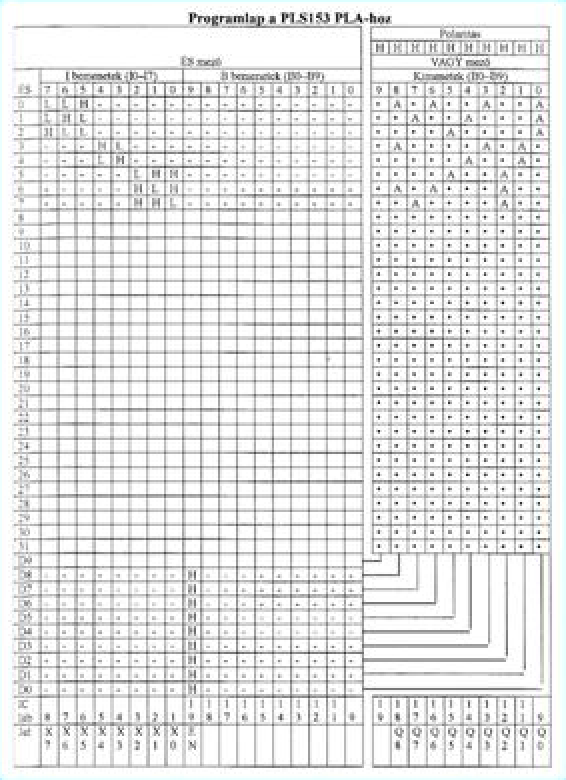
PLA, PAL, GAL, FPGA, CPLD Programming



PLA: PLS153 – inner circuit diagramm

PLA: PLS153

programming sheet



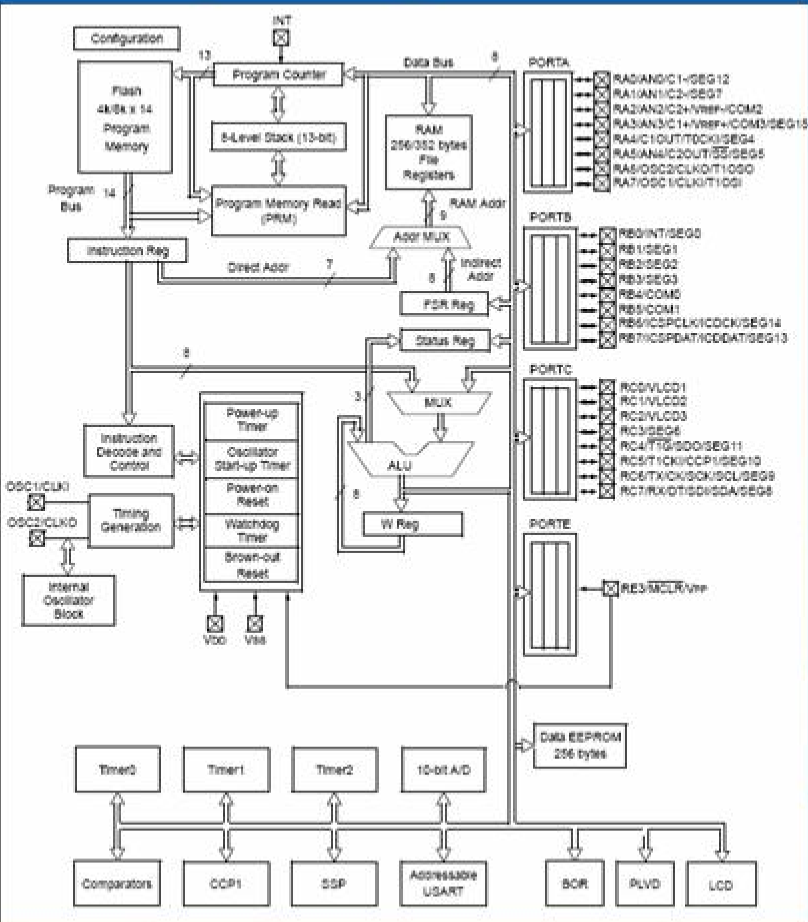
Fuse matrices and *JEDEC* file for *PAL* circuits (*PAL16L8*)

```
*F0
*L00000    11111111111111111111111111111111
*L00032    01011111111111111111111111111111
*L00064    10101111111111111111111111111111
*L00256    11111111111111111111111111111111
*L00288    11110111011111111111111111111111
*L00320    11111011101111111111111111111111
*L00512    11111111111111111111111111111111
*L00544    11111111111101110111111111111111
*L00576    11111111111110111011111111111111
*L00768    11111111111111111111111111111111
*L00800    11111111111111111111101110111111
*L00832    11111111111111111111110111011111

*P 1 2 19 3 4 18 5 6 17 7 8 16 9 11 12 13 14 15 10 20
*V0001     00L00L00L00LXXXXXXXNN
*V0002     01H01H01H01HXXXXXXXNN
*V0003     10H10H10H10HXXXXXXXNN
*V0004     11L11L11L11LXXXXXXXNN
```

