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DesIRE

Presentation of P04
Zaporizhzhya National Technical University (ZNTU)
Zaporizhzhya, Ukraine

Work in Embedded Systems Laboratory.
Best students practices.

Anzhelika Parkhomenko

PhD, Associate professor

http://moodle.zntu.edu.ua/

Co-funded by the
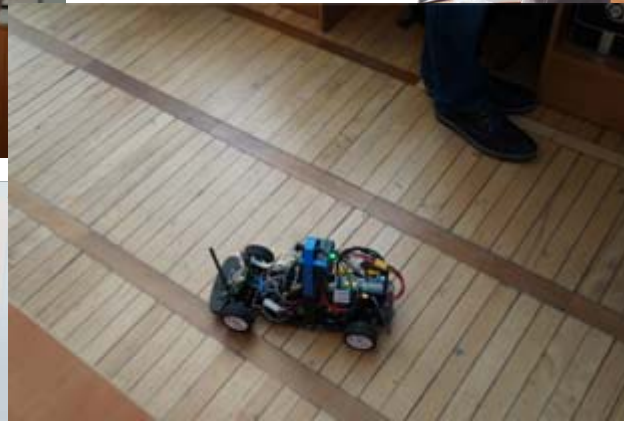Tempus Programme
of the European Union

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

FPV auto project

Zaporizhzhya,
October 15, 2015

Moving objects control systems

Basic software requirement:
•minimum response time for input parameters;

Basic hardware requirements:
•compactness;
•energy consumption minimization.

Basic system requirements
•expected behavior of the system;
•reliability;
•durability.

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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System architecture

Programmable components

Completed solutions

Constructive components

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**Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM**
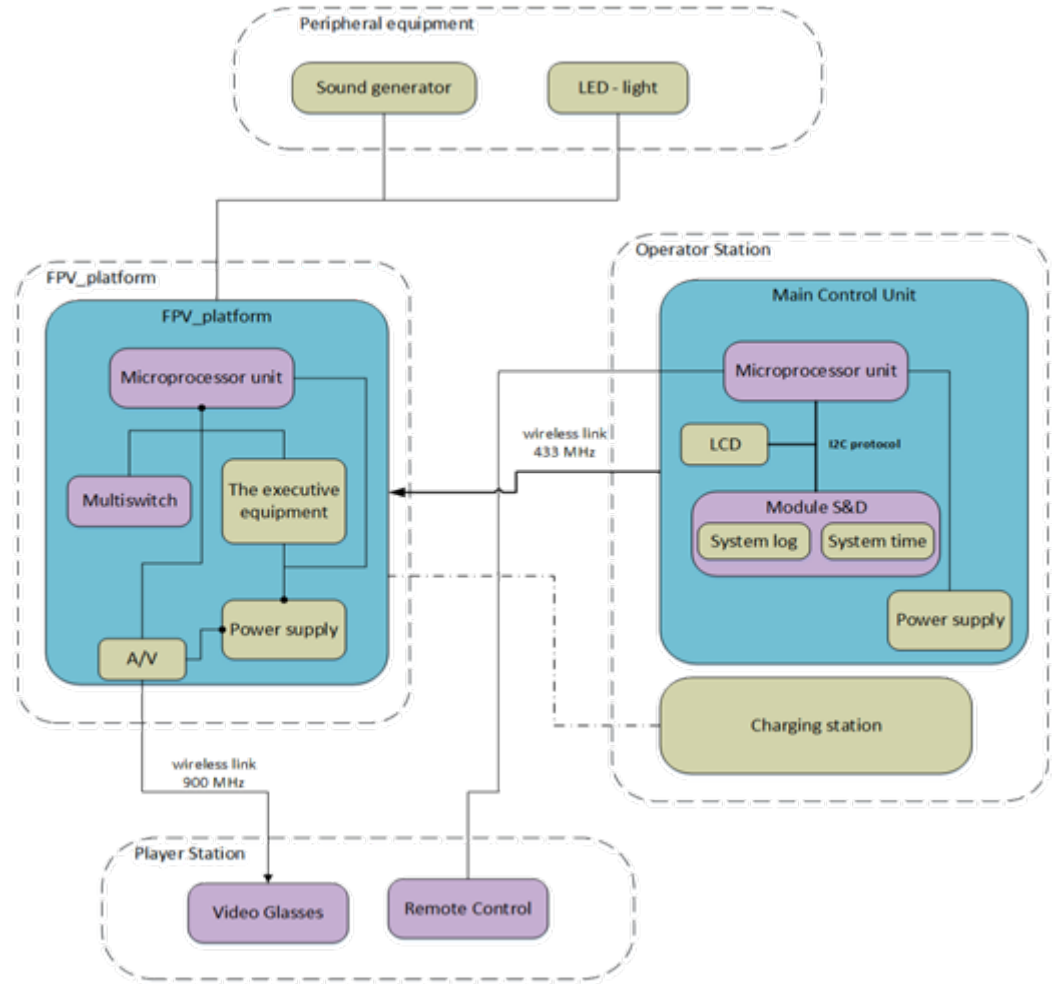
Development of programs for the microcontroller

*.HEX - files

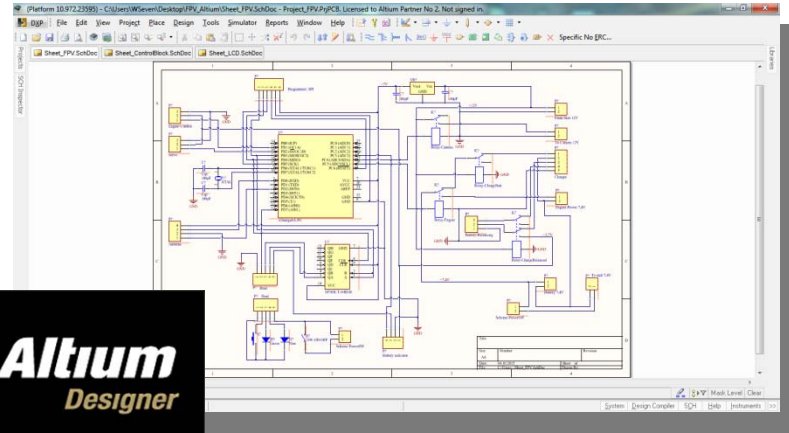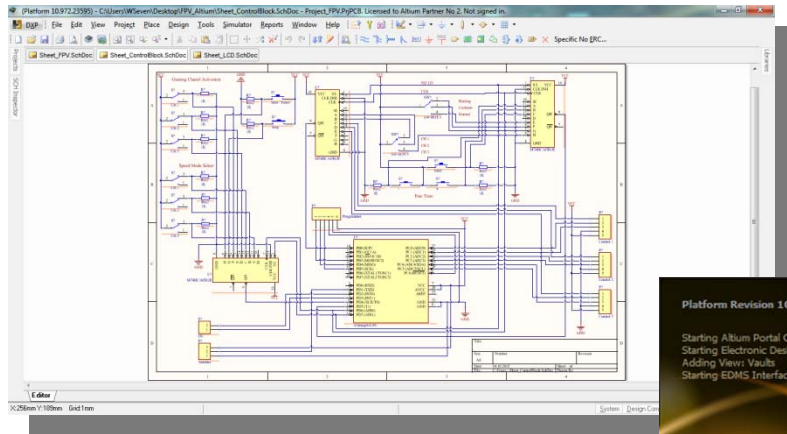HEX
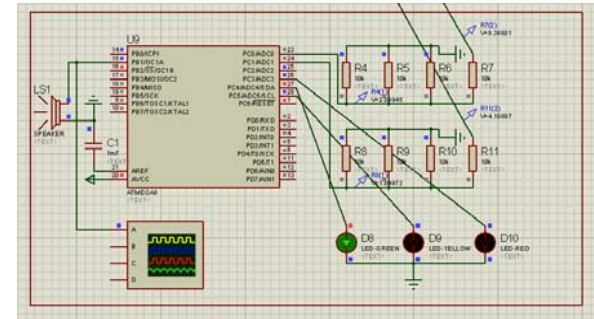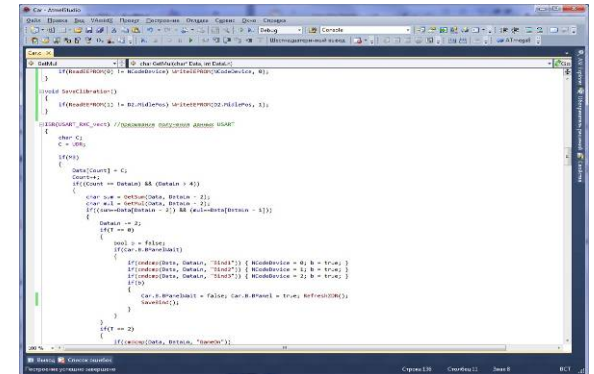
ATMEL STUDIO 6

Atmega 8A

Programmer

Co-funded by the
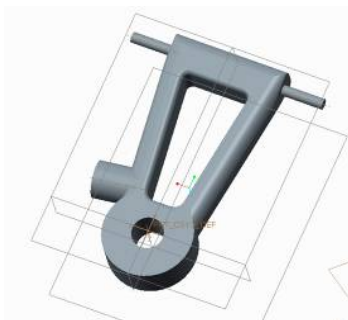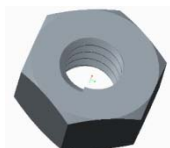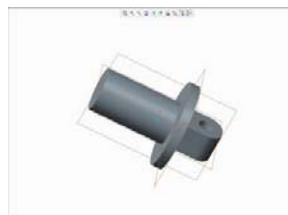Tempus Programme
of the European Union

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

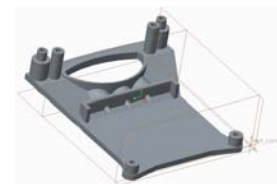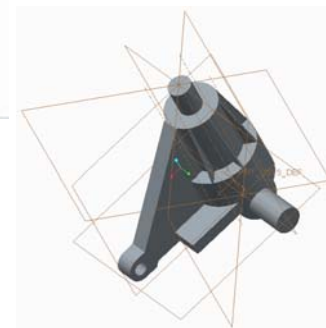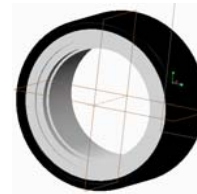# Creation and investigation system virtual prototype
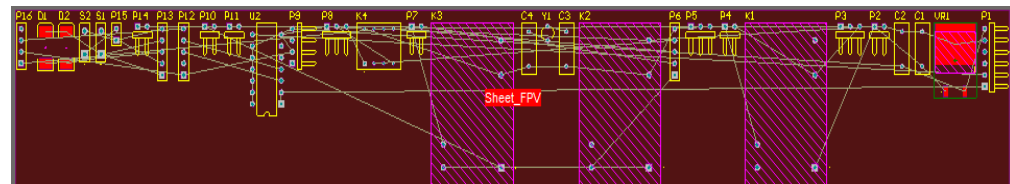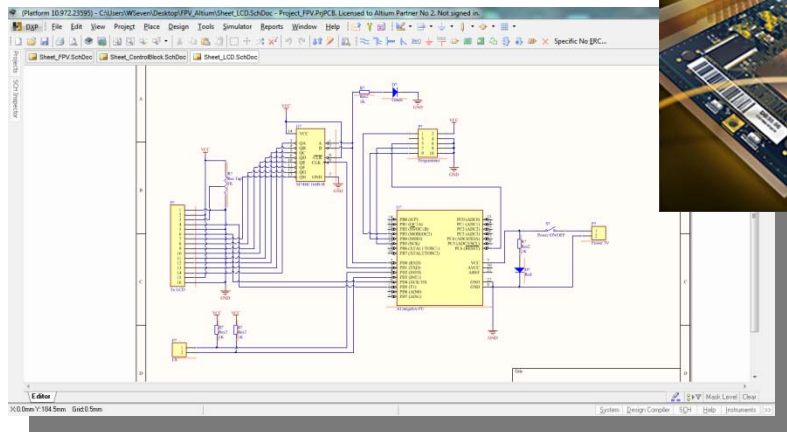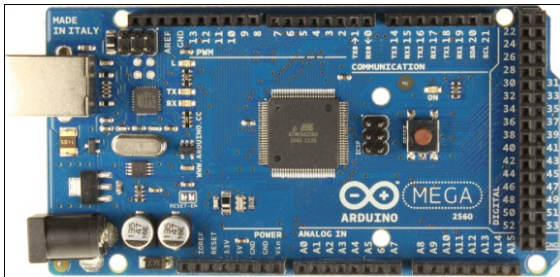
Creation and investigation system virtual prototype

