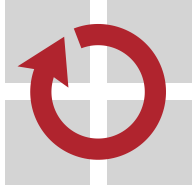
HanDi

05. November 2019

Henriette Hofmeier, Peter Wägemann, Bernhard Heinloth,
Florian Harbecke, Wolfgang Schröder-Preikschat



Chair in Distributed Systems
and Operating Systems

FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

FACULTY OF ENGINEERING

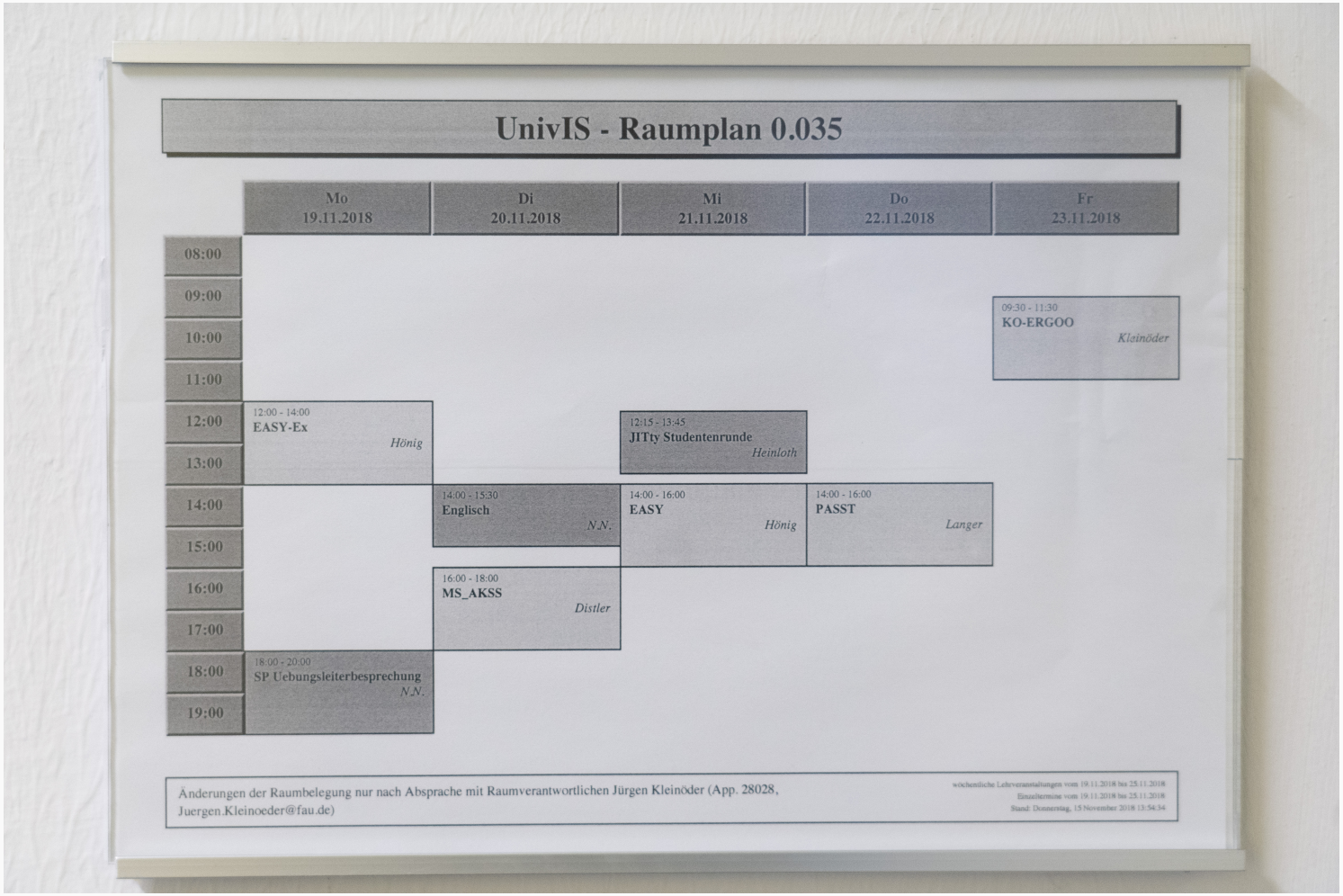
Laufzeit:
0
15
30
Tage
Mittwoch
Donnerstag
Freitag
08:00
10:00
12:00
14:00
16:00
18:00
Ü SP2
Ü SP2
Ü VM
Ü SP1
Ü SP2
MW
BS
Ü BS
Ü SP2
Ü SP2
Ü SP2
Ü SP2
Ü SP2
Raum 0.035

