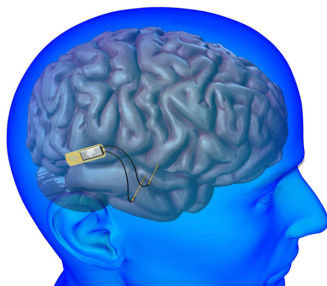


ETIA06 Electrical Engineering: Possibilities and Limitations

Anders J Johansson
2017

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 and demo!

29/8 **Tuesday Lecture** Course information and introduction to concepts.

1/9 **Friday Lecture** Electronics and embedded systems.

Register project groups.

5/9 **Tuesday Laboration** LittleBits

8/9 **Friday Lecture** Programming.

Register project name.

12/9 **Tuesday Laboration** Arduino

15/9 **Friday Meeting** Project groups present their ideas and propose material list.

19/9 **Tuesday Lecture**

22/9 **Friday Lecture**

26/9 **Tuesday** Project group meeting A

29/9 **Friday** Project group meeting B

3/10 **Tuesday** Project group meeting A

6/10 **Friday** Project group meeting B

10/10 **Tuesday TBD**

15/10 **Friday Project demos.**

22/10 **Friday Deadline** for the report and video.

Course requirements

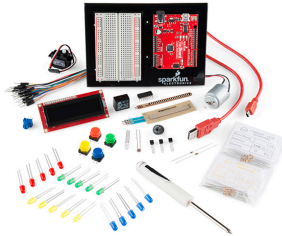
- Needed to pass course:
 - Attend two labs.
 - Attend and give project demo.
 - Project report (Details later, but necessary parts include: parts list, estimated cost, block and circuit diagram, photos of quick and dirty, functional, and final prototypes.
 - Project video (1 minute)
 - Hand back parts

Labs

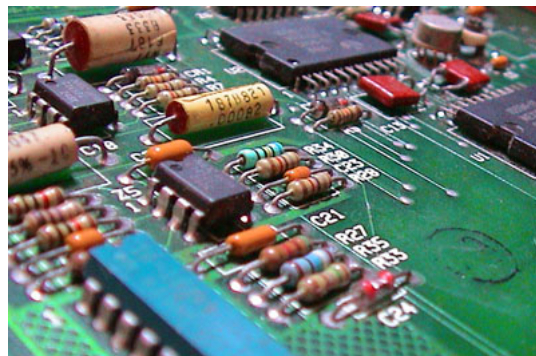
- LittleBits



- Arduino



Electrical engineering basics



Embedded basics



Programming basics

```
152     document.getElementById( cell ) {
153     document.getElementById( bigImageDesc ).innerHTML = description[page * 9 + i];
154     }
155     function updatePhotoDescription() {
156     if ( descriptions.length > (page * 9) + (currentImage + 1) - 1 ) {
157     document.getElementById( bigImageDesc ).innerHTML = description[page * 9 + i];
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 = 'images/' + photos[page * 9 + i - 1];
168     document.getElementById( elementIdBig ).src = 'images/' + photos[page * 9 + i - 1];
169     } else {
170     document.getElementById( elementId ).src = '';
171     }
```

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

Quick and dirty



Quick and Dirty

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

Illustrative “Idea”: Home Souse vide!

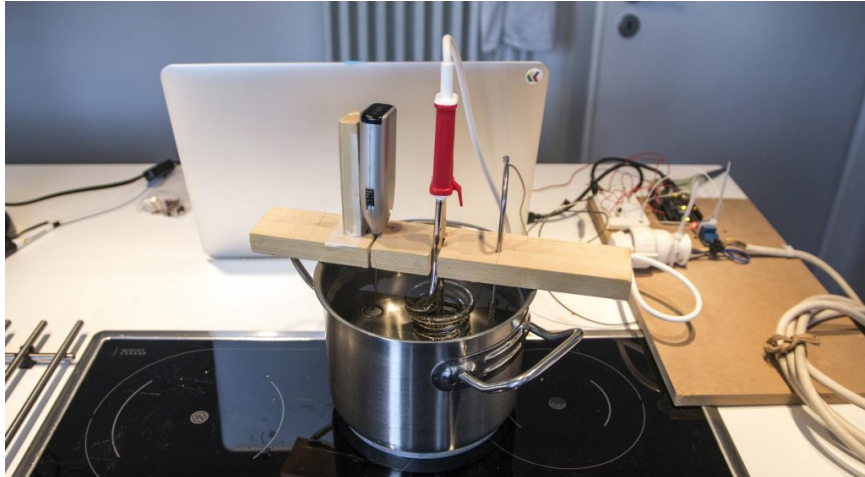
Idea in head:



Quick-and-dirty prototype



Functional electric prototype

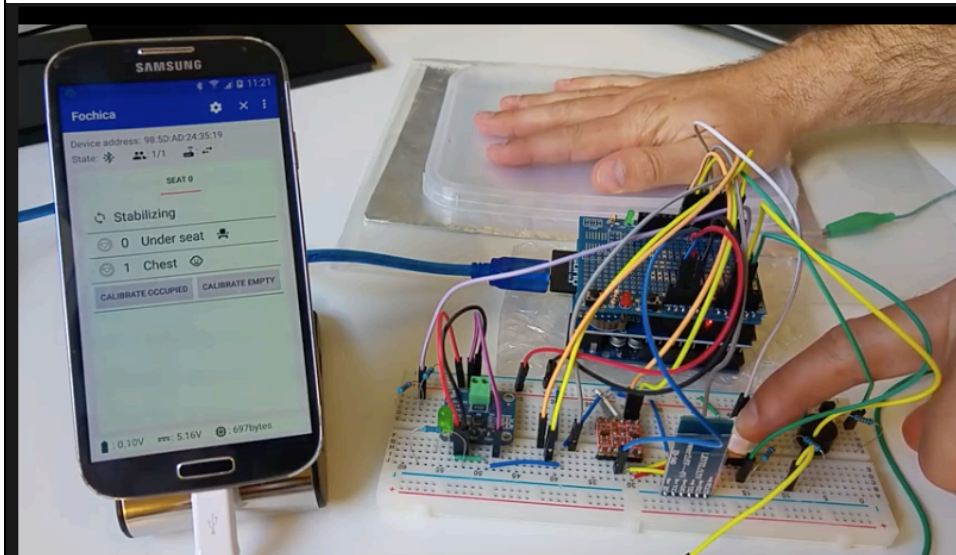


(Not my kitchen, found the picture on the web....)

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



<https://hackaday.com/2017/08/26/hackaday-prize-entry-fochica-alerts-you/>

Next steps

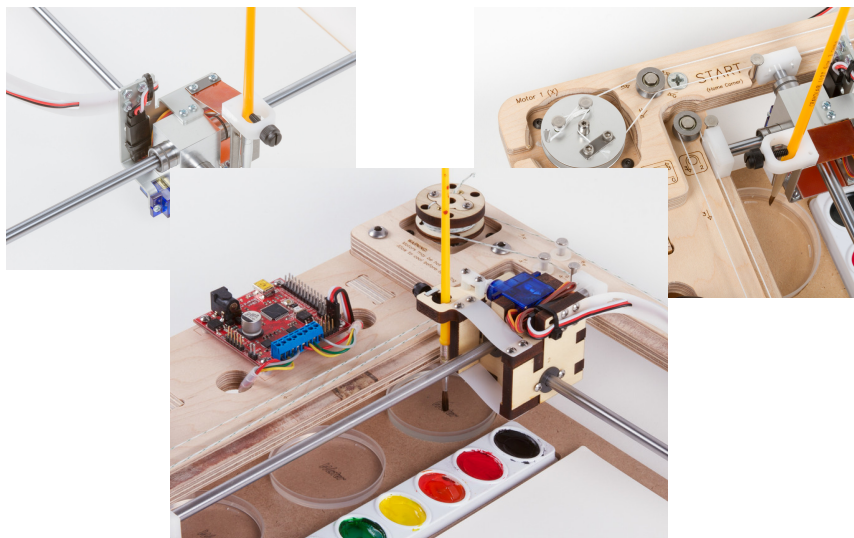
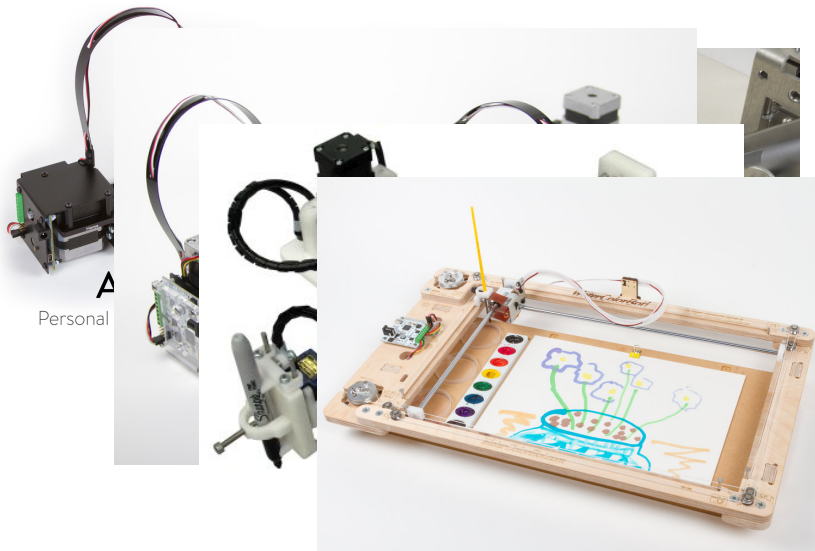
In some order:

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

Then:

- Production prototype
- Refinements...

Prototype/product generations Example: AxiDraw



Books

- No course book, but Humble Bundle right now has an offer >18 pdf books for 15 USD

– www.humblebundle.com



Some resources

- Adafruit
 - learn.adafruit.com
 - Basics: Collins lab
- Sparkfun
 - learn.sparkfun.com

More about this when we speak about embedded systems! (I.e. Arduino, Raspberry Pi et al.)

First assignment:

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