Modern hardware and software platforms

Arduino

Raspberry Pi

Altera Cyclone

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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Bachelor work in progress based on Arduino

Traffic light Program

LCD Program

I2C-protocol

The main program S&D module

Flash Program

Clock Program

Arduino shields

MCU Program

Radio channel

Multiswitch Program

FPV - program

Charge control Program

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Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

Bachelor work in progress based on Raspberry Pi

Co-funded by the
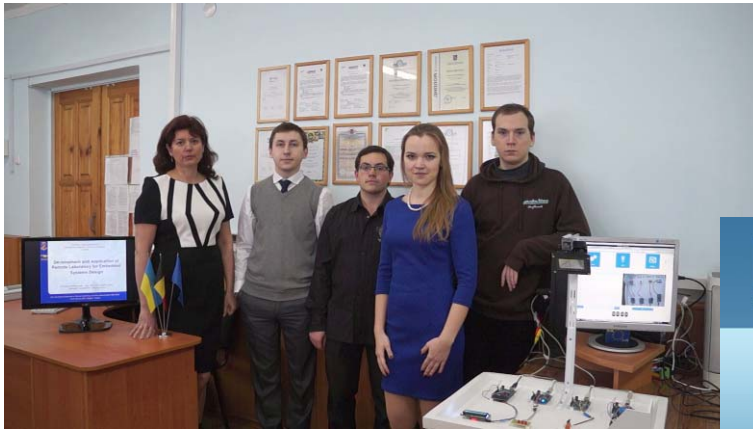Tempus Programme
of the European Union
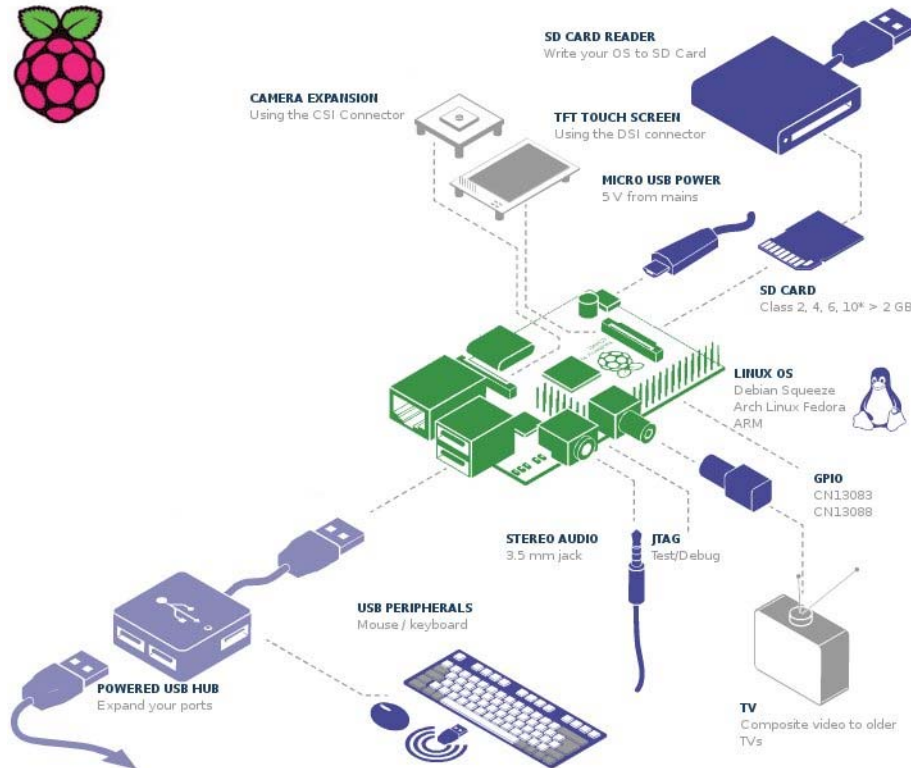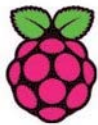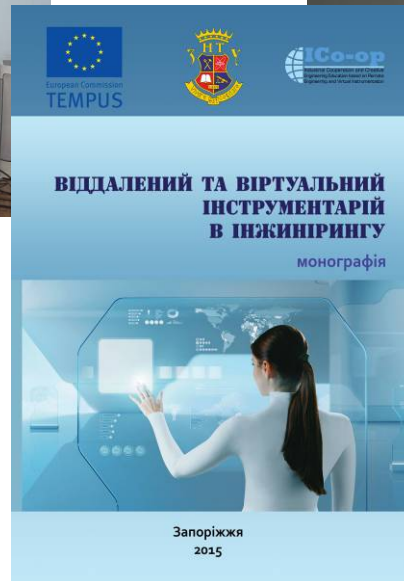
Real prototype
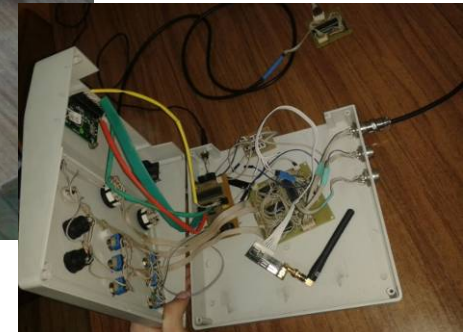
Development and Application of Remote Laboratory for Design of Embedded Systems (RELDES)

RELDES team

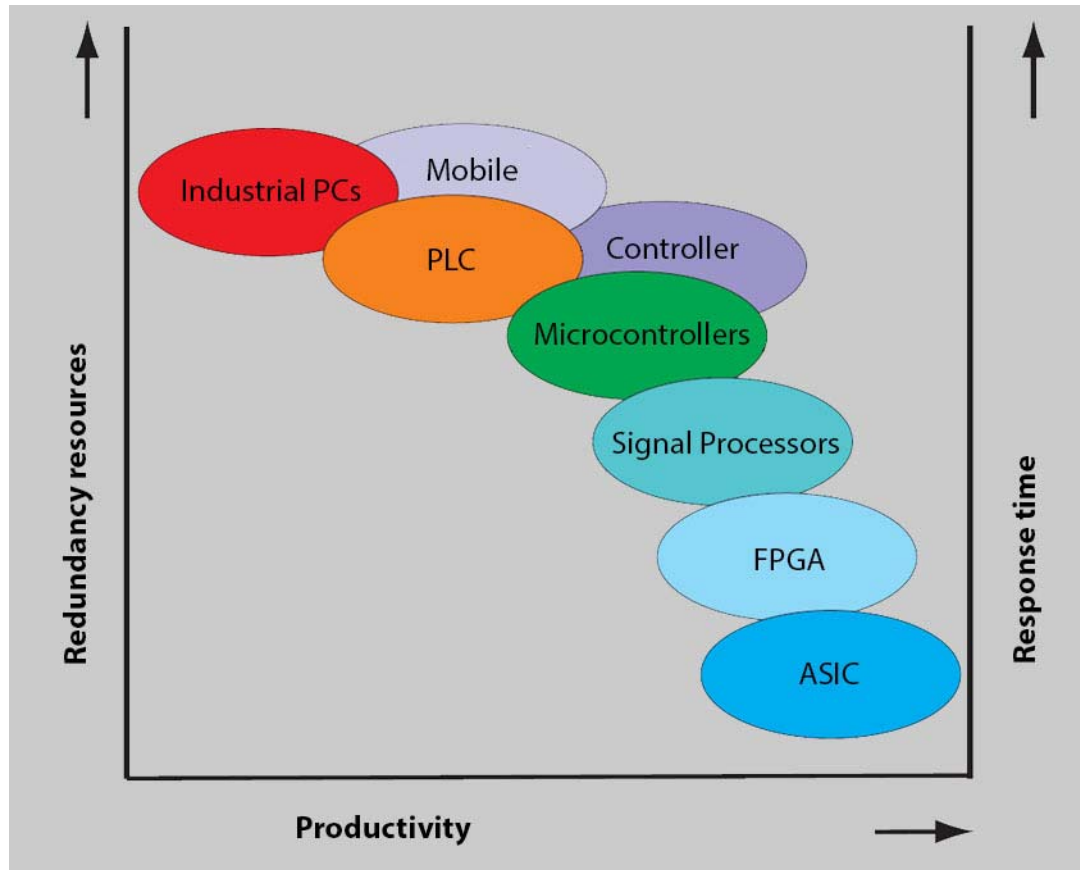**Presentation of RL Zaporizhzhya, October 15, 2015**

Co-funded by the
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ES today
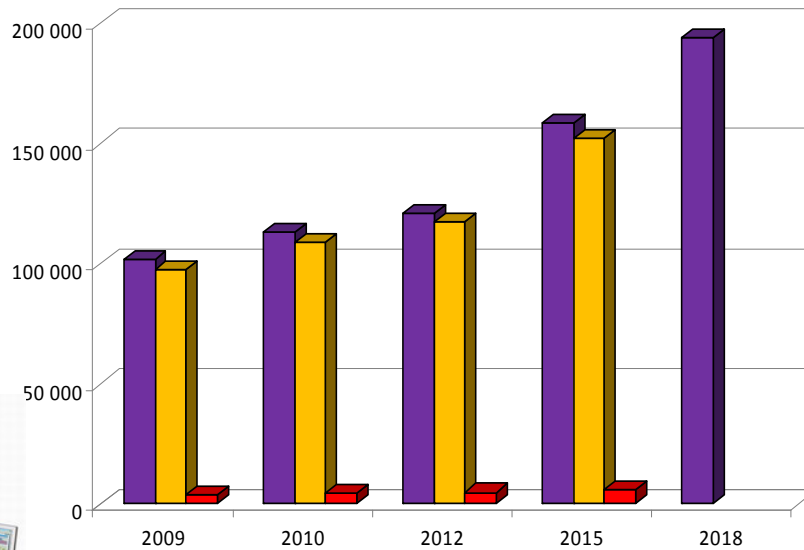
- Embedded System
- Embedded hardware
- Embedded software

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Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM
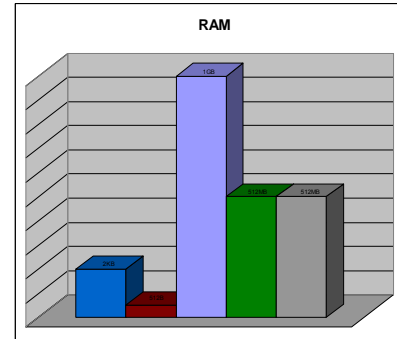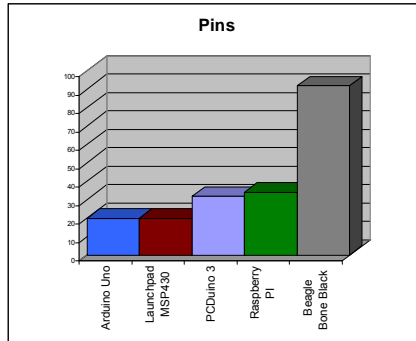
ESs design technologies