Hand-Cranked Display

Hand-Cranked **Di**splay

Energy-Neutral, WiFi-Connected Room Display with Hand-Crank–Based Energy Harvesting

HanDi 1.0 – Motivation



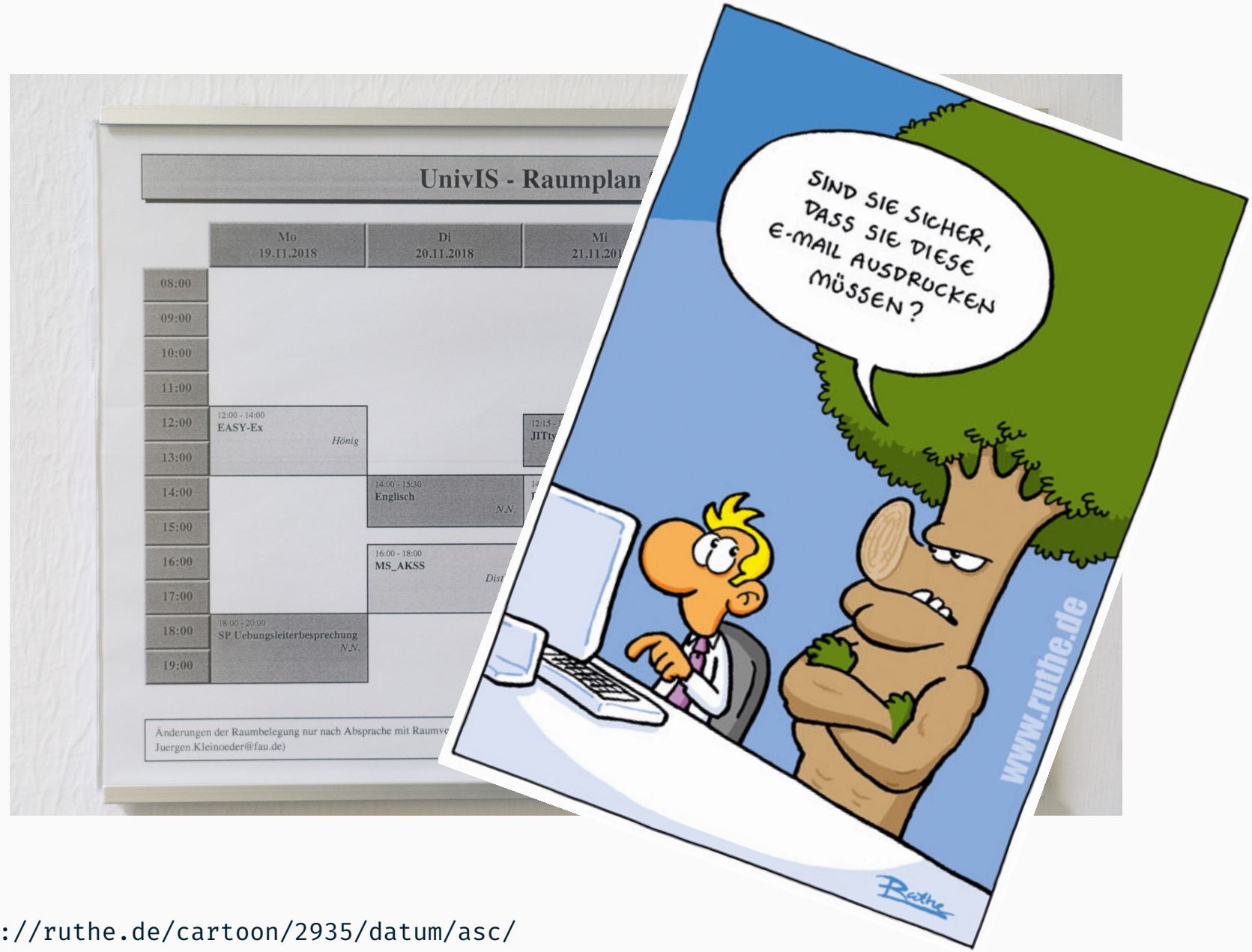
UnivIS - Raumplan 0.035

	Mo 19.11.2018	Di 20.11.2018	Mi 21.11.2018	Do 22.11.2018	Fr 23.11.2018
08:00					
09:00					09:30 - 11:30 KO-ERGOO *Kleinöder*
10:00					
11:00					
12:00	12:00 - 14:00 EASY-Ex *Hönig*		12:15 - 13:45 JITty Studentenrunde *Heinloth*		
13:00					
14:00		14:00 - 15:30 Englisch *N.N.*	14:00 - 16:00 EASY *Hönig*	14:00 - 16:00 PASST *Langer*	
15:00					
16:00		16:00 - 18:00 MS_AKSS *Distler*			
