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Multipurpose Educational System based on Raspberry Pi

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Plan

1. About ISRT
2. What we can do with Raspberry Pi
3. ISRT CMS

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Software Tools Department

Specialties

- Engineering of Software;
- Computer science and Information technologies.

Education levels

- Bachelor;
- Master;
- PhD.

About Myself

- Professor of Software Tools Department of Zaporizhzhya National Technical University, Institute of RadioElectronics and Informatics, Faculty Computer Sciences and Technologies
- supervising work of PhD students;
- **Courses**: Object Oriented Programming, Designing and Modelling of Software in Embedded Systems, Requirements Analysis, Quality of Informational Systems, Software Project Management, Software Quality and Testing;
- Local Project Manager in Tempus Project 544091-TEMPUS-1-2013-1-BE-TEMPUS-JPCR - Desire
- head of scientific research group of Reliability of Informational Systems at Software Tools Department

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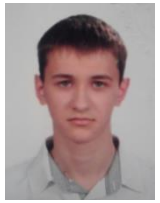
ISR Team

- Appear in 2011
- Work:
  - System Verification
  - Planning and Monitoring of Software Development Process
  - Risk Analysis for Industrial Application
  - Reliability of Embedded Systems
  - Smart Beacon Development



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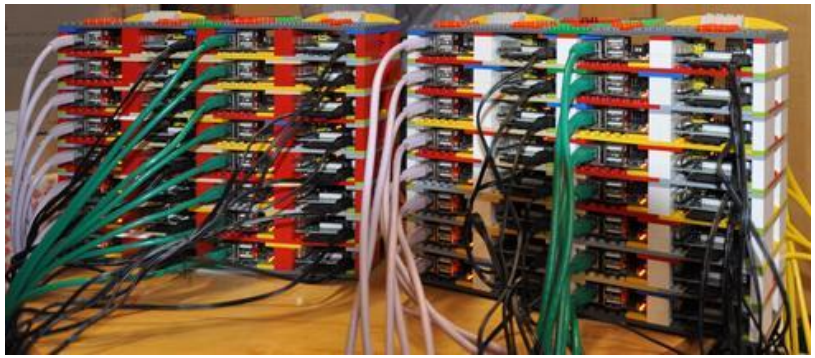
What you can do with Raspberry Pi??????????

- Robotics

https://www.youtube.com/watch?v=j_1JFnwOFwI

- Learn Programming
  - Scratch
  - C++
  - Python

- Web Server
- Media Server
- Cluster



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TMMA expansion board

- IO
- 8 leds
- Spi
- temperaturesensor
- I2c lightsensor
- SPI CAN interface

github.com/bthange/Export-More.

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Embedded Software Development

Total hours 108h

- Lectures: 12 h
- Lab works: 24 h
- Self work 72 h

Lecturer
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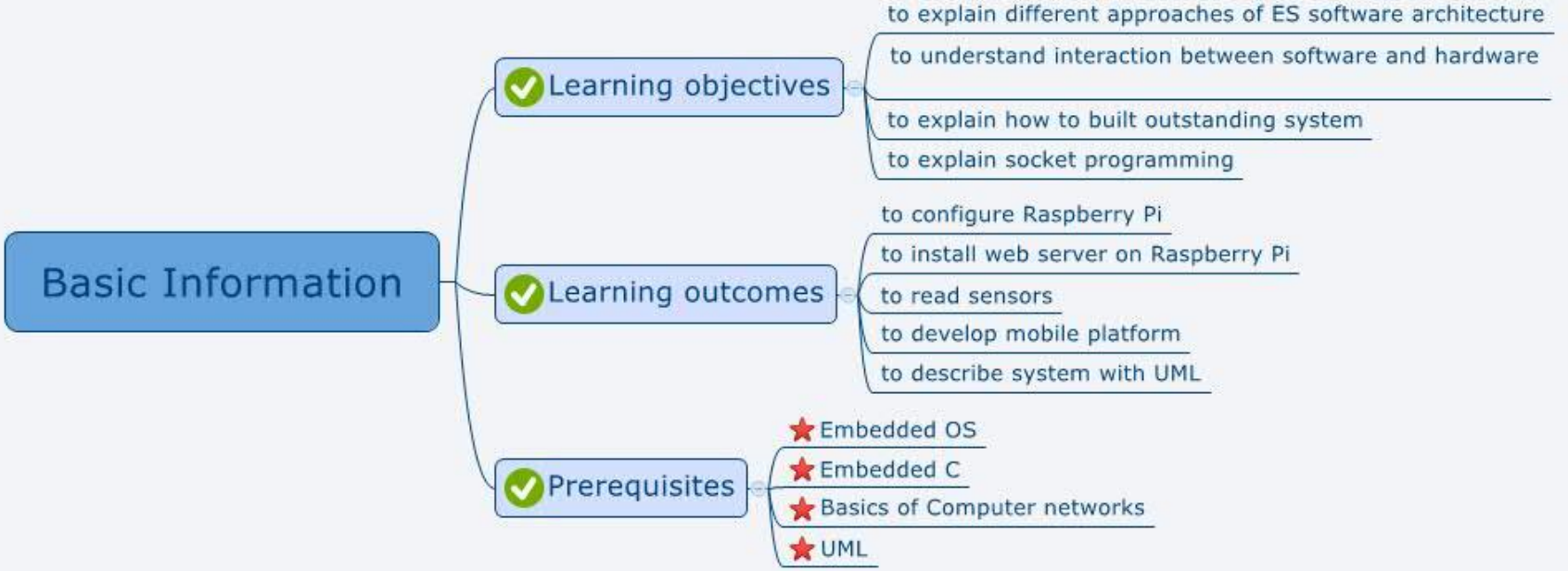