Platunov A.E, 2012
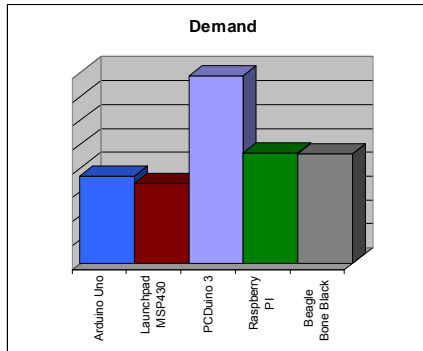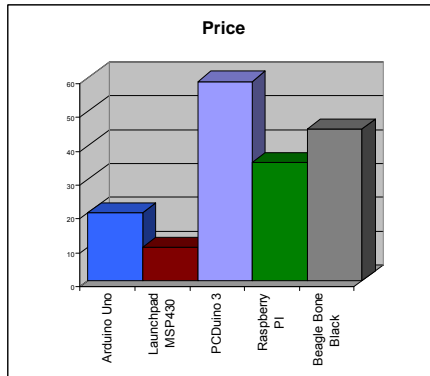
Hardware/software platforms for ES design

Launchpad MSP430

Freeduino

Raspberry Pi

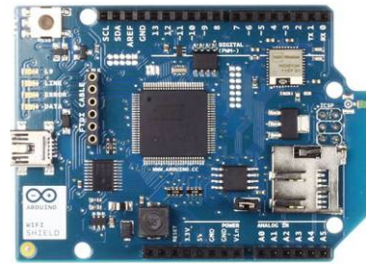*Pins*

RAM

Price

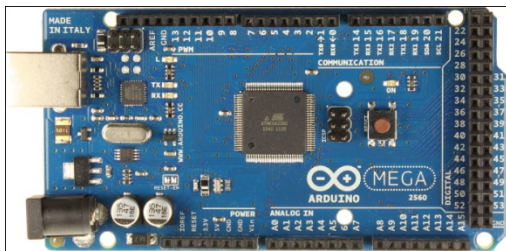

Demand

Beagle Bone Black
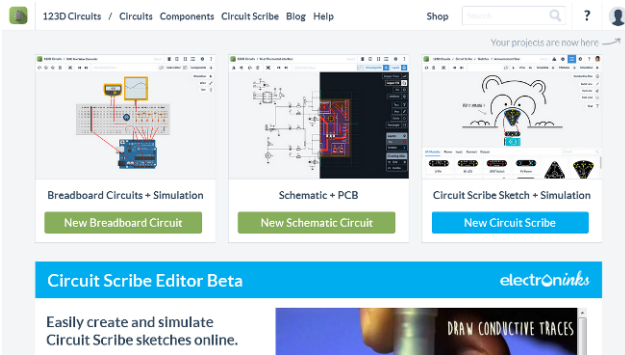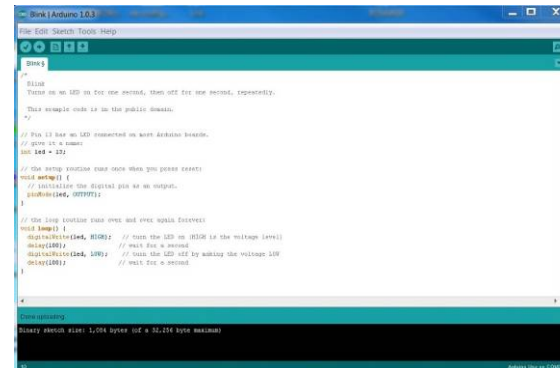

Arduino

Altera Cyclone

Hardware/software platform Arduino
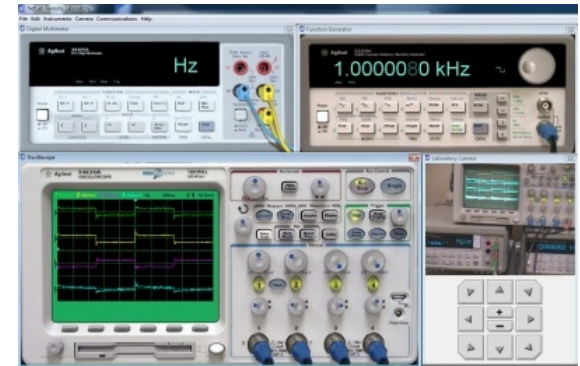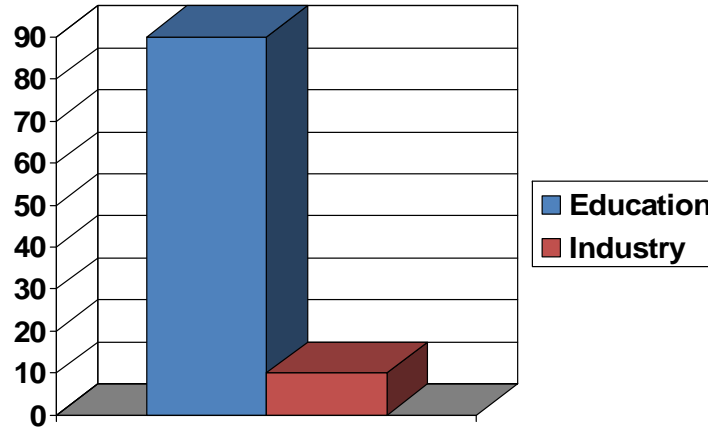

Arduino boards and shilds

Arduino simulator

Arduino IDE

Applications of remote laboratories

- Electronics
- Robotics
- Physics
- Chemistry
- Biology
- Earth Science
- etc..

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Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

Remote laboratories in the fields of electronics

TEXAS INSTRUMENTS

- GOLDI
- WEBENCH ® Design Center
- DEUSTO
- Intel Remote.Lab
- iLabs

RELDES Hardware architecture

User side
(cross-platform)

Internet

Server side

Server

USB

Exp.1

Exp.2

Exp.3

Exp.4

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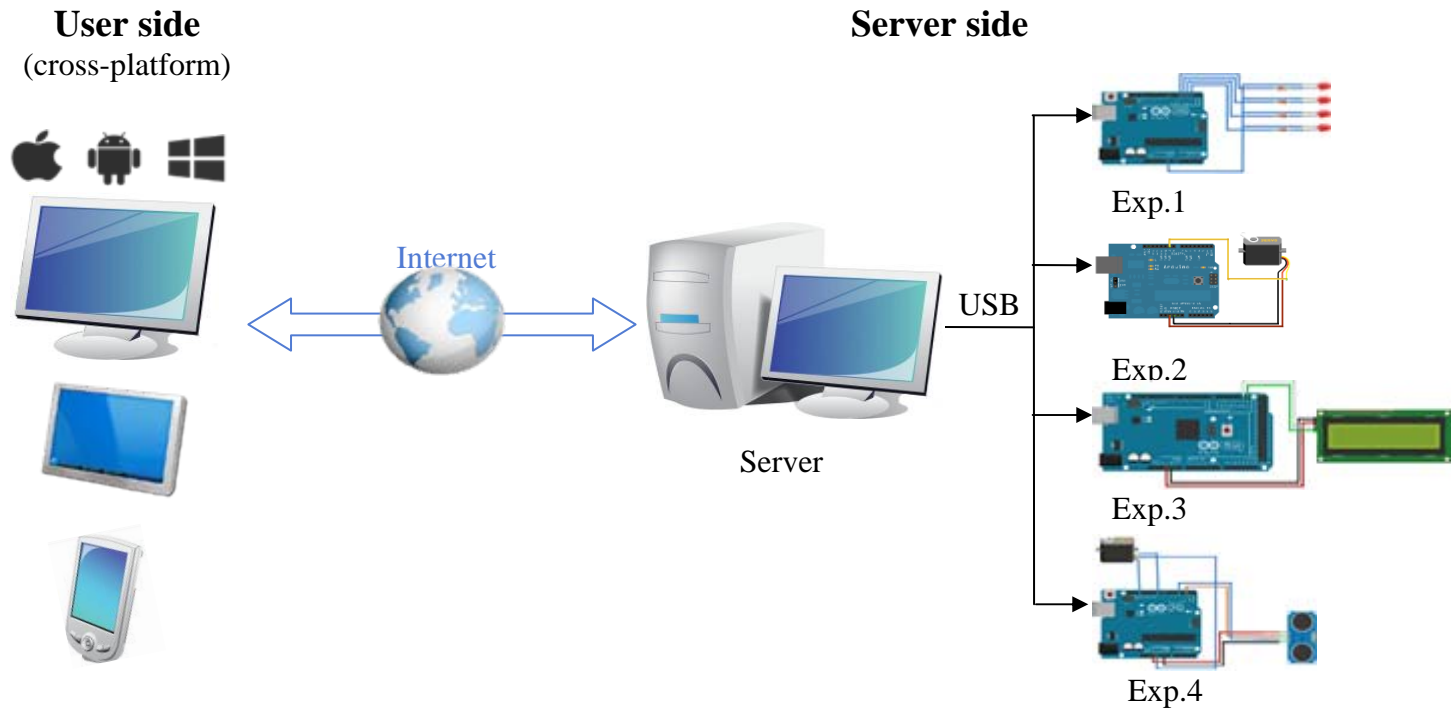
RELDES Software architecture

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of the European Union
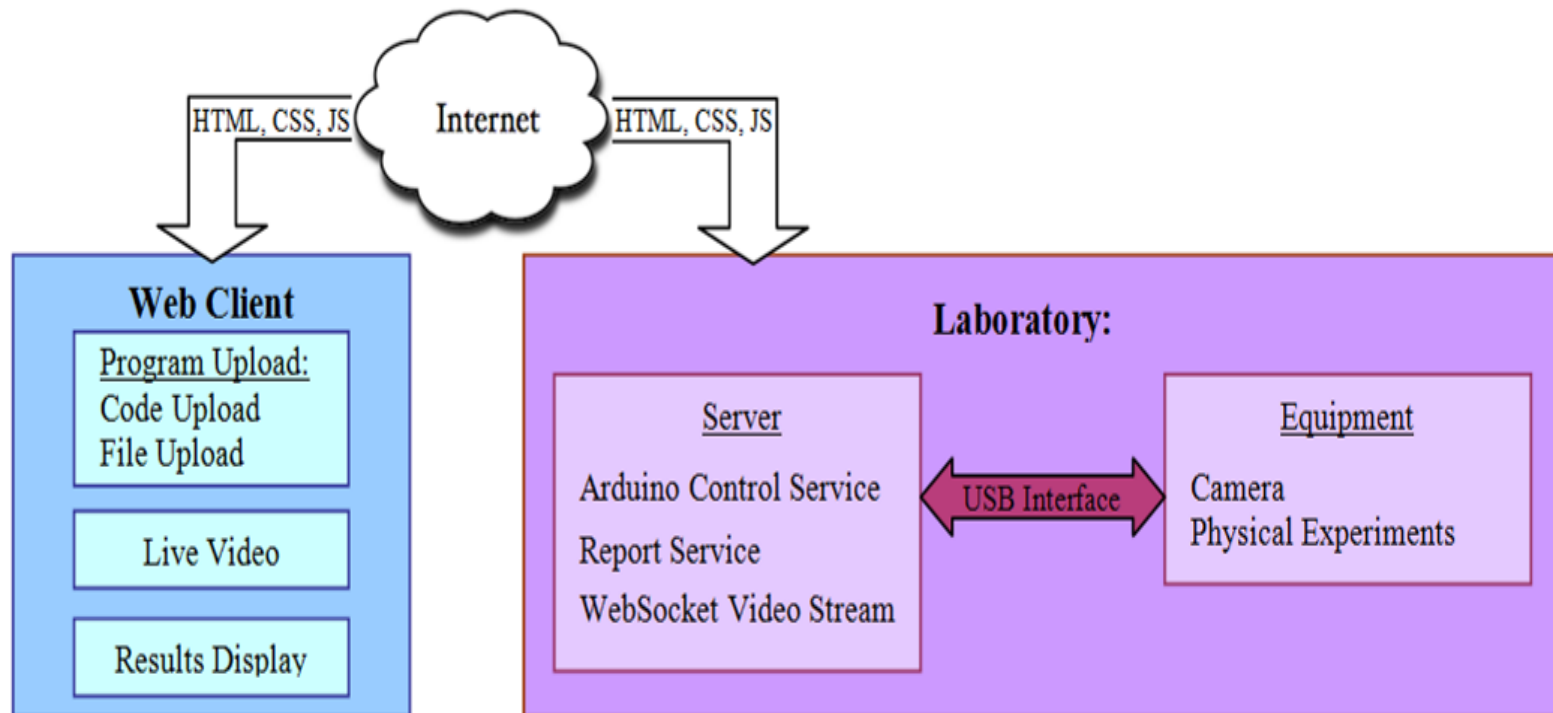
Laboratory process diagram