17:00					
18:00	18:00 - 20:00 SP Uebungsleiterbesprechung *N.N.*				
19:00					

Änderungen der Raumbelegung nur nach Absprache mit Raumverantwortlichen Jürgen Kleinöder (App. 28028, Juergen.Kleinoeder@fau.de)

wöchentliche Lehrveranstaltungen vom 19.11.2018 bis 25.11.2018
Einzeltermine vom 19.11.2018 bis 25.11.2018
Stand: Donnerstag, 15 November 2018 13:54:34

HanDi 1.0 – Motivation

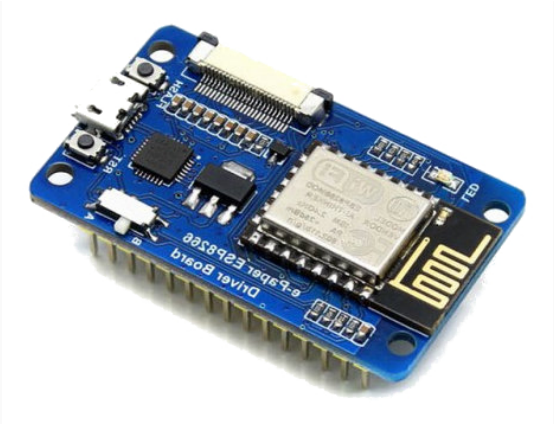


https://ruthe.de/cartoon/2935/datum/asc/

HanDi 1.0 – Components

Waveshare Epaper-Display 7.5” [1]

- Resolution: 640 × 384 px
- Colours: black and white
- Communication protocol: SPI