Basic Information
Learning objectives
to explain different approaches of ES software architecture
to understand interaction between software and hardware
to explain how to built outstanding system
to explain socket programming
Learning outcomes
to configure Raspberry Pi
to install web server on Raspberry Pi
to read sensors
to develop mobile platform
to describe system with UML
Prerequisites
Embedded OS
Embedded C
Basics of Computer networks
UML

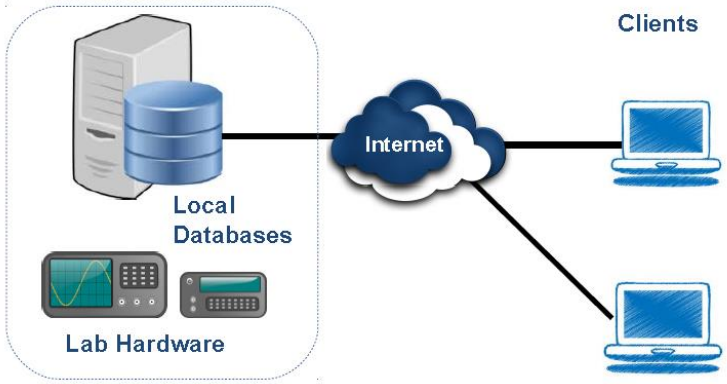
Week	Subject
1	Introduction
2-3	Modelling of software for Embedded Systems
3-4	Standard component models
5-6	Architecture of the software for Embedded Systems
6-8	Templates for Software Architecture for Embedded Systems
9-10	Socket programming
11-12	Programming Linux Socket

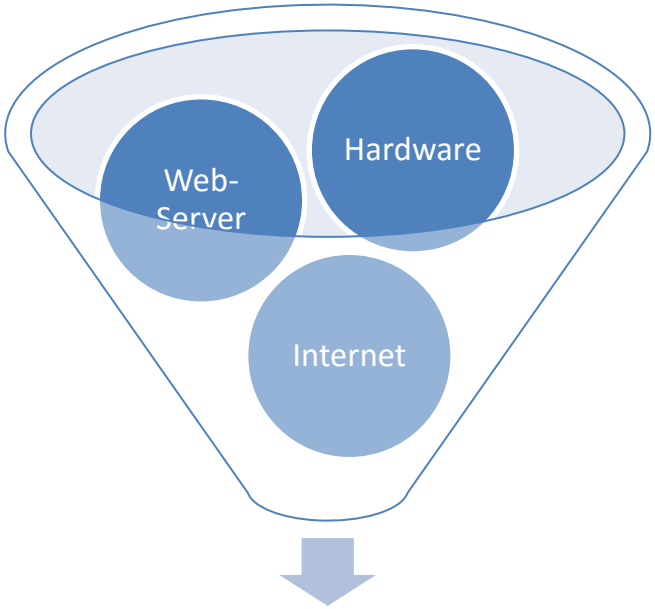
Experiments, Projects, Lab Works	Subject
Lab work 1	Configuring Raspberry Pi
Lab work 2	Installing Web-server at Raspberry Pi
Lab work 3	Developing QT application at Raspberry Pi
Lab work 4	Reading sensors from extension board
Lab work 5	Developing Project on Raspberry Pi

