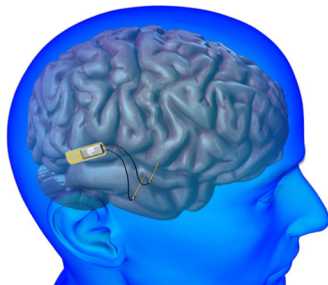


ETIA06 Electrical Engineering: Possibilities and Limitations

Anders J Johansson
2018

Anders J Johansson

- Docent in Radiosystems
 - How to design and build a radio that works.
 - Applications ranging from brain implants to particle accelerators (uW to Mw).



www.medgadget.com



www.essscandinavia.se

Anders J Johansson, cont.

- Develops material for and educates teachers in embedded systems and electronics in order to get more engineering into basic education.
- Works with getting rapid prototyping and digital design methods into Swedish slöjd education.
- Previously antenna designer at Sony Ericsson.
 - Worked closely with industrial designers and mechanical engineers.

Course outline

- A couple of lectures
- Two labs
- One project
 - Two persons per group
- Final report, video and demo!

4/9 Tuesday	Lecture Course information and introduction to concepts.
7/9 Friday	<i>Moved</i>
11/9 Tuesday	Laboration LittleBits Lecture Electronics and embedded systems. Register project groups.
14/9 Friday	Laboration Arduino Register project name.
18/9 Tuesday	Lecture Programming Meeting Project groups present their ideas and propose material list.
21/9 Friday	<i>Not in schedule!?</i>
25/9 Tuesday	Lecture Programming part 2 Delivery of parts for project.
28/9 Friday	Lecture <i>Content to be decided</i>
2/10 Tuesday	<i>Moved</i>
5/10 Friday	Project group meetings (All groups have one meeting this week)
9/10 Tuesday	Project group meetings (All groups have one meeting this week)
12/10 Friday	Lecture Design for manufacturing
16/10 Tuesday	Project group meetings (All groups have one meeting this week)
19/10 Friday	Project demos.
2/11 Friday	Deadline for the report and video.

Course requirements

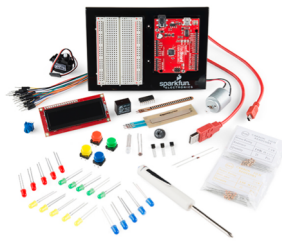
- Needed to pass course:
 - Attend two labs.
 - Attend and give project demo.
 - Project report (Details later, but necessary parts include: parts list, estimated cost, block and circuit diagram, photos of quick and dirty, functional, and final prototypes.
 - Project video (1 minute)
 - Hand back parts