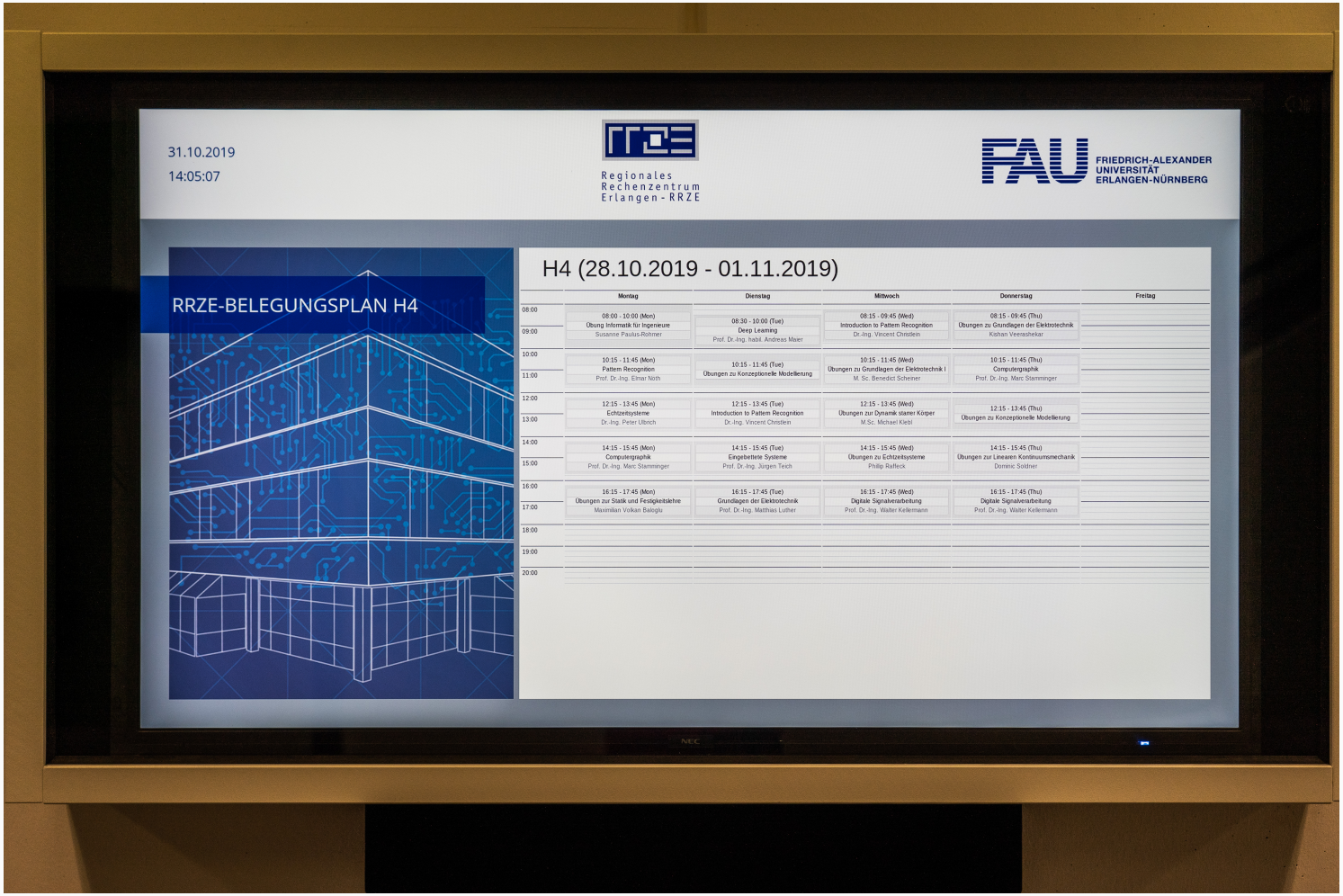


Driver Board [2]

- ESP 8266
- WiFi module
- Arduino compatible pin header

[1] https://www.waveshare.com/7.5inch-e-paper-hat.htm
[2] https://www.waveshare.com/e-paper-esp8266-driver-board.htm

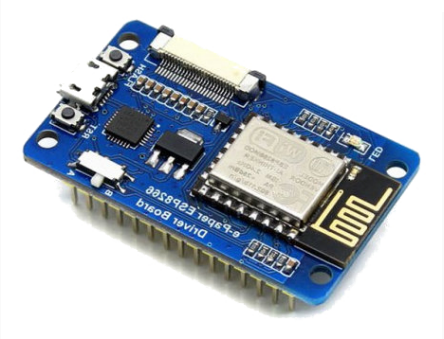
HanDi 2.0 – Motivation



HanDi 2.0 – Motivation

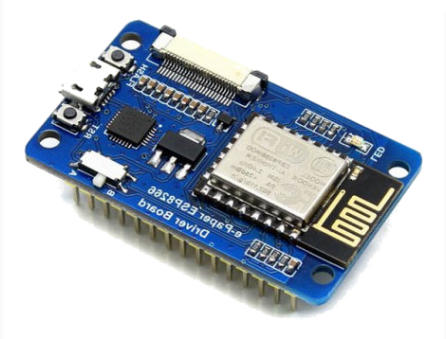
https://ruthe.de/cartoon/2921/datum/asc/

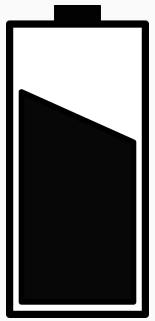
HANDI 2.0 – Components



Wägemann et al., ”An Energy-Neutral, WiFi-Connected Room Display with Hand-Crank–Based Energy Harvesting” FAU Idea Competition on Energy Saving ’19.