Supported Operational Systems

- Raspbian
- OpenELEC Pidora
- Arch Linux ARM
- Kali Linux
- Windows 10

REMOTE EXPERIMENTS





Raspberry Pi

Requirements for remote experiments

- availability 24/7
- should provide possibility for hardware and software testing
- no requirement for students HW
- should improve students skills in software development

Prerequisites for students

- Basic knowledge in Linux
- C++ skills
- Basic knowledge in Electronic Devices
- Software quality metrics
- Basics in computer systems and network

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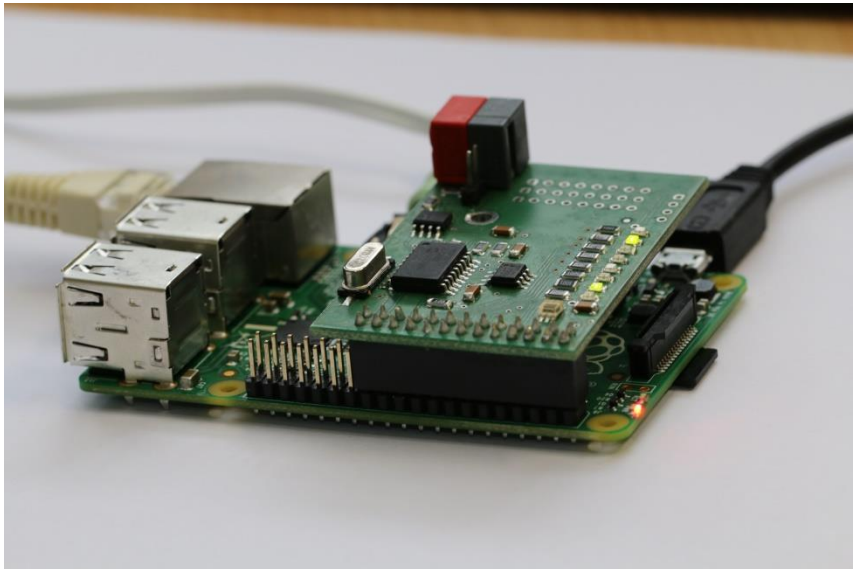
New remote experiments



Hardware:

Raspberry Pi Model B

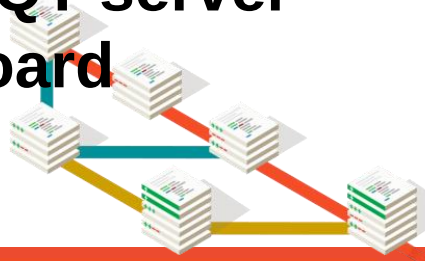
Expansion board

Wifi, BLE4 adapters, webcam

Software:

Raspbian Linux, Apache, MySql, C++, git, QT server for expansion board

Pilot usage:
Master course:
Embedded Software Development
Bachelors course:
Design of Informational System



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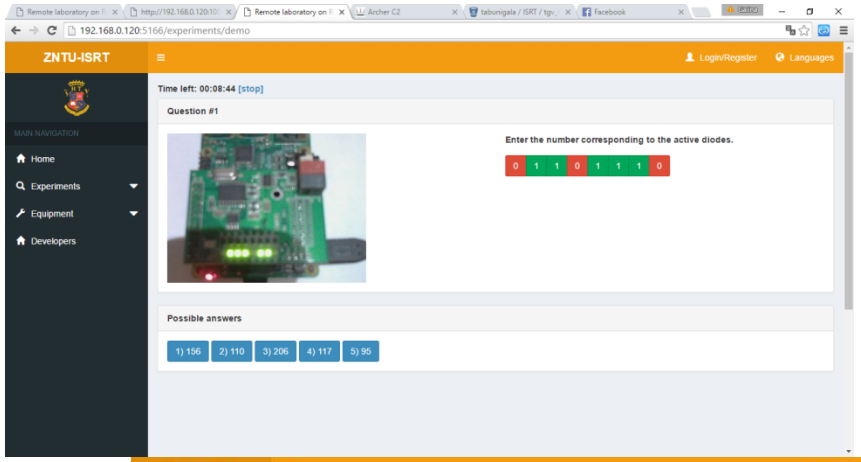
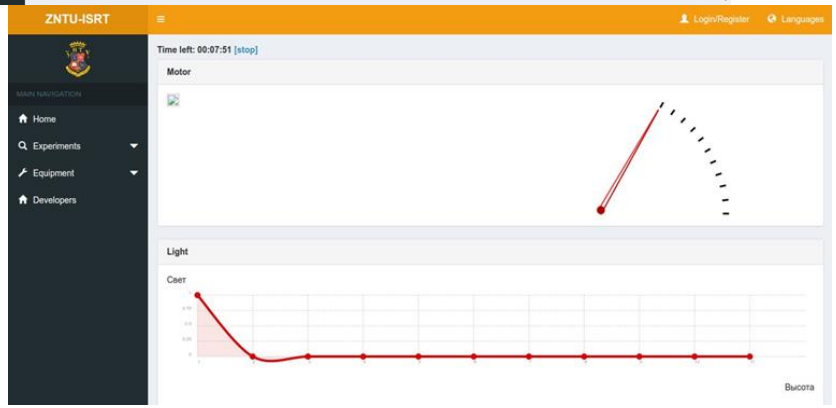
Two demo Modes





