Design Thinking and Electronic Prototyping

Introduction

Aalto University
School of Electrical
Engineering

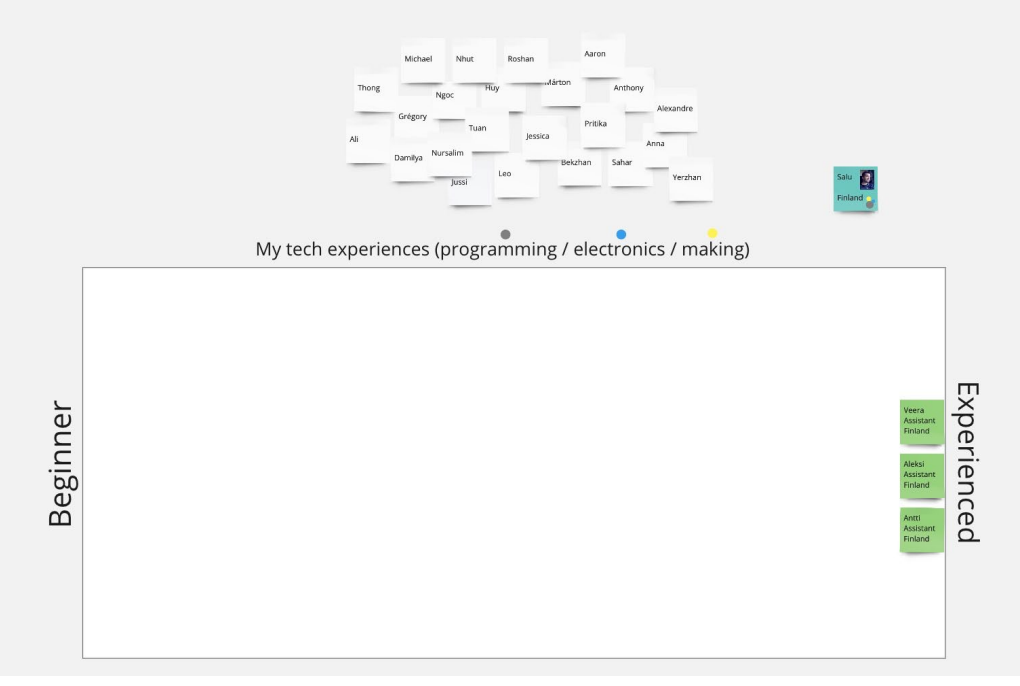
Salu Ylirisku

8.9.2020

Welcome

Who are we?

Let’s try Miro



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Expectations?

What we shall cover

Design Thinking

- Norman (2013) The Design of Everyday Things: Revised and Expanded Edition

Electronic Prototyping

- Arduino family

Learning methods

- **Project work**
  - User-centred design, programming, electronics, making
  - Project management, presenting
- **Reading, writing, and discussing**

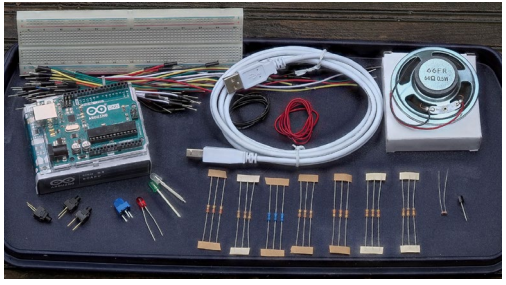
Learning resources

The Sähköpaja Lab

Personal Electronics Box

MyCourses website

Wiki (weekly exercises / Period I)



Arduino UNO

Created by Shahram Barai, last modified by Salu Ylirisku yesterday at 07:39 AM

Note: In case you use your own laptop and want to connect a physical Arduino to it, you need to install Arduino programming environment first (Arduino IDE). You can download it from here: https://www.arduino.cc/en/Main/Software

Sähköpaja computers already have these installed.

Note: If you do not have an Arduino (and other required equipment) at hand, it is also possible to do this exercise in TinkerCad. (instructions below)

What is Arduino?

Arduino is an open source programmable circuit board that can be integrated into a wide variety of maker-space projects both simple and complex. Arduino contains a microcontroller which is able to be programmed to sense the environment by reading data from various sensors, buttons and components. It also can impact the environment by controlling LEDs, motors, servos, relays, and much more.

Getting connected

Open Arduino IDE and choose the right board from the **Tools** menu [*Arduino UNO*]. Choose the port from the Tools menu with an Arduino name on. Once you have connected an Arduino board to the computer, one of the ports will have the name Arduino in the port name. The full port names vary across platforms, i.e. Windows, Linux, and OSX.