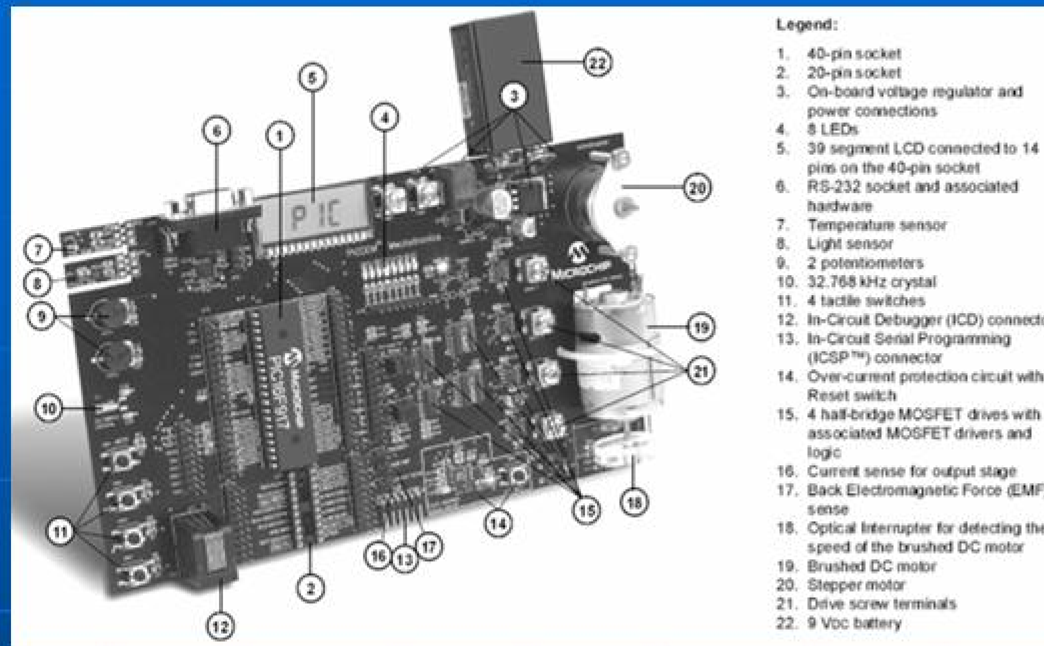
```
<STX>
Cupl        3.0  Serial    #    0-00000-000
Device      tibpal16r4     Library DLIB-h-24-11
Created     May  08  14:32:41  2001
Name        Example_001
PartNo      EX001
Revision    01
Designer    Nagy_Alajos
Company     KFMFK_(GAMF)
*QP20
*QF2048
*G0
*F0
*L00000     10110101110111111100111000110111
*C0307
*QV1
*P 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
*V0001     CXXXXX110N0HHLLZXXHN
*<ETX>6AA1
```