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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RELDES interface

http://youtu.be/u2anq--UYFg
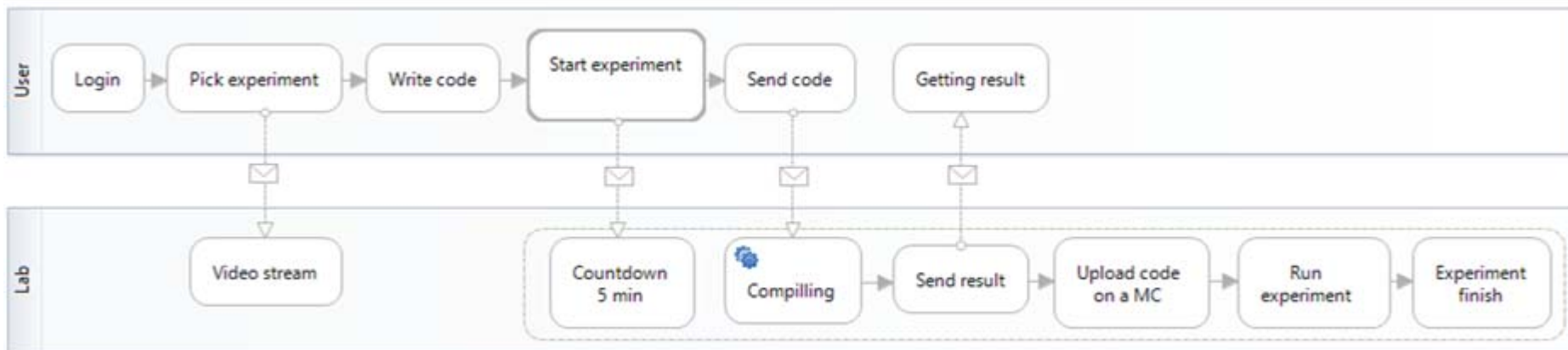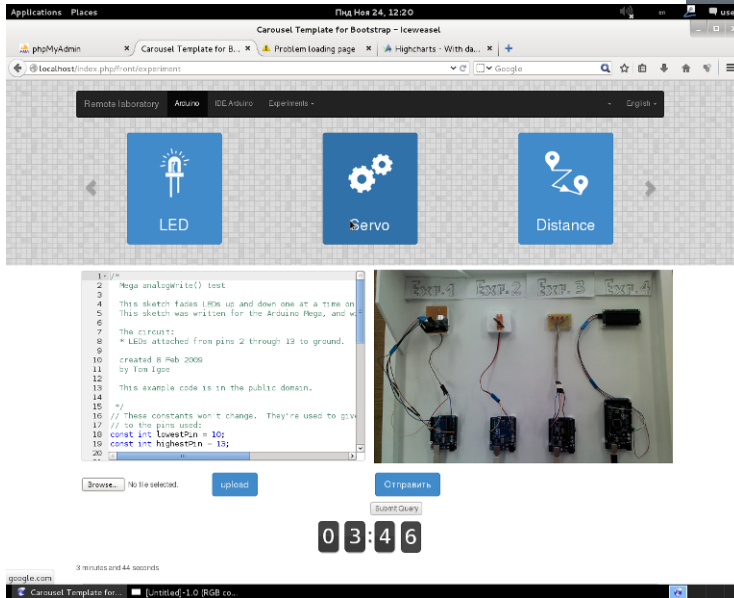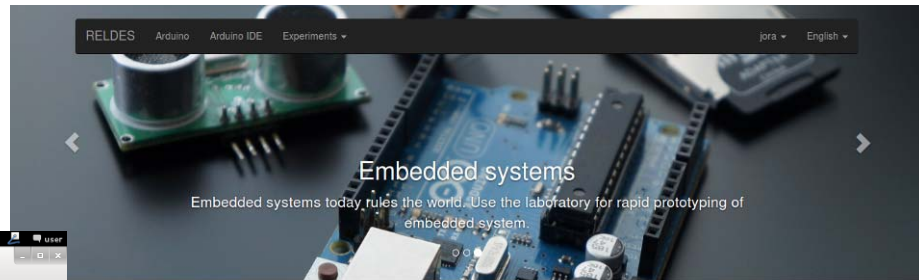
Work in progress

Future work will be focused on :

- expanding the range of provided hardware-software platforms;

- adding the set of experiments for solution of different tasks of embedded systems of mobile objects control design;

- development of special mechanism of lab reservation;

- creation of statistical data processing module for control of laboratory using.

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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CNC machine

for training students

**Presentation of project
Zaporizhzhya,
October 15, 2015**

Project Overview

CREO 2.0
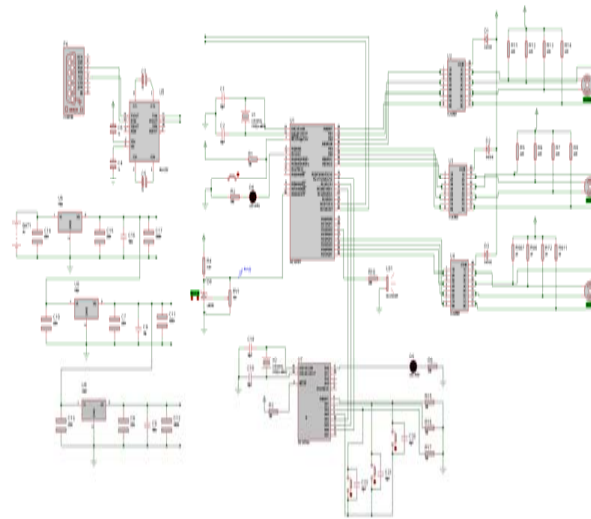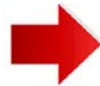
Embedded Control System
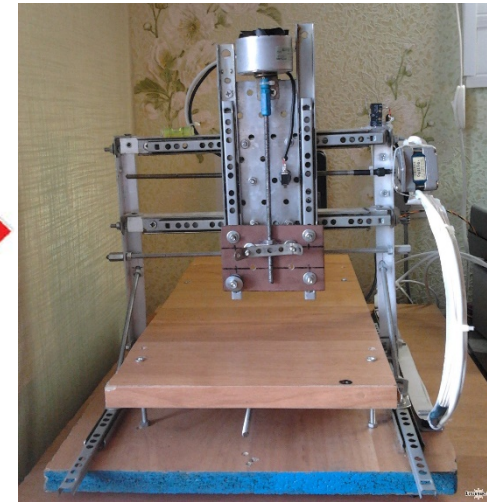
CNC Machine

CNC Machine Control Unit
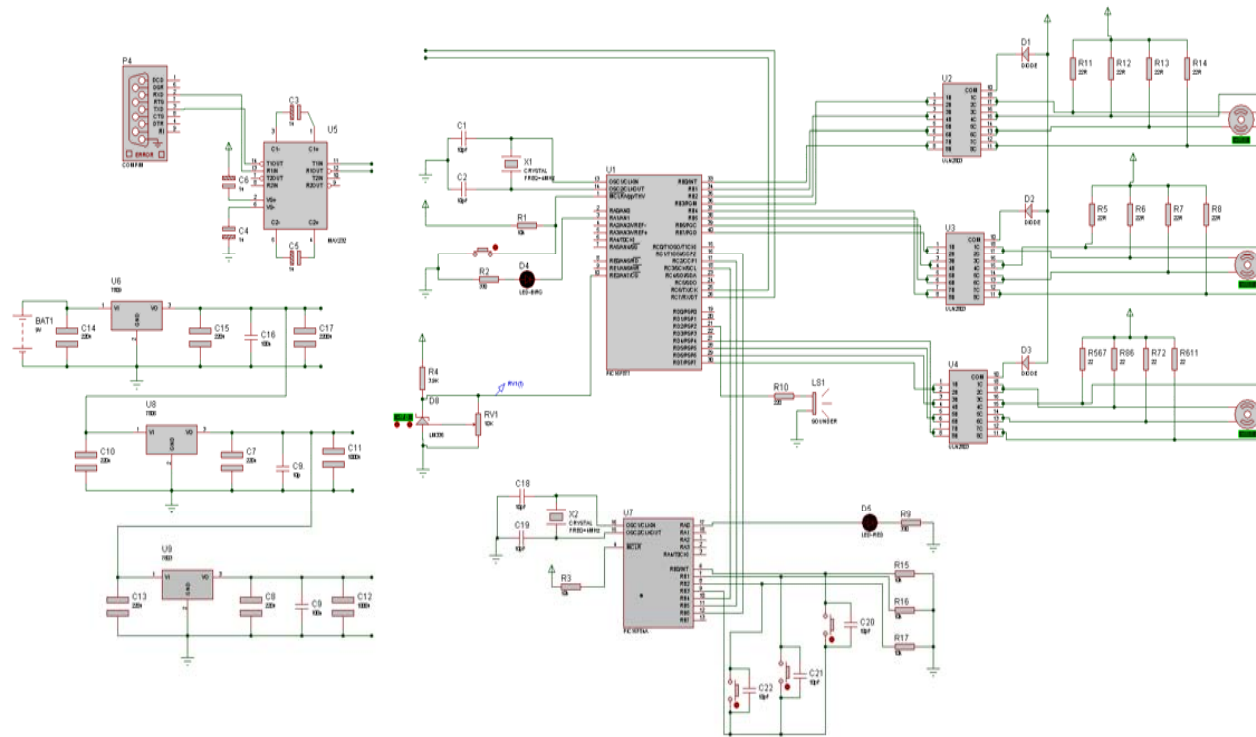
1. **Power supply module**
2. **Commands transformation module**
3. **Motor control driver**
4. **Sensor control module**

CNC Machine Control Unit
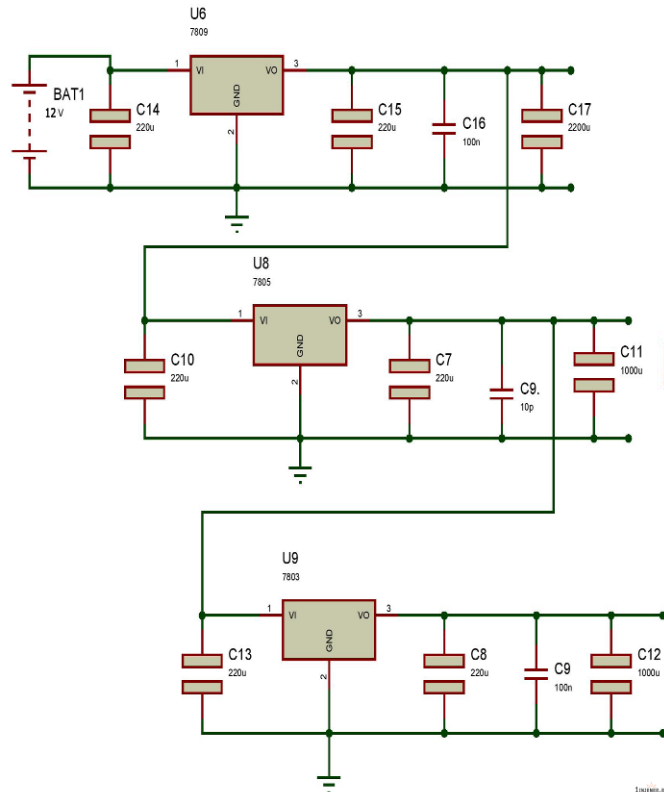
1. **Power supply module**
2. **Commands transformation module**
3. **Motor control driver**
4. **Sensor control module**