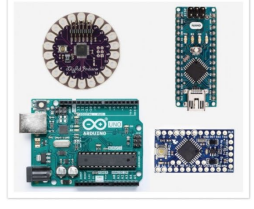


Figure 1. *Example of the different types of Arduino boards*

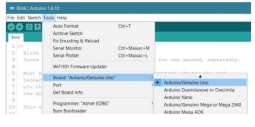


Figure 2. *Select your board type*

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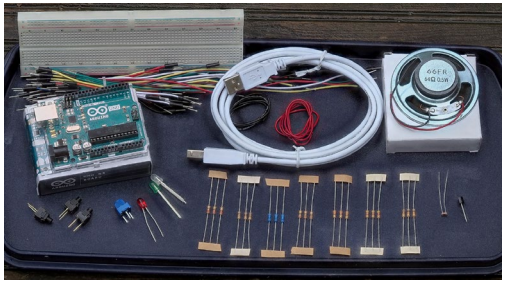
Sähköpaja Lab Works

- **We have an electronics lab called Sähköpaja**
- **During the corona season we have limited access to the lab, and max 20 people are allowed to stay there at once**
- **The lab has two spaces: old and new**
  - Old = the one with components and 3D printers
  - New = the open space with empty work stations
- **When working in the old space, please, use a mask**
  - These are available from the janitor (only 1/day/person)

Lab work abroad



Purchasing your own making kit is encouraged

- **Arduino UNO, resistors, potentiometer, wires, buttons, temp sensor, proximity sensor, LEDs, and a speaker, USB cable**
- **Also multi-meter and soldering iron are good to have**

TinkerCAD has a decent Arduino simulator

- **You can get a taste of coding and connections, but not the smell of smoke…**
- **Also very limited set of boards and components are available**

The Project

The aim is to create a useful product that is technically based on the Arduino platform

Project Presentations

In 1 week (15.9.):

Ideas for Useful Products

In 2 weeks (22.9.):

Project Focus

In 5 weeks (13.10.):

Project Plan

In 12 weeks (1.12):

Project Results with Prototype Demo

Inspiration for your project

https://www.hackster.io/arduino

An IoT controlled temperature monitor (S1.3)

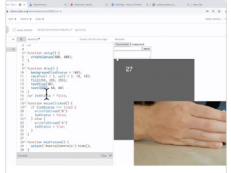
greg

541

Wifi quality tester

adameliemorin

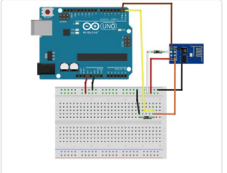
4 957



Let Arduino Control Your Browser

Geert Roumen

11 2.7K



Control the Arduino's GPIO pins from a Webpage

Iasonas Christoulakis

220

Connecting to the Arduino IOT Cloud (S1.2)

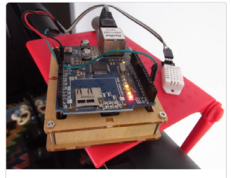
greg

142

Bluetooth Remote Control for Lego Technic Hub

haraldholzner

76



Temperature and Humidity Sensor on a Self-Hosted Cloud

Lucas Godoy

7 2.2K

Bluetooth AT Commands Settings (HC05 HC06)

Multiple Authors

7 597

Evaluation

- **Grading 0-5**
  - Diary 60 %
    - Active participation, process, learning, reading
  - Presentations 20 %
  - Prototype 10 %
  - Wiki documentation 10 % (hackster.io style)
- **Attendance to at least 80% of lectures is required**
- **Exercises can be replaced if you already know the stuff**
  - You can always find a bit of something else to learn instead

The Diary – How to Write

~600 words / week

- **½ about activities, ½ reflecting on the readings**

Write about:

- What you have done and learnt
- Cover 1) lectures, 2) exercises/project work and 3) the book contents
- Returns each Monday by 10 AM (with an hour sheet excel!)

Delayed returns will lower the score with '-1pt' / day

Next week we shall update these requirements a little bit…

This week’s tasks

1. **Diary – Deadline on Monday at 10 AM**
2. **Reading: Chapter 1 pages 1-10**
    1. The Complexity of Modern Devices
    2. Human-Centered Design
3. **Exercises**
    1. Arduino UNO
    2. Libraries (and Teensy)
4. **Project (agree on your team communication channel)**
    1. Ideas for Useful Products (5 potential ideas / team)

DSD students – English course!

- **Remember to enrol to the English course**
- **Latest TODAY by midnight!**
- **It is required for the DSD students, and is closely integrated with Design Thinking and Electronic Prototyping course**
    - English teacher will be evaluating the presentations (at least the final one) as part of the language course