Labs

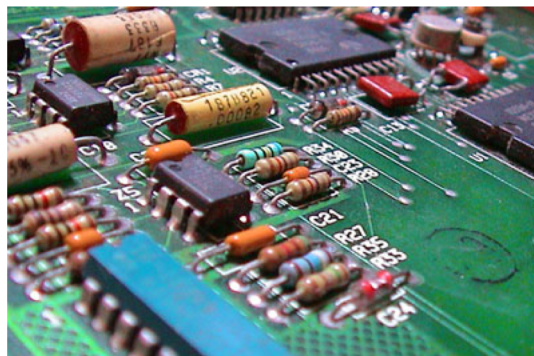
- LittleBits



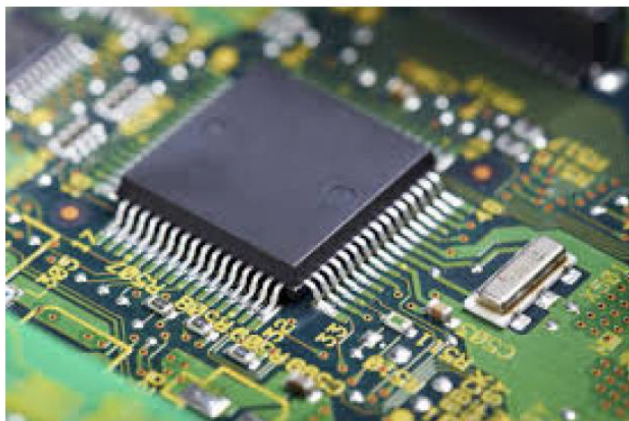
- Arduino



Electrical engineering basics



Embedded basics



Programming basics

```
152     document.getElementById( 'description' ).innerHTML = description;
153 }
154
155 function updatePhotoDescription() {
156     if (descriptions.length > (page * 9) + (currentImage.sizing() - 1)) {
157         document.getElementById( 'bigimageDesc' ).innerHTML = description;
158     }
159 }
160
161 function updateAllImages() {
162     var i = 1;
163     while (i < 10) {
164         var elementId = 'foto' + i;
165         var elementIdBig = 'bigimage' + i;
166         if (page * 9 + i - 1 < photos.length) {
167             document.getElementById( elementId ).src = 'img/photo' + photos[i];
168             document.getElementById( elementIdBig ).src = 'img/photo' + photos[i];
169         } else {
170             document.getElementById( elementId ).src = '';
171         }
172     }
173 }
```

Prototype basics



3D systems

Prototypes

- Different kind of prototypes
 - Quick and dirty
 - Functional (Proof of concept, Working)
 - Look and feel (Visual/Tactile)
 - Integrated (User experience/Functional)
 - Production

Where prototyping would have been good:



Hummer H1



Interior space



Quick and dirty



Quick and Dirty

- The quick and dirty prototype
 - Facilitates communication
 - Gives a first idea of look and feel
 - Test/roleplay experinece

Illustrative “Idea”: Home Souse vide!

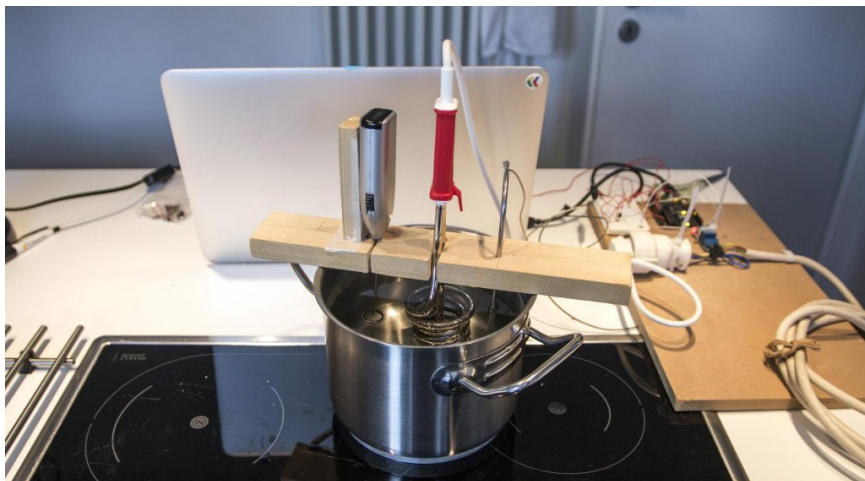
Idea in head:



Quick-and-dirty prototype



Functional electric prototype

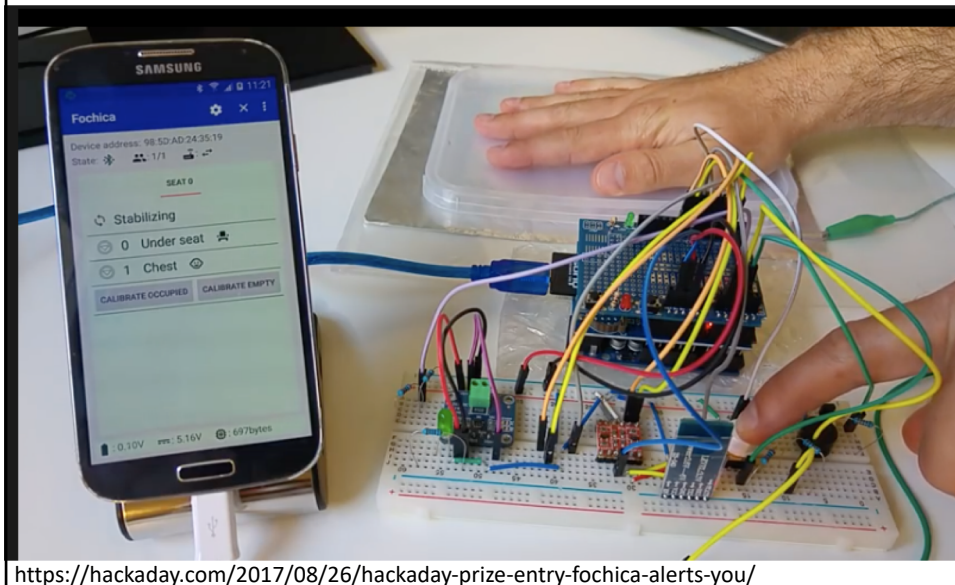


(Not my kitchen, found the picture on the web....)

Functional (electrical) prototype

- All electric components present
- Test functionality
 - Does motors, lights etc. turn on and off as intended?
 - Does displays give the right message?
 - Do the inputs and sensors work?

Forgotten-kid-in-car-seat-alarm



Next steps

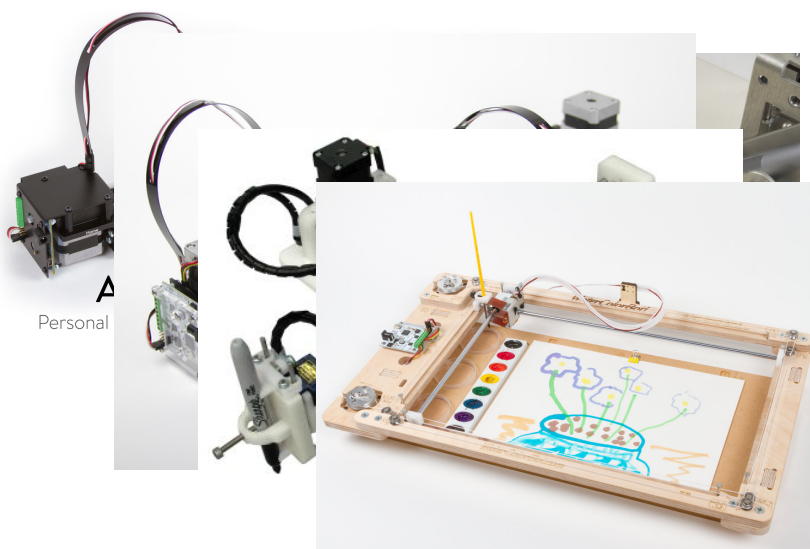
In some order:

