

Using NI myDAQ as an education tool in basic electronic courses at Mälardalen University (MDH)

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Mälardalen University (MDH)

- One of Sweden's large institutes of higher education
- Over 13 000 students studying one of our approximately 65 programs and 1000 courses and almost 1000 faculty and staff.
- School of Innovation, Design and Engineering (IDT)
- 1000 full-time students and around 180 staff
- Educate students to become: engineers in product design, production and logistics, **robotics, computer science and aeronautical engineering.**
- Our research cooperates :Volvo CE, ABB Robotics, Ericsson, Scania, CC Systems, Volvo Cars, Bombardier, Alvenius, Deva Mecaneyes, Level 21, Propeller, Vilstagruppen, Stora Enso, Holmen Paper, Robotdalen, Marinen, Riksutställningar



Courses in Electronics

➤ Basics in Electronics

Analogue- and digital electronics. Introduction to electro physics followed by components like resistors, inductors, capacitors, OP-amps, gates and latches. Constant and transient signal component behavior as well as frequency characteristics of circuits.

➤ Electronic Systems

Diodes, pn - transition, AC-DC and DC-DC conversion, instrumentation amplifier, precision rectifier, Schmitt-trigger, Oscillator, multiplexer, synchronous and asynchronous state machines, EMC, PCB - design and AC theory with phasors.

➤ Complex Electronic Systems

ADC, DAC, PWM, Motors, H-bridges, Communication.

➤ Control Theory

Modeling and analysis of dynamic systems.

➤ Sensor technique

In the course the physical principles and properties of different types of actuators and the methods for measuring parameters as i.e. temperature, flow, and pressure are dealt with.

➤ Signals and Systems

Signal theory, Sampling, Frequency analysis/synthesis, Modulation, Transient signals, Filter, Frequency function, Fourier series and transform, Oversampling of A/D and D/A converters, Time discrete systems, Causality, Convolution, Z-transform, FIR and IIR filters, Time Continuous systems, Laplace transform.



Basic electronic course

- Five laboratory moments
 - AC and DC – voltages and currents, Ohms law, Kirchhoff's laws
 - Operational amplifier
 - Digital electronic
 - Transient behaviour, filter design
 - Project
- Groups of two student
- Presentation during the laboratory moment
- 40 hours for the labs of which 20 hours are scheduled



Lab premises and equipment

- Previous laboratory works in our courses were performed in special equipped laboratory premises
- Two rooms with 16 work places each (two students at each work station)
- Costs for the lab premises: 500000kr/year for each room
- Costs for the maintenance ~50000kr/year
- 40 students each year within the Robotics program
 - 40 students from the aeronautical engineering
 - ~20 students from computer science and other students



Lab equipment

Previous lab equipment



Measurement equipment:

- Multimeter
- Oscilloscope
- Function generator
- Power supply

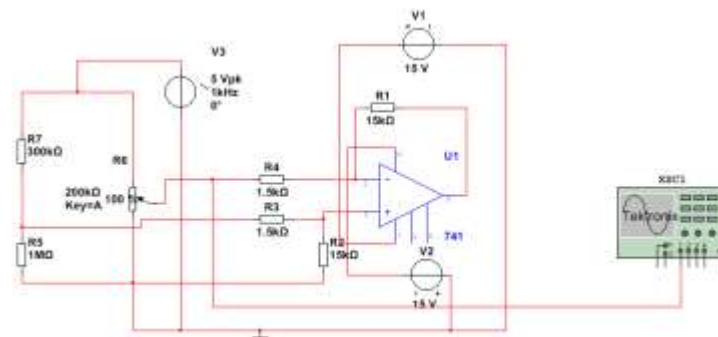
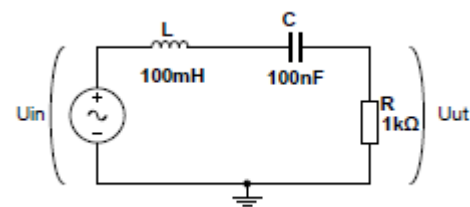
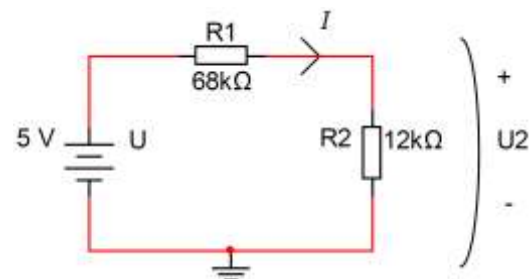
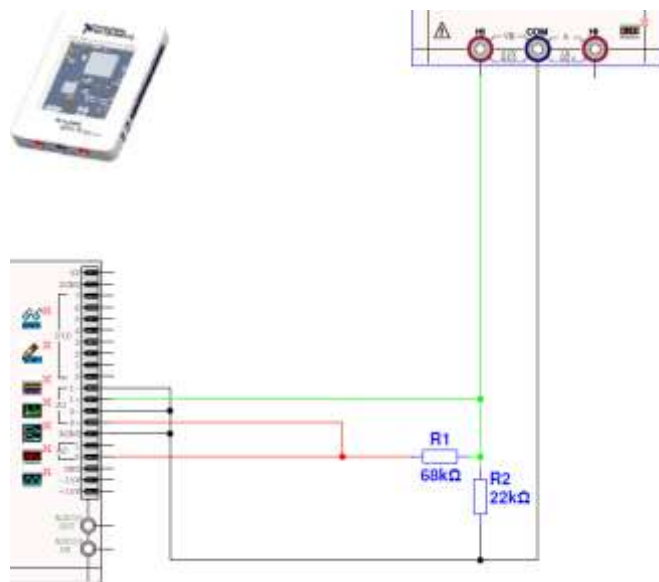
Current lab equipment