- Manipulating with leds on Thomas More expansion board with C++
- Manipulation with step engine and light sensors by Python and C++

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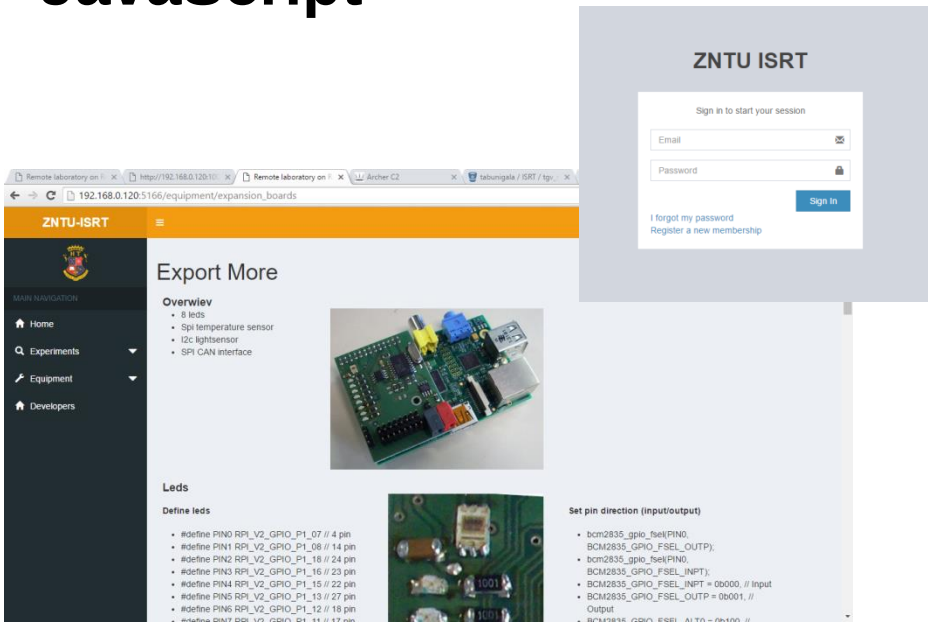
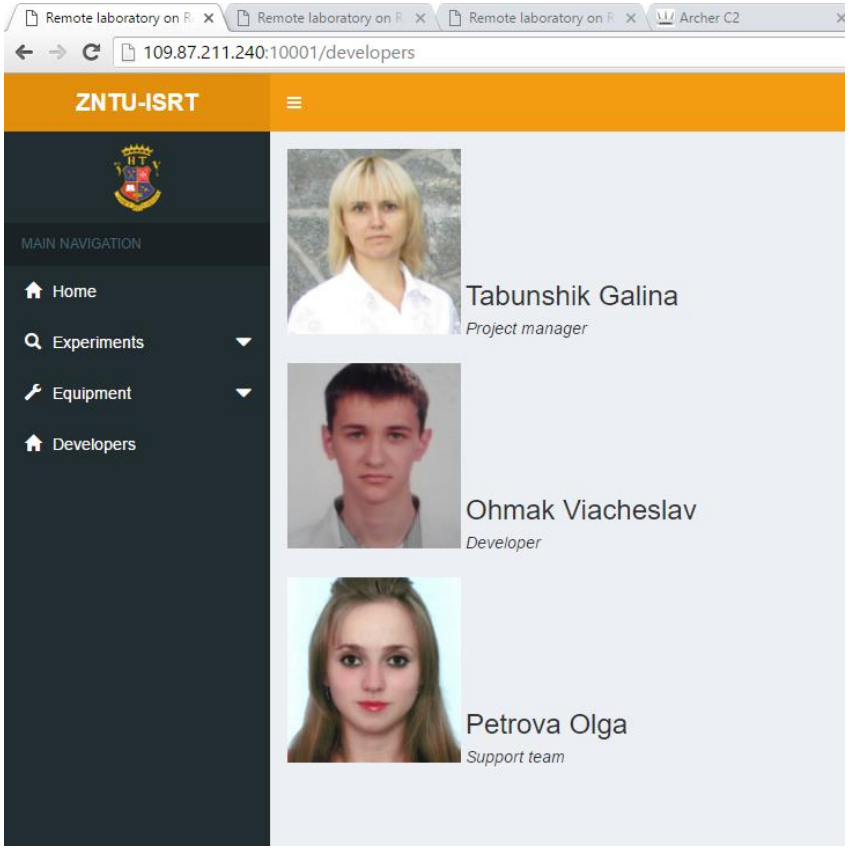
Web-server