HANDI 2.0 – Components





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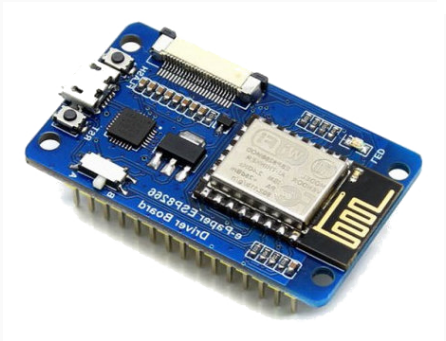

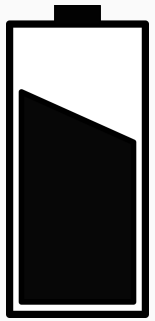

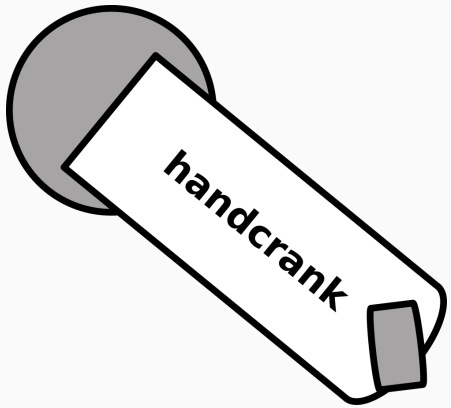

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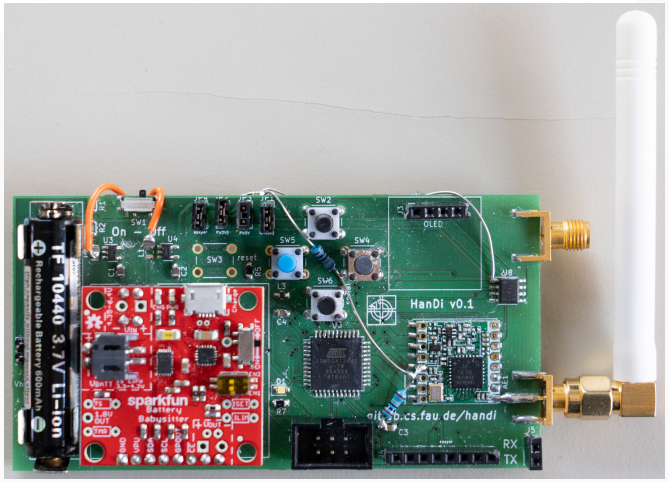
HanDi 2.0 – Components

Waveshare Epaper-Display 9.7” [3]

- Resolution: 1200 × 825 px
- Colours: 16 (grey scale)
- Communication protocol: SPI