myDAQ

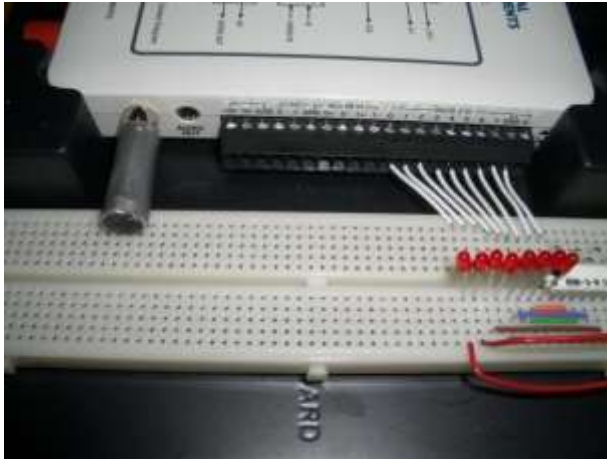


myDAQ examples

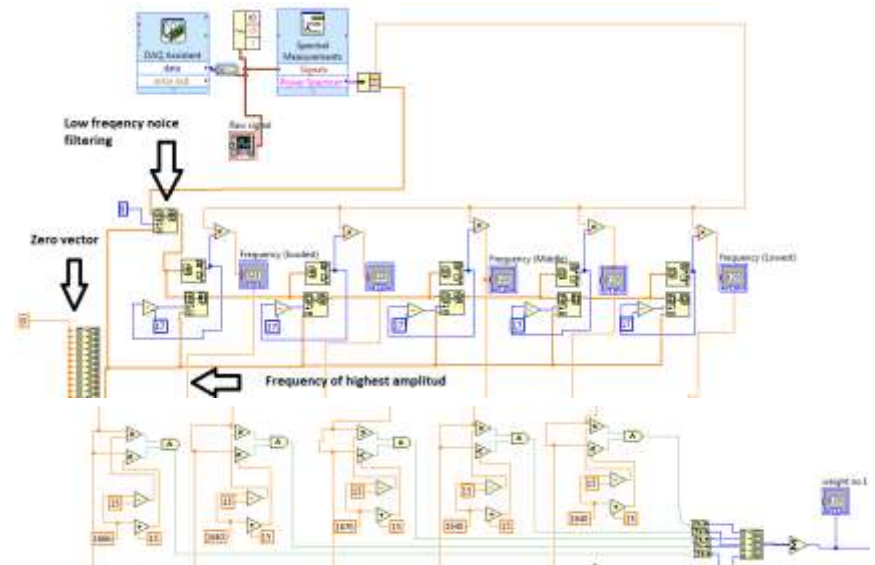


Example from the course Signals and Systems

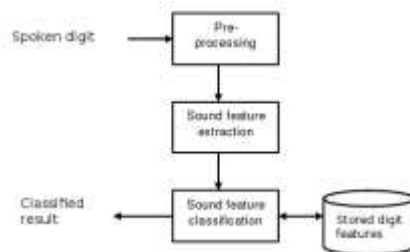
myDAQ



LabVIEW



Automatic Recognitions of Spoken Digits





Experience with myDAQ

- Economical benefits - saving money on the costs for the laboratory premises and the maintenance.
- Pedagogical benefits - demonstrating and preforming the laboratories work in an ordinary auditorium.
- Give the students the possibility to deepen their studies in a home environment.
- Portable solutions an advantage with campus in two different cites.

Disadvantages

- Limitations of the standard virtual instruments.
 - In hardware - power supply USB (500mA)
 - In software - oscilloscope function limited
- No hands on compared to traditional measurement instruments.



Thank you for listening!

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