The main components: LM7805, LM7809, LM78033

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM
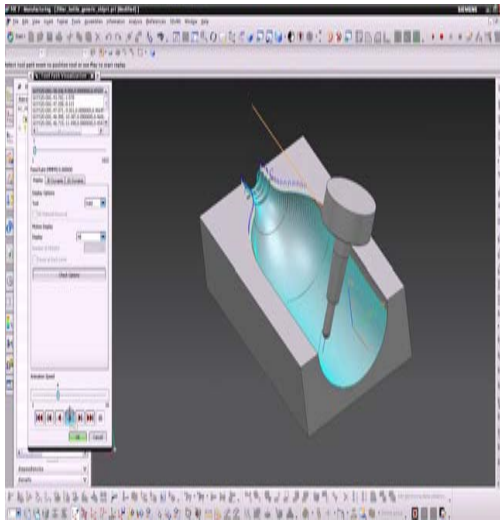
Co-funded by the
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CNC Machine Control Unit

1. **Power supply module**
2. **Commands transformation module**
3. **Motor control driver**
4. **Sensor control module**

The main components : PIC16f877a

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Tempus Programme
of the European Union

CNC Machine Control Unit

1. **Power supply module**
2. **Commands transformation module**
3. **Motor control driver**
4. **Sensor control module**

The main components : ULN2804a

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Tempus Programme
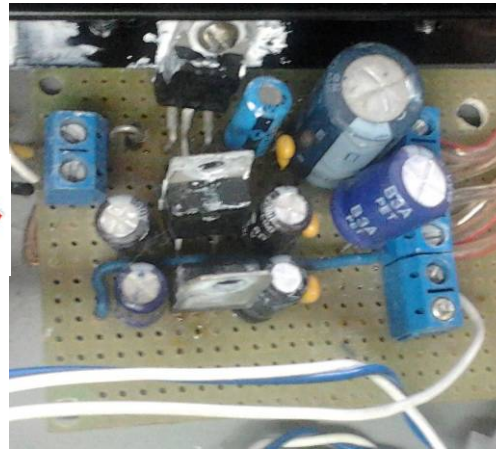of the European Union
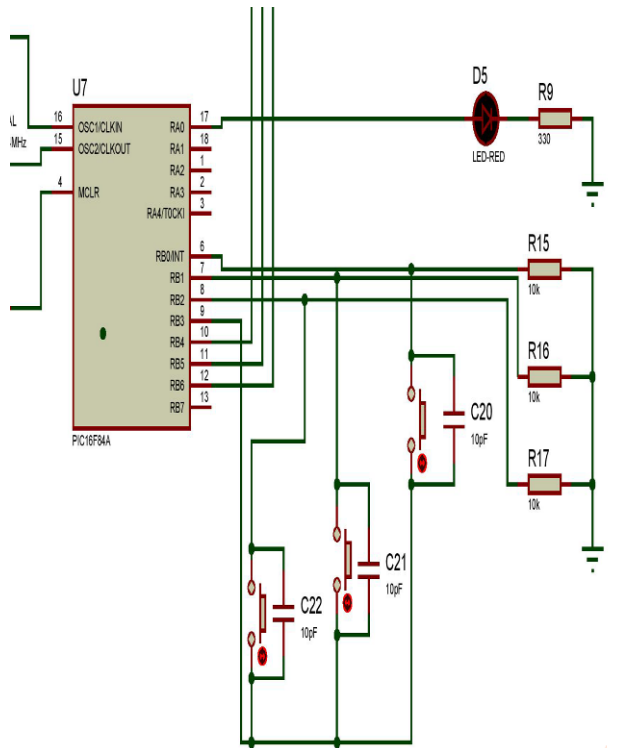
CNC Machine Control Unit

1. **Power supply module**
2. **Commands transformation module**
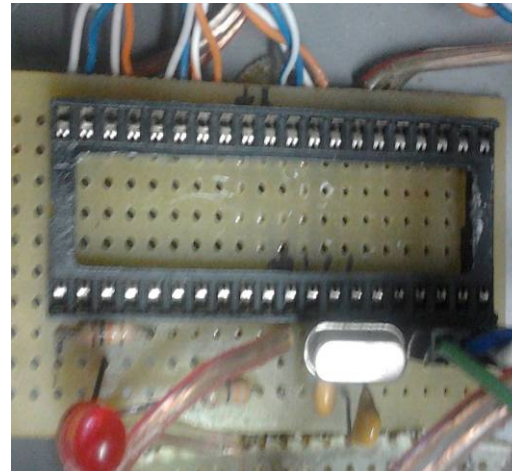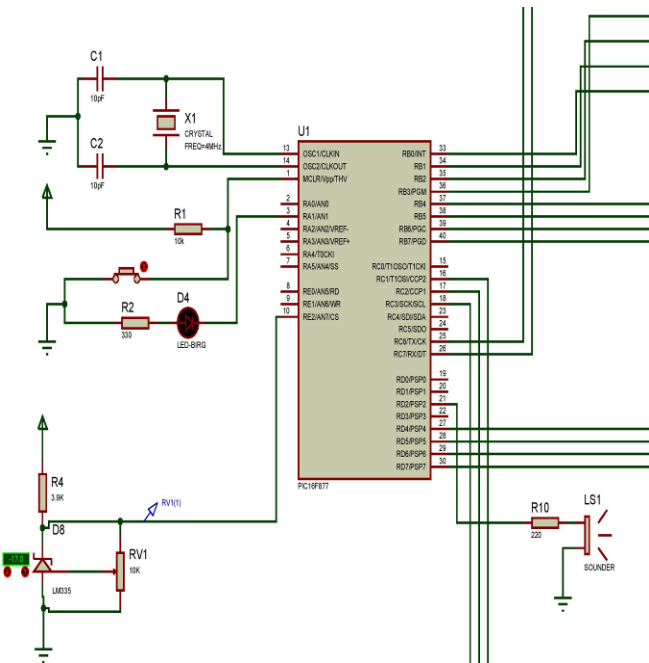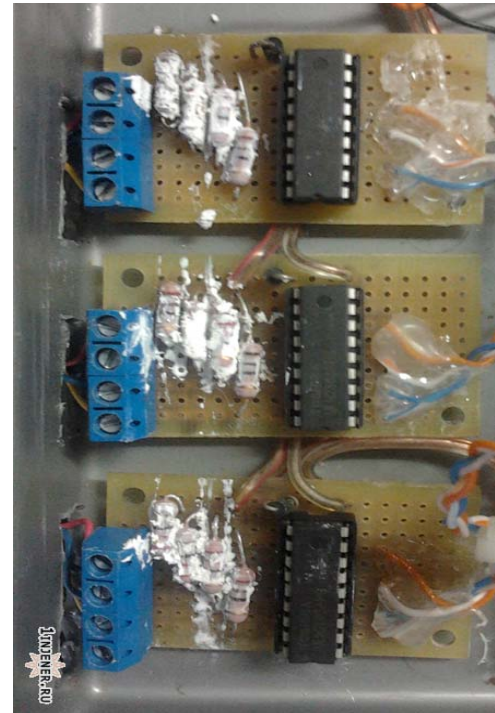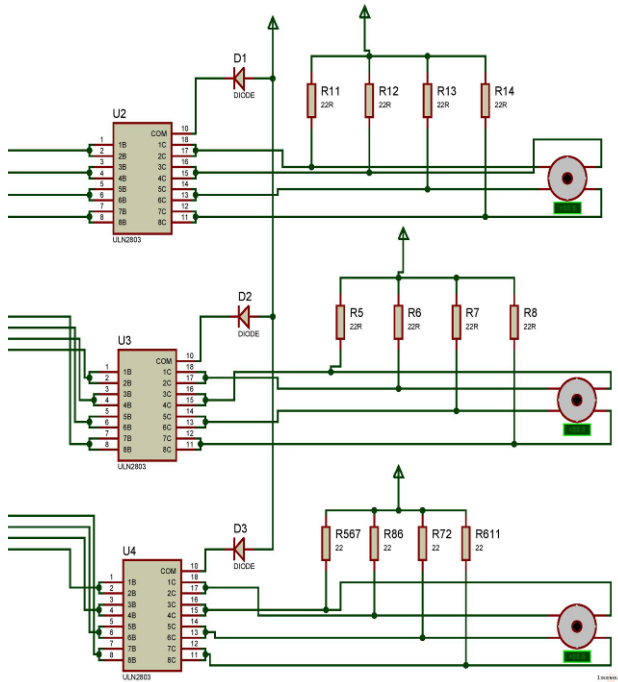3. **Motor control driver**
4. **Sensor control module**

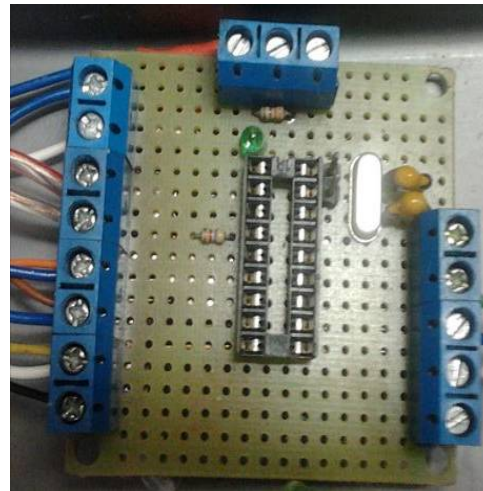**The main components : PIC16F84a**

CNC Machine Control Unit
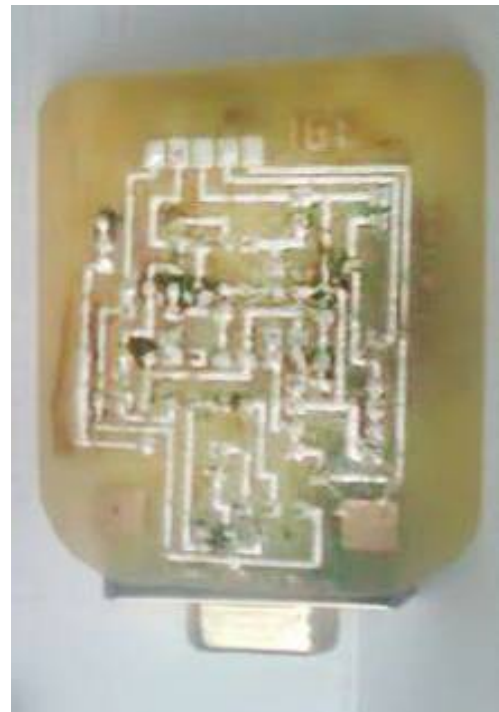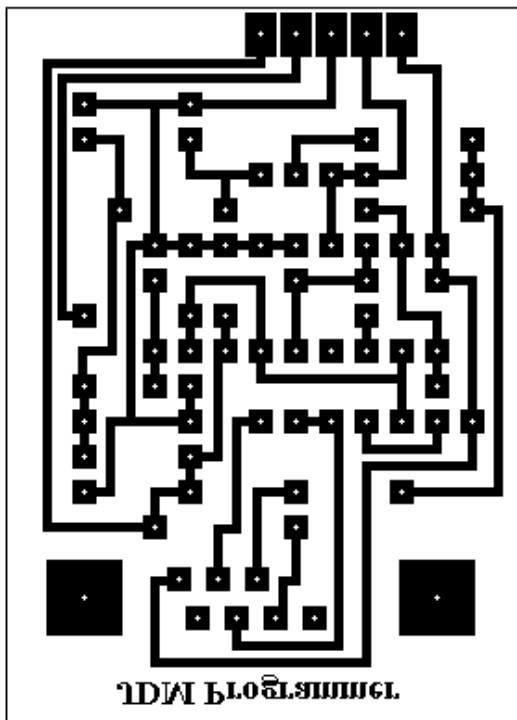
Programing of