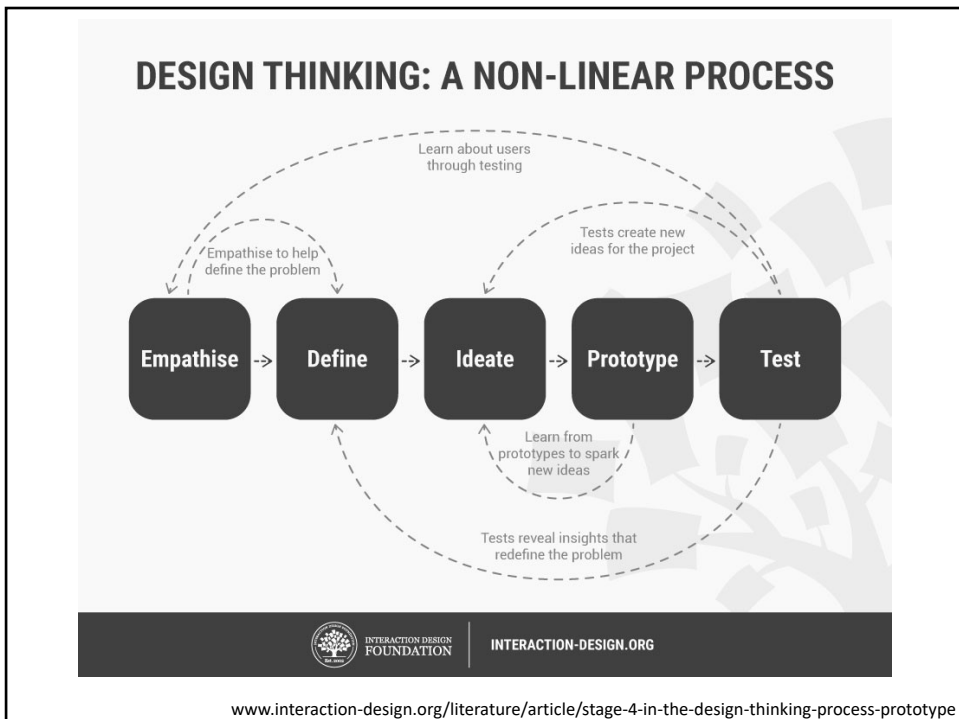
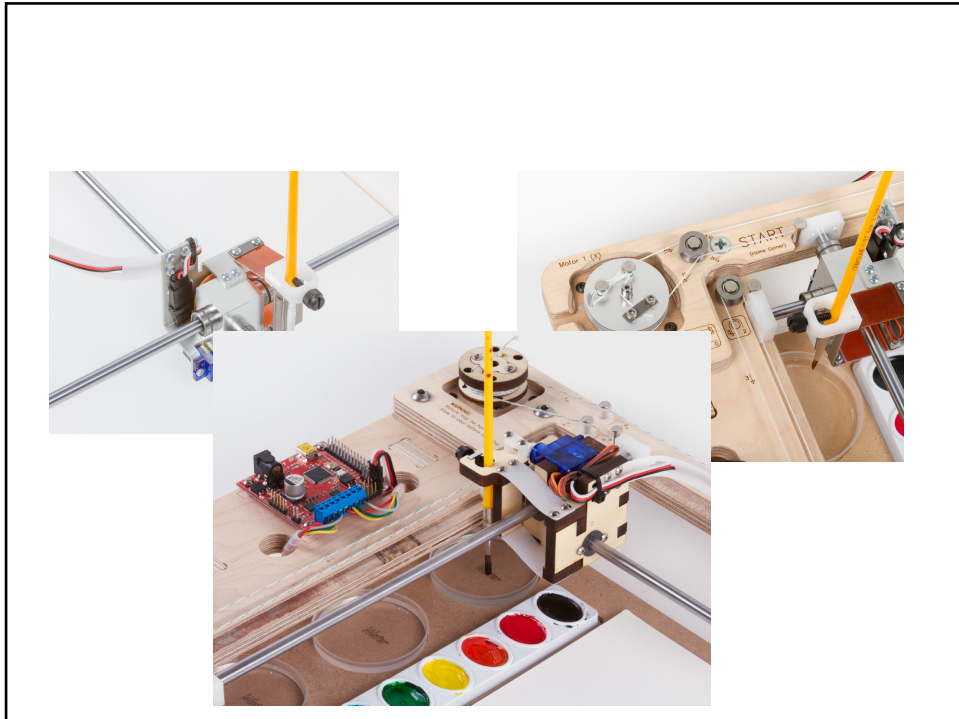
- Look and feel
 - Handmade
 - CAD/3D-printed mockup
 - Etc.
 - Possible to “fake” functionality
- Integrated prototype

Then:

- Production prototype
- Refinements...

Prototype/product generations Example: AxiDraw





“They slow us down to speed us up. By taking the time to prototype our ideas, we avoid costly mistakes such as becoming too complex too early and sticking with a weak idea for too long.”
– Tim Brown

**“THE FIRST ONE IS ALWAYS A
PROTOTYPE”**

First assignment:

- The project will be done in pairs, find a partner before Tuesday!
- Start thinking about ideas, but don't get stressed / locked in yet: the labs are intended to give inspiration!