Nodejs
JavaScript





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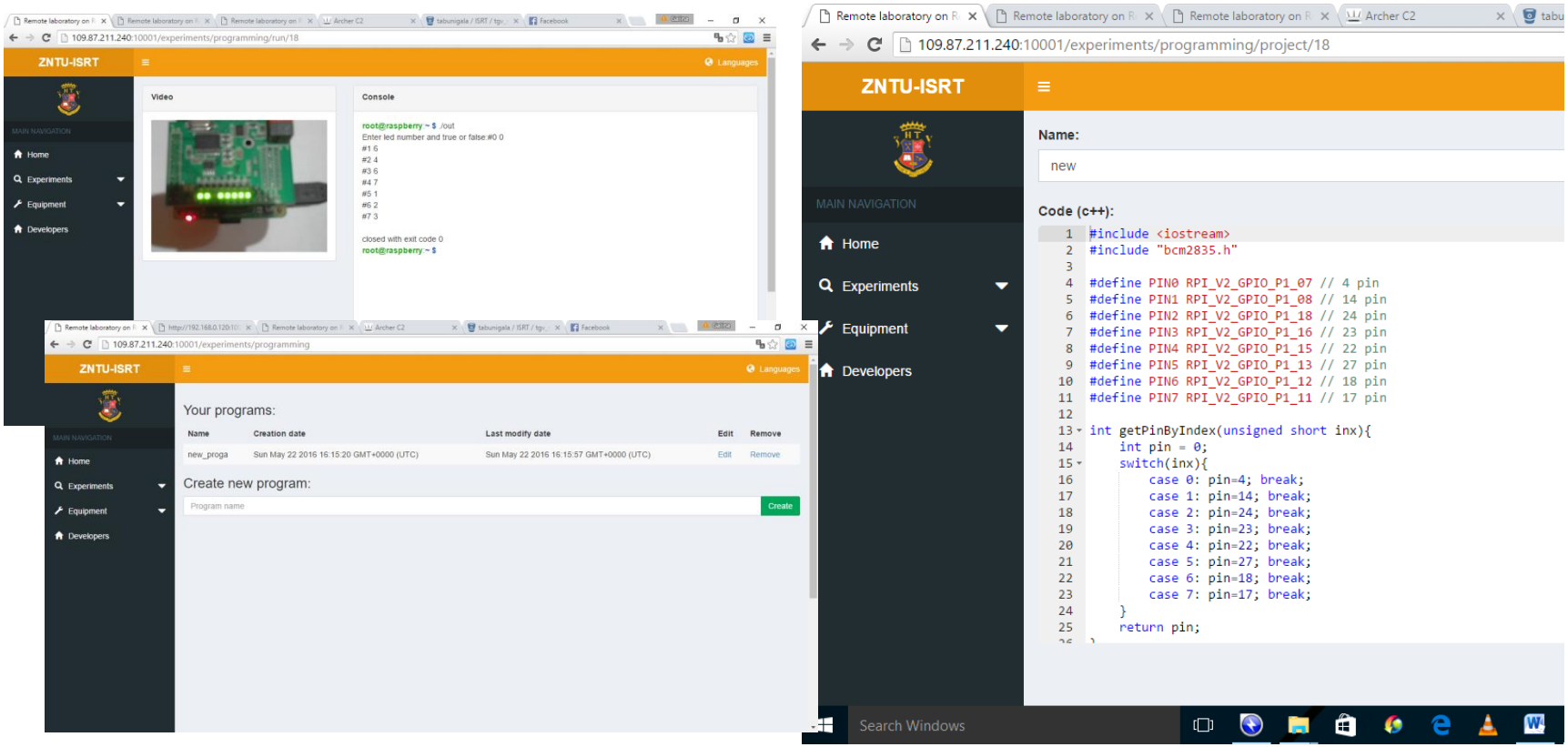
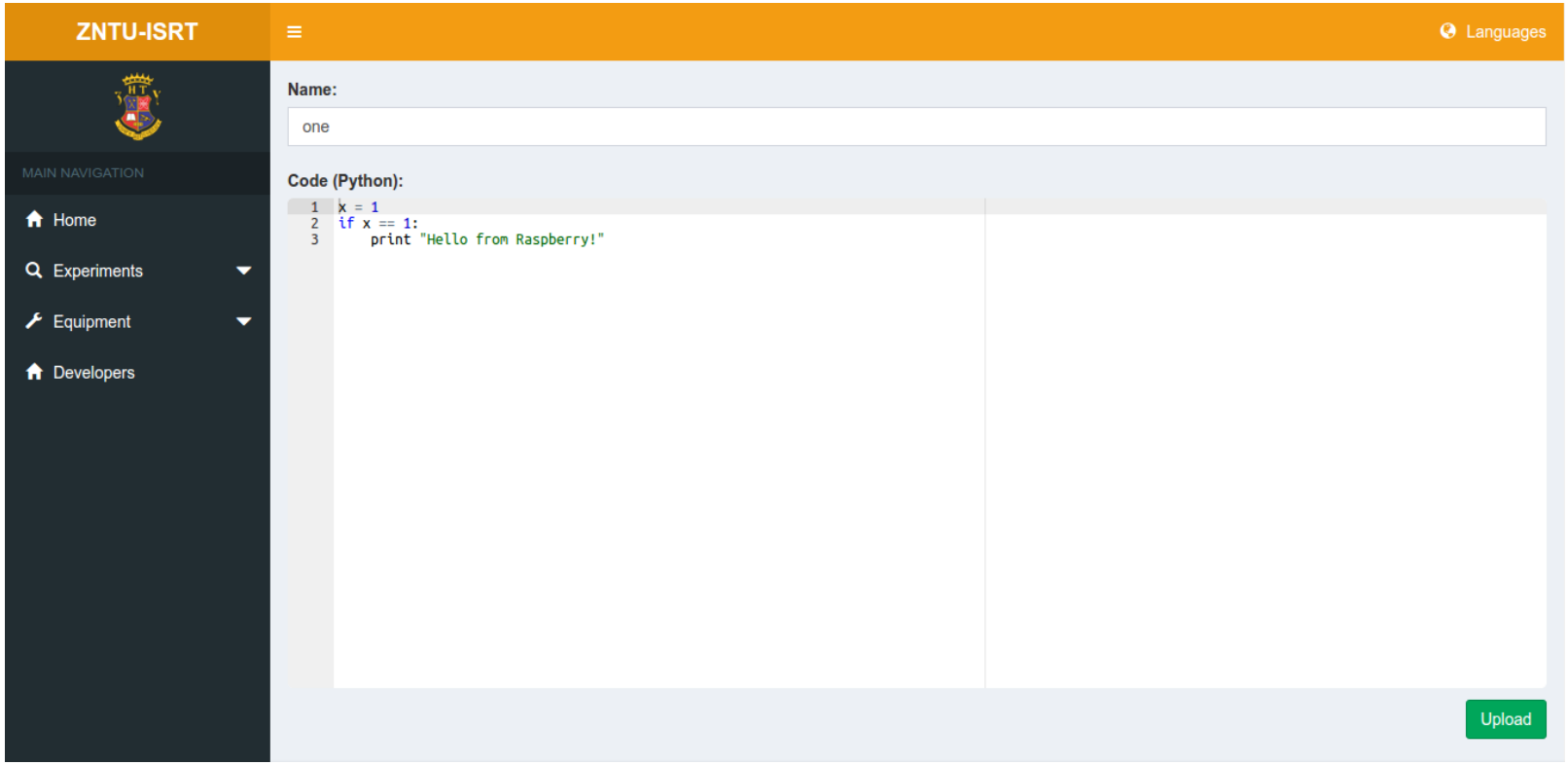
Programming with C++



Programming on Python



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Future Work

- Development of Mechanical Construction for Lightening Measurements
- Increasing measurement system with measurement systems
- Development external Storage System
- Demo Experiments on reliability calculations
- Development of Data Protection System

Thank You for Your Attention