PIC12C509A,
PIC16F84,
PIC16F84A,
PIC16F628A
PIC16F877A

CNC Machine hardware design

The Test Program

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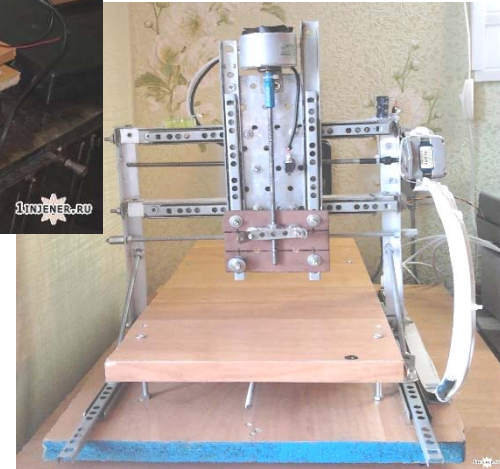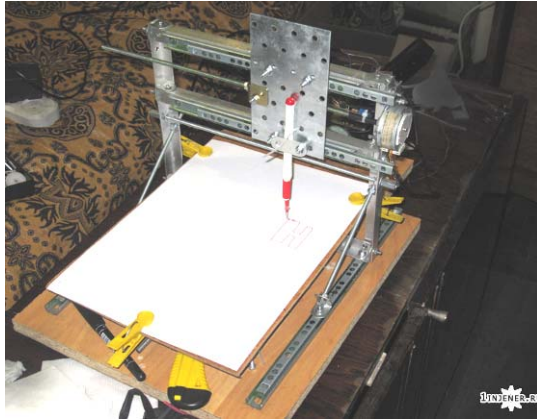
Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM
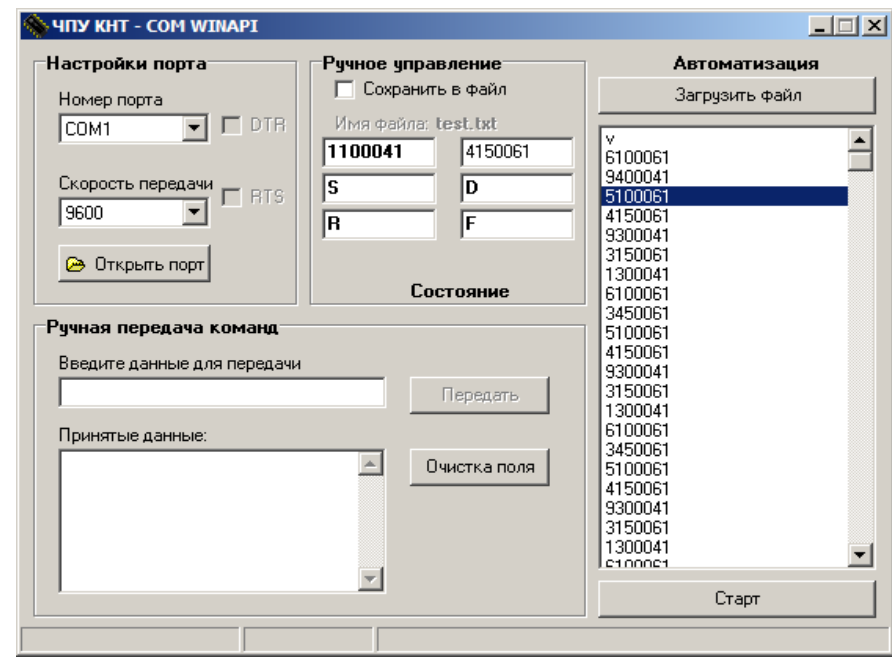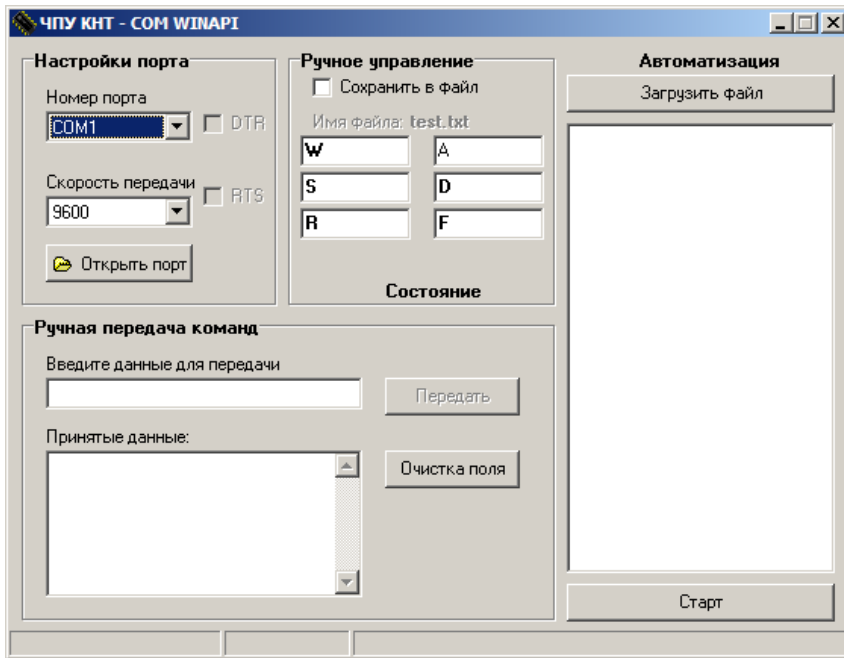
Work in progress

PIC16FXXX
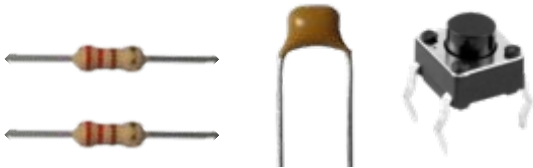
Arduino   **Raspbery Pi**   **STM32**

Cheaper, but less quality and functionality
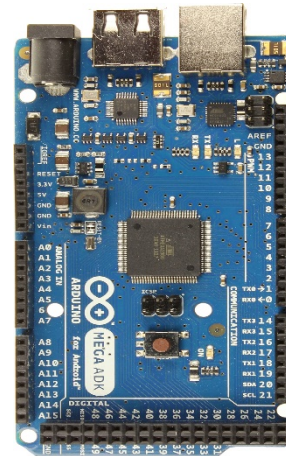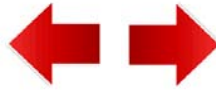
Expensive, but high quality, more functionality

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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Work in progress
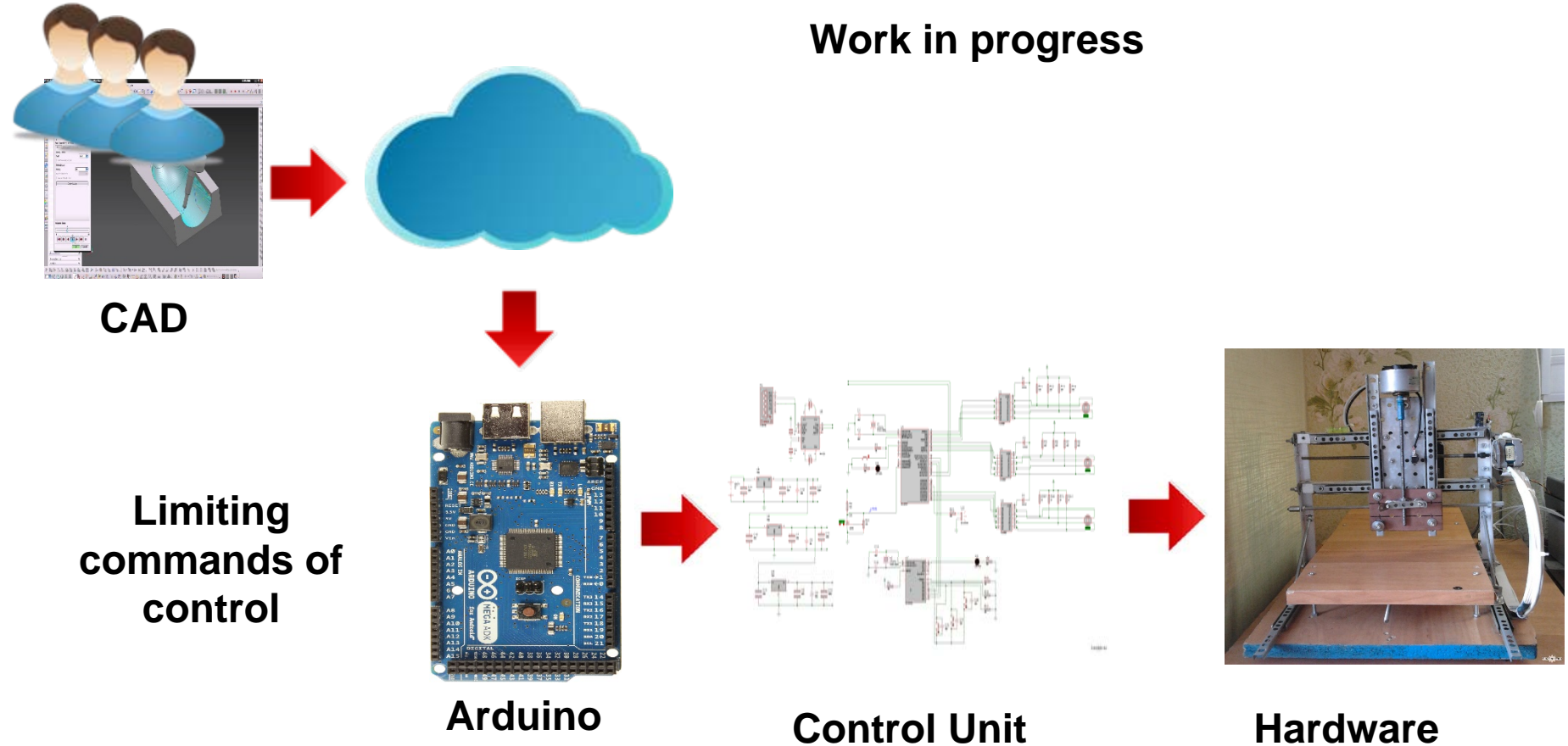
CAD

Limiting commands of control

Arduino

Control Unit

Hardware

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Modern tools for design and prototyping
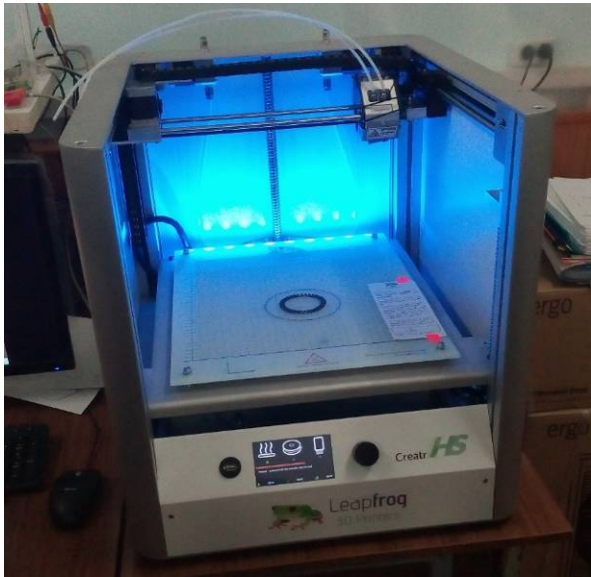
3D scanner Gotcha