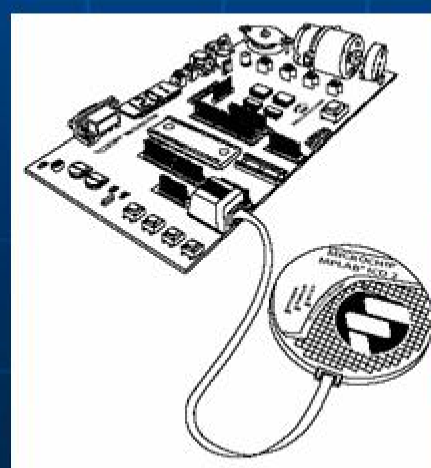
PIC Programming Course, PIC Demo board



The Block Diagramm of *PIC 16F913*

The *Mechatronics Demo Board*





Connection of the Demo Board and *ICD-2 Programming* Unit

Mobile Robot Designing & Path Planning, Training

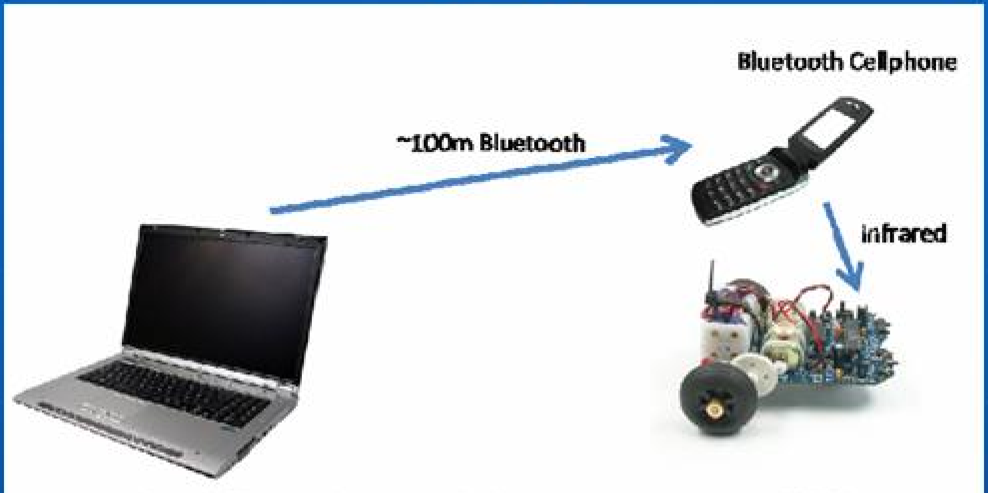


Figure 3: The alternative communication between a computer and ASURO.

ASURO programming:

First Try: The programming we can provide by the AVR μP ***Program editor***

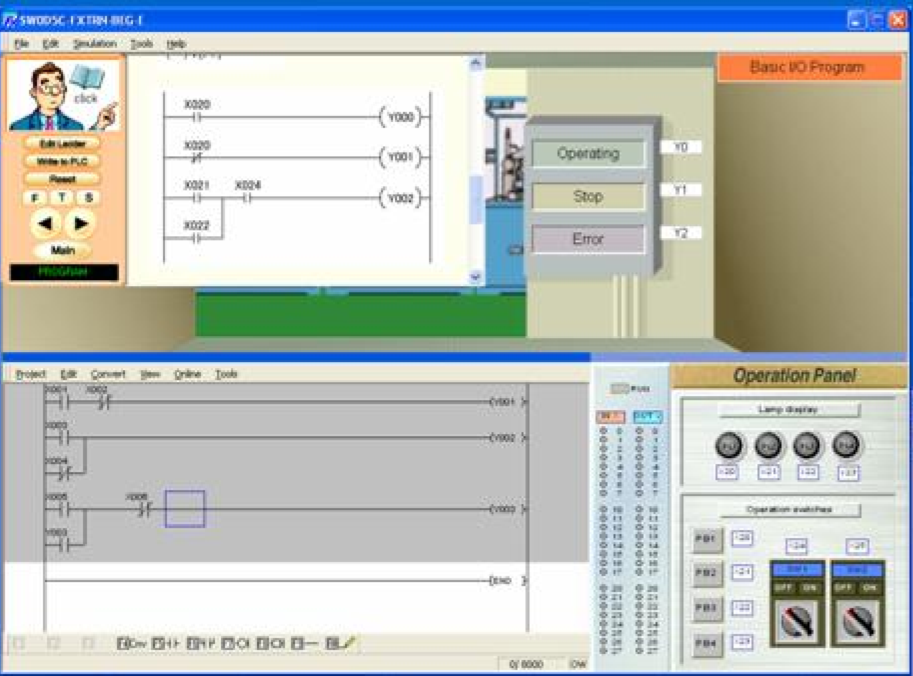
Switches 1: (signal analysis) We have to know how the ***sensors*** operate

Switches 2: (schematics)

Flashing: Finally we have to ***upload*** the program to the μP

Mitsubishi PLC FX- Trainer:

Basics of Ladder diagramm programming, …..



A short **Competition?**