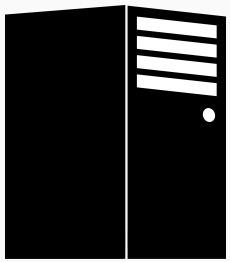
HanDi PCB

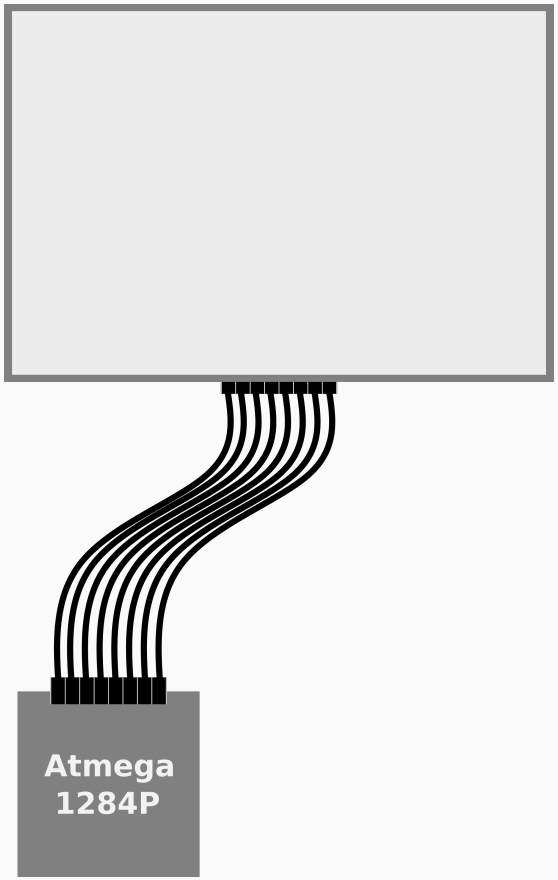
- Atmega microcontroller
- LoRa module
- LiPo battery
- LiPo battery manager

[3] https://www.waveshare.com/9.7inch-e-paper-hat.htm

HanDi 2.0 – Implementation

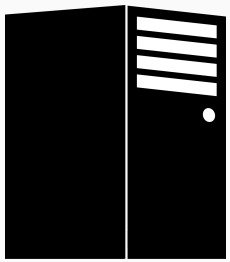
UnivIS

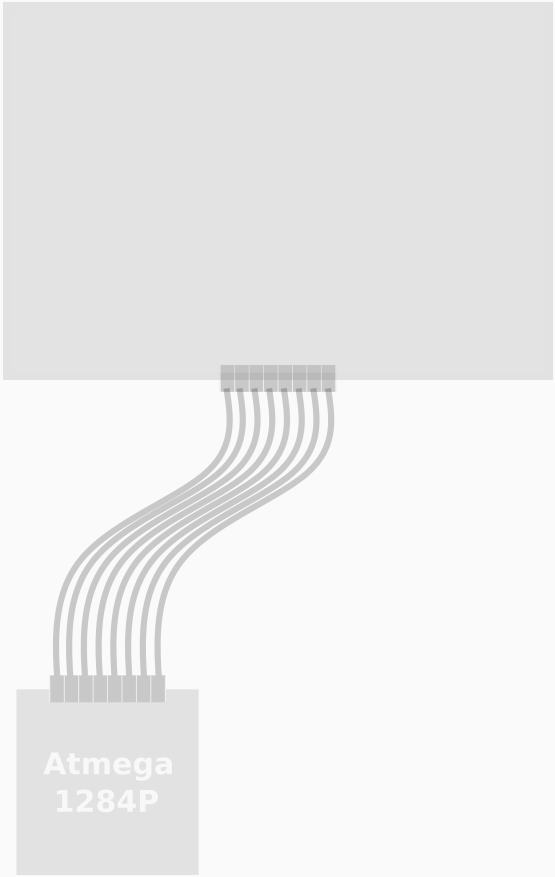




HanDi 2.0 – Implementation

UnivIS





HanDi 2.0 – Implementation

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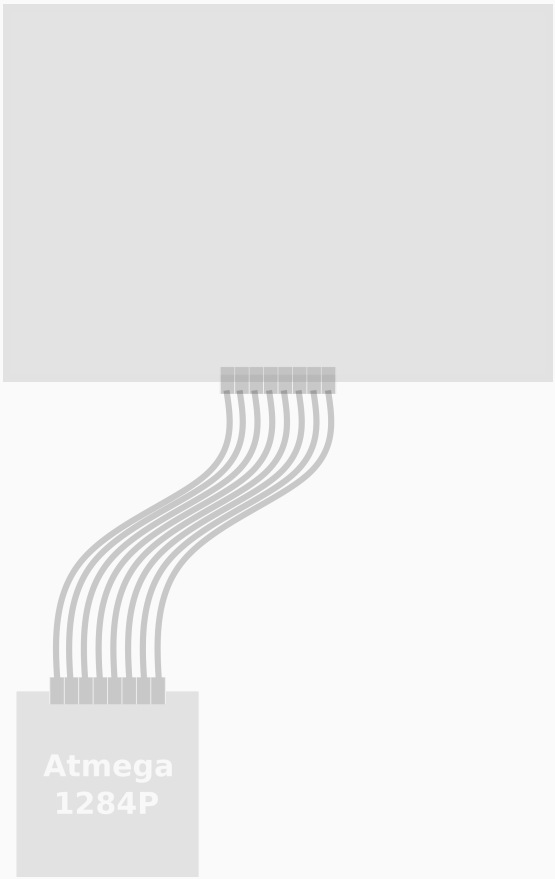

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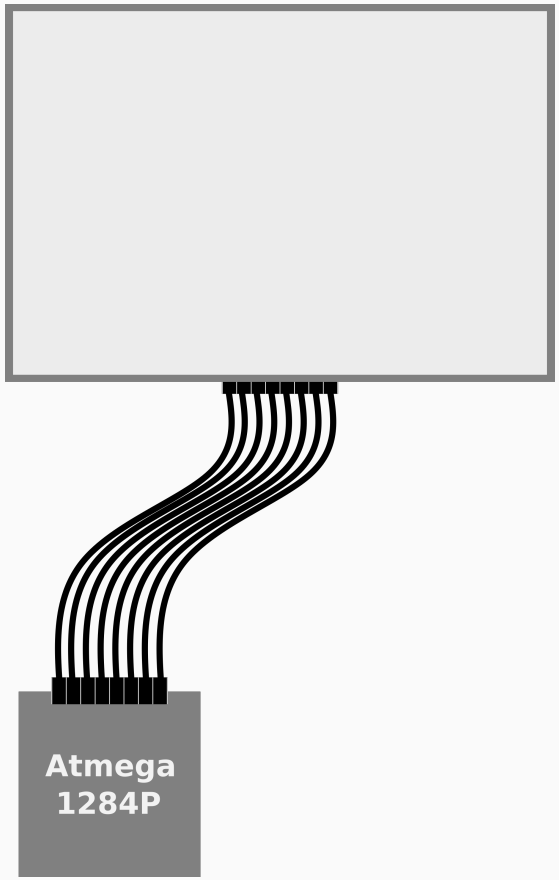

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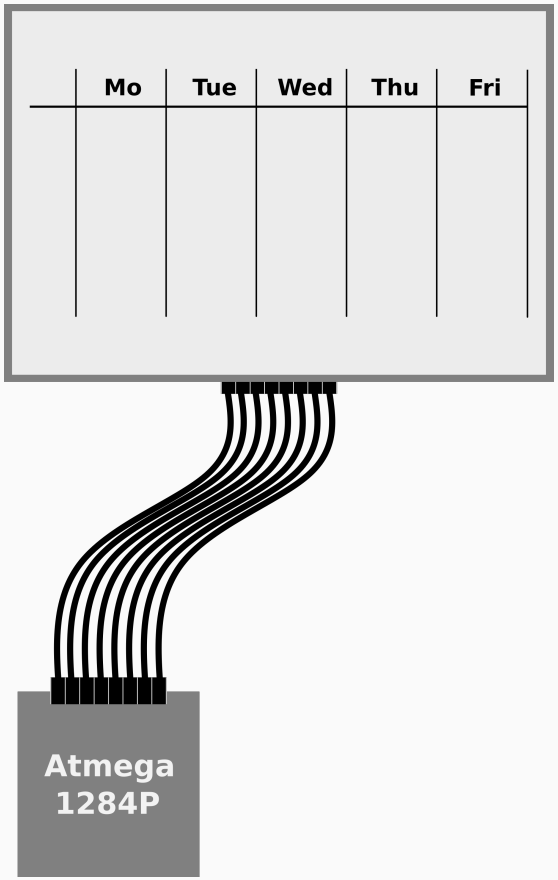

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