3D printer Leapfrog Creatr HS

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of the European Union

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM
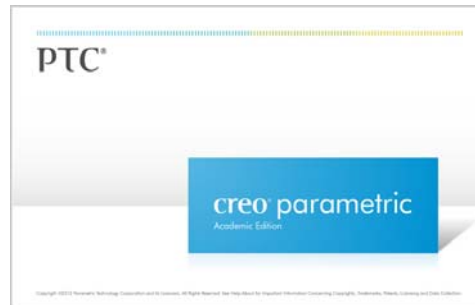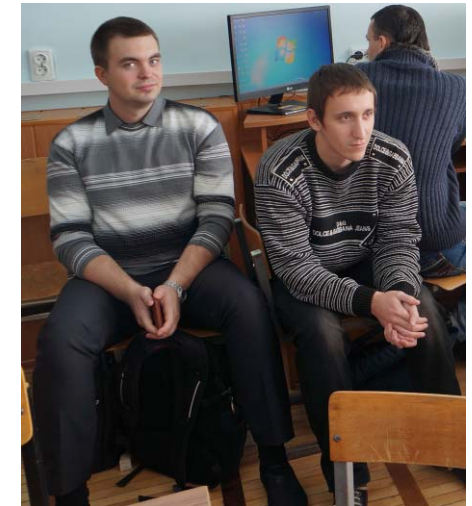
Student integrated project in
Creo Elements/Pro 5.0

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

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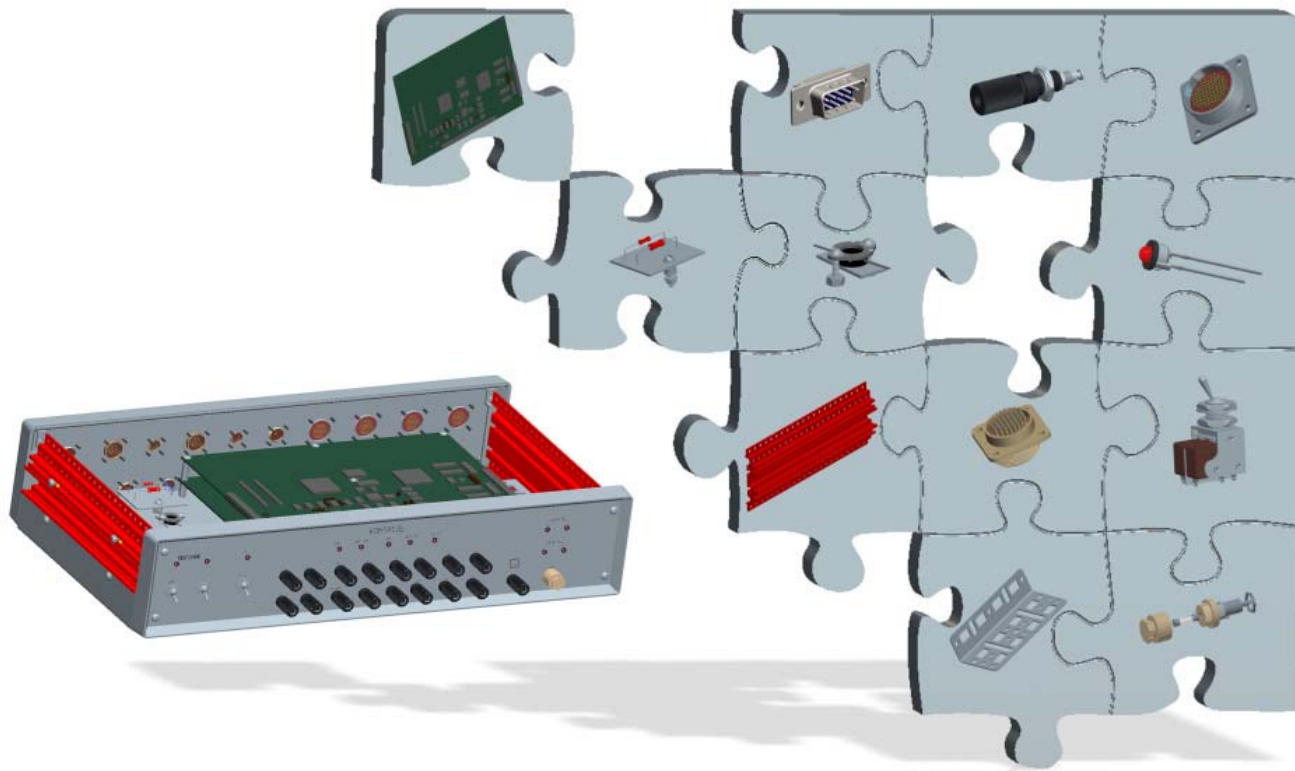
CREO virtual model of car body

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

Co-funded by the
Tempus Programme
of the European Union
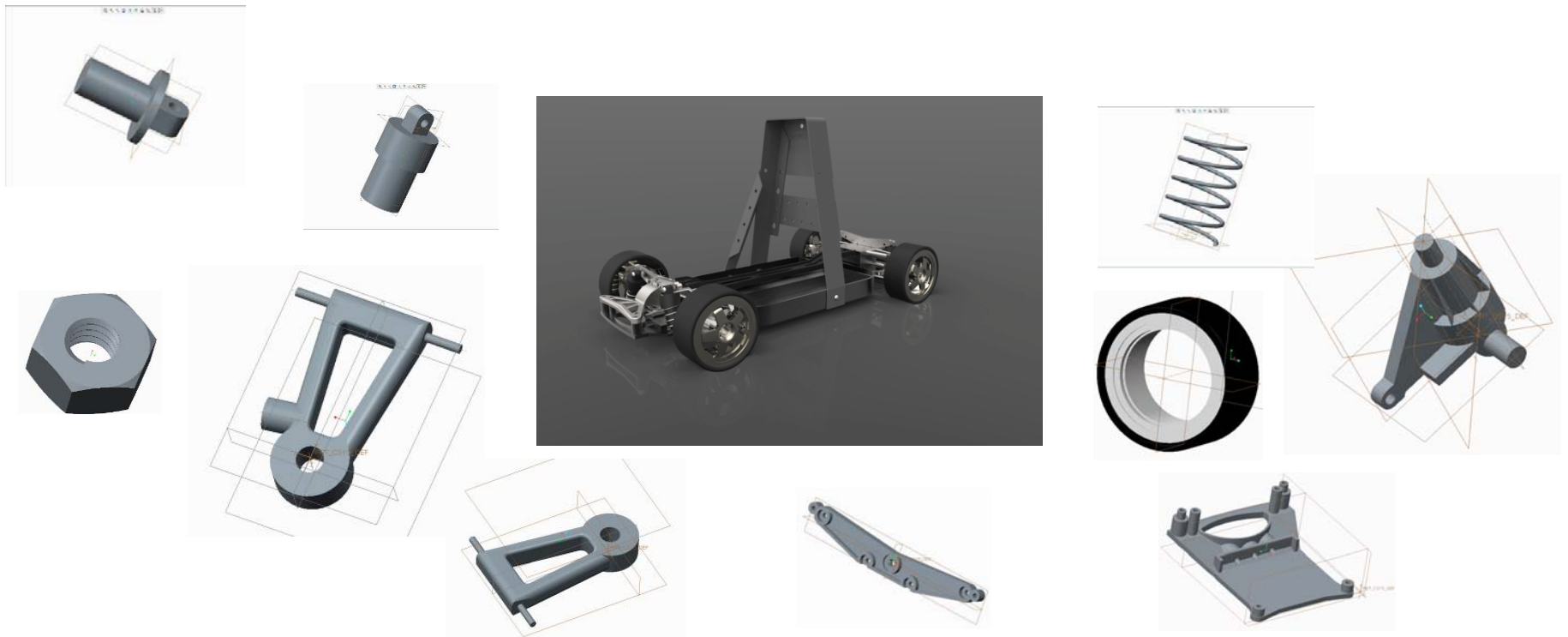
CREO virtual model of electromechanical system

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

Co-funded by the
Tempus Programme
of the European Union
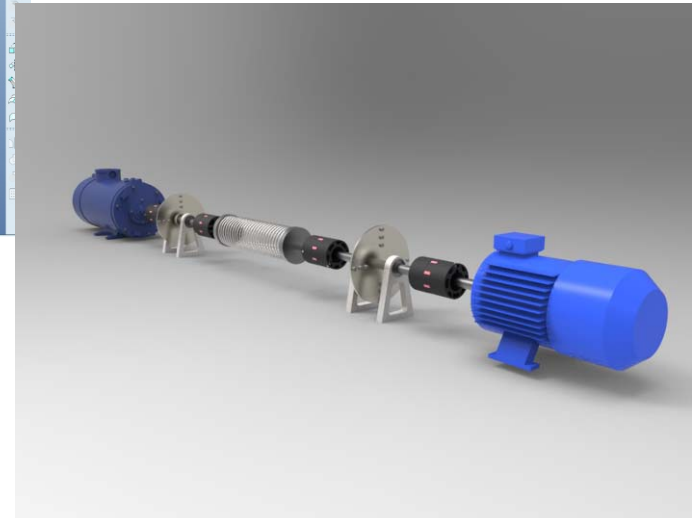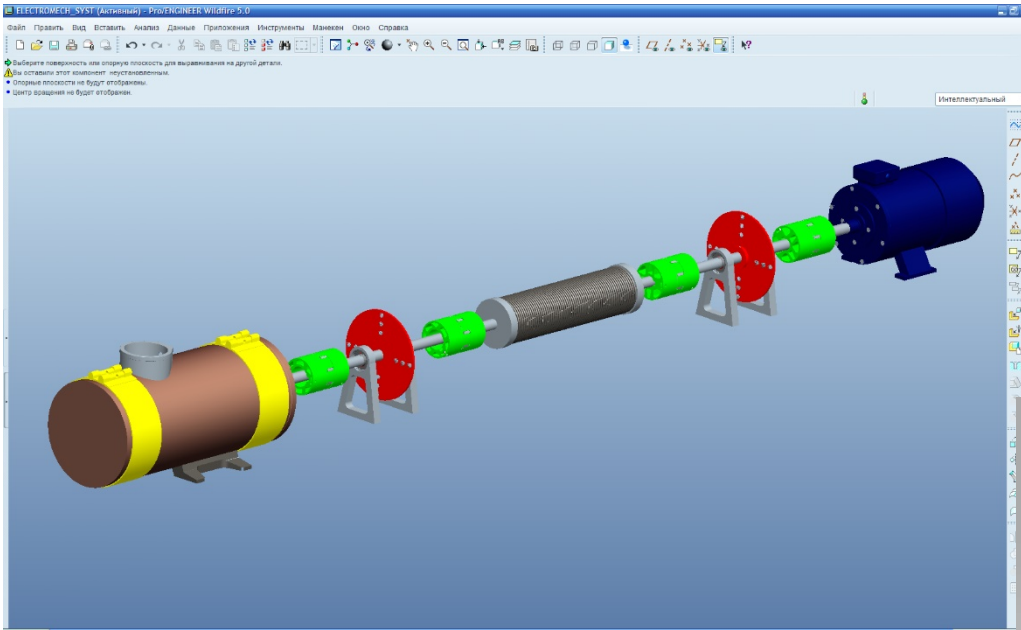
Design of 3D model of transformer beam in Creo 2.0

Co-funded by the Tempus Programme of the European Union

Development of Embedded System courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

WP3 Implementing a (virtual) learning environment in ESD eng.
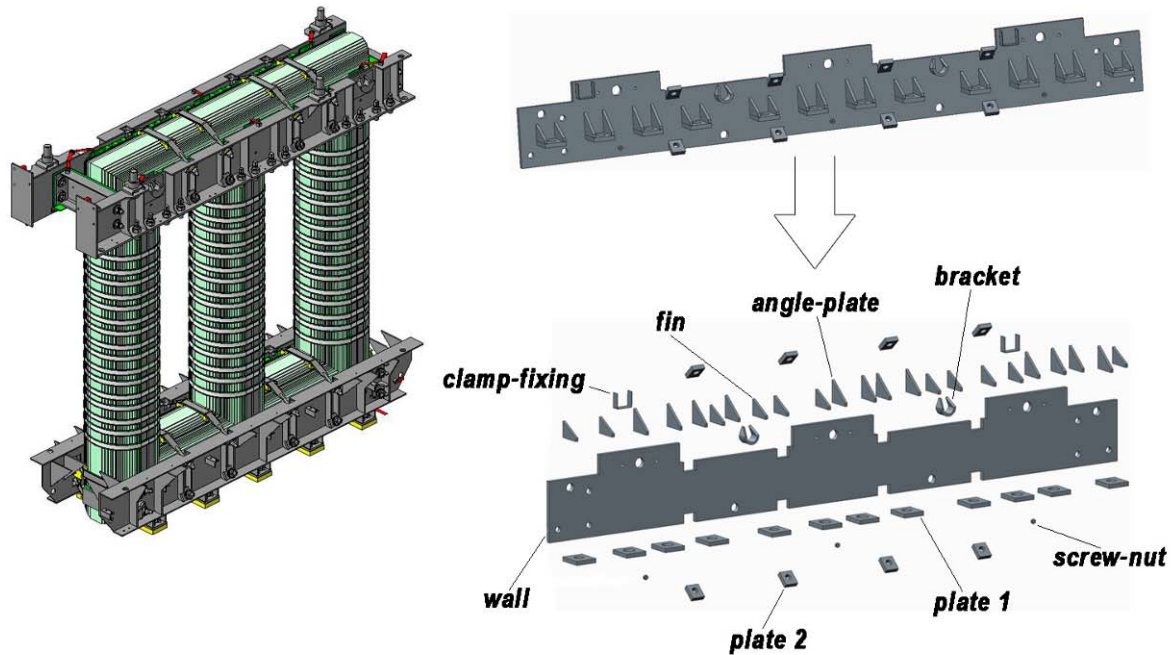
CREO virtual model of CNC machine

Development of <u>E</u>mbedded <u>S</u>ystem Courses with implementation of <u>I</u>nnovative Virtual approaches for integration of <u>R</u>esearch, <u>E</u>ducation and Production in UA, GE, AM

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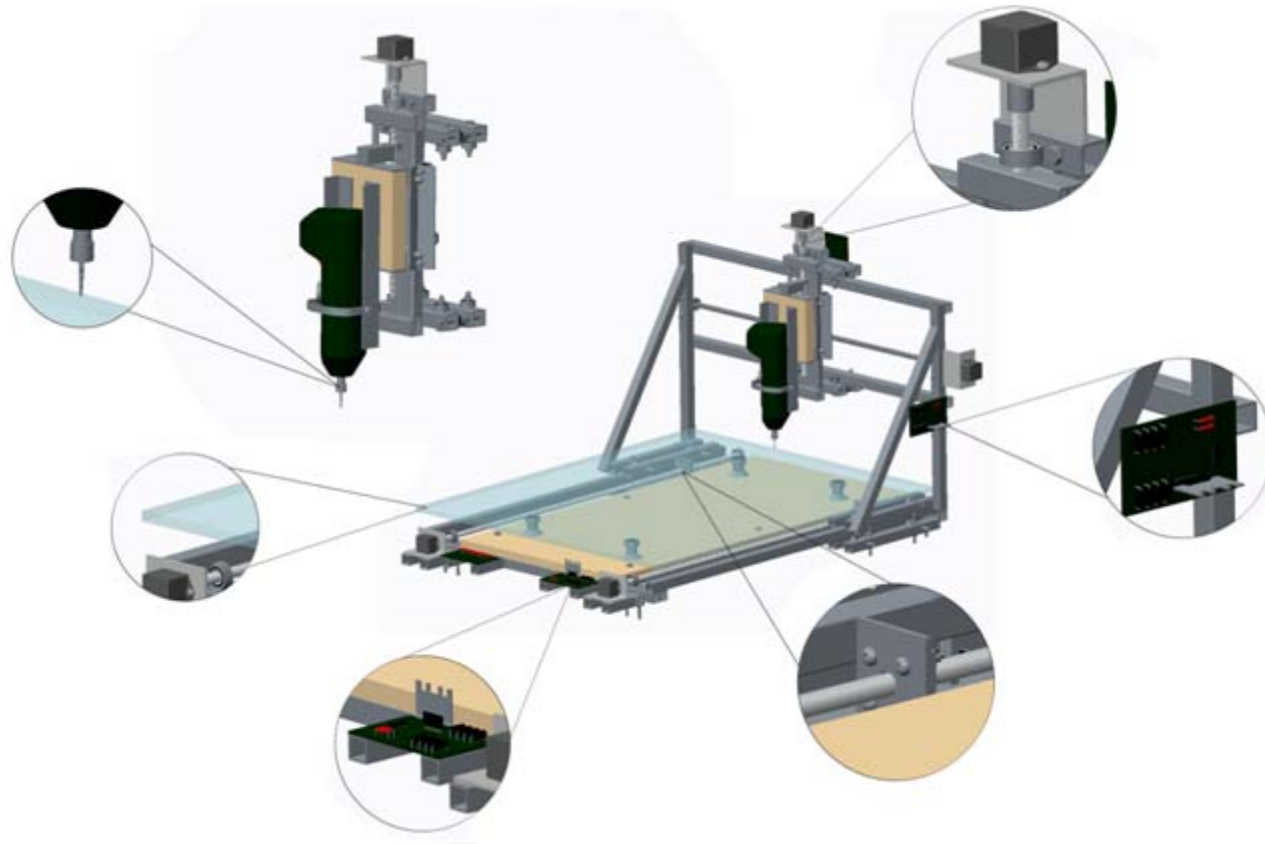
CREO virtual model of simple valve

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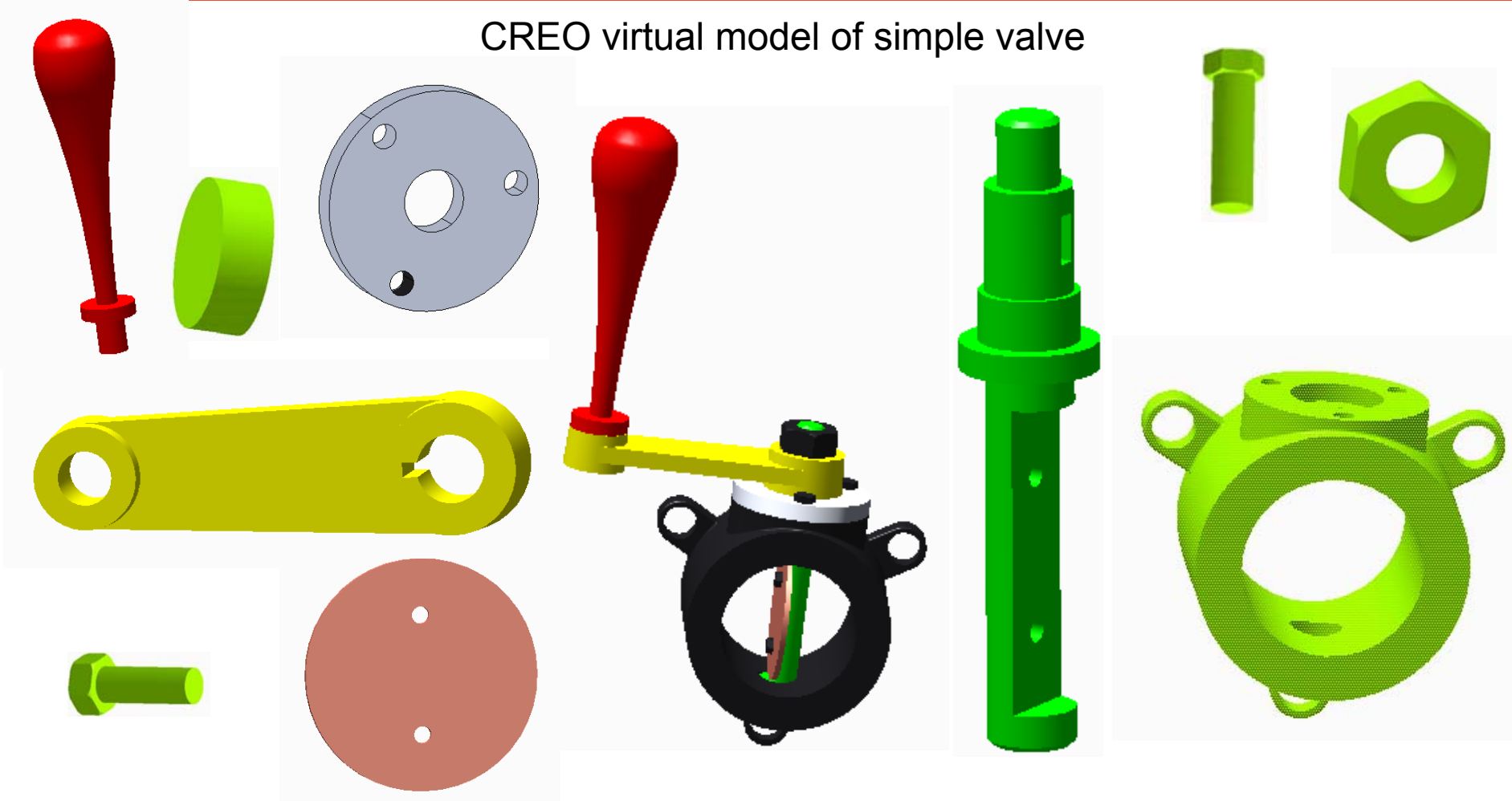
Printed real valve prototype

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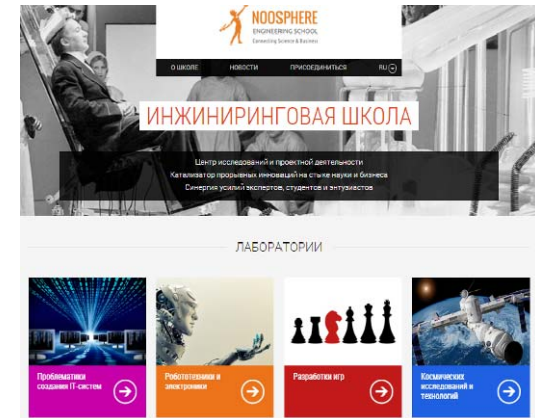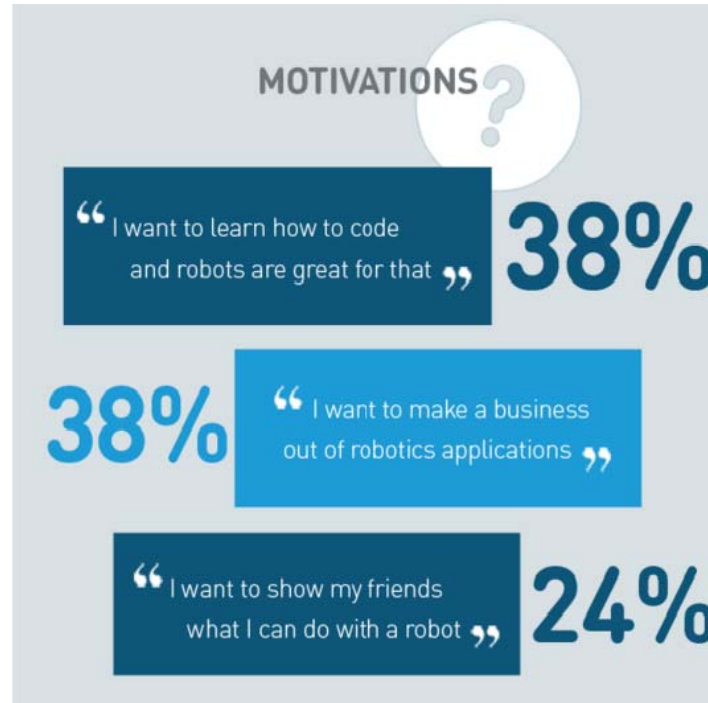of the European Union

Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM

3D printing

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We are open for new projects

https://community.aldebaran.com/en/developerprogram

THANK YOU FOR YOUR ATTENTION!

Zaporizhzhya National Technical University

Address:
Zaporizhzhya National Technical University
Zhukovskogo Str, 64
Zaporizhzhya
Ukraine 69063

E-mail:
parhom@zntu.edu.ua

Telephone:
+38-061-7698267
(Software Tools Department)
+38-068-4461774
(Anzhelika Parkhomenko)

URL:
http://zntu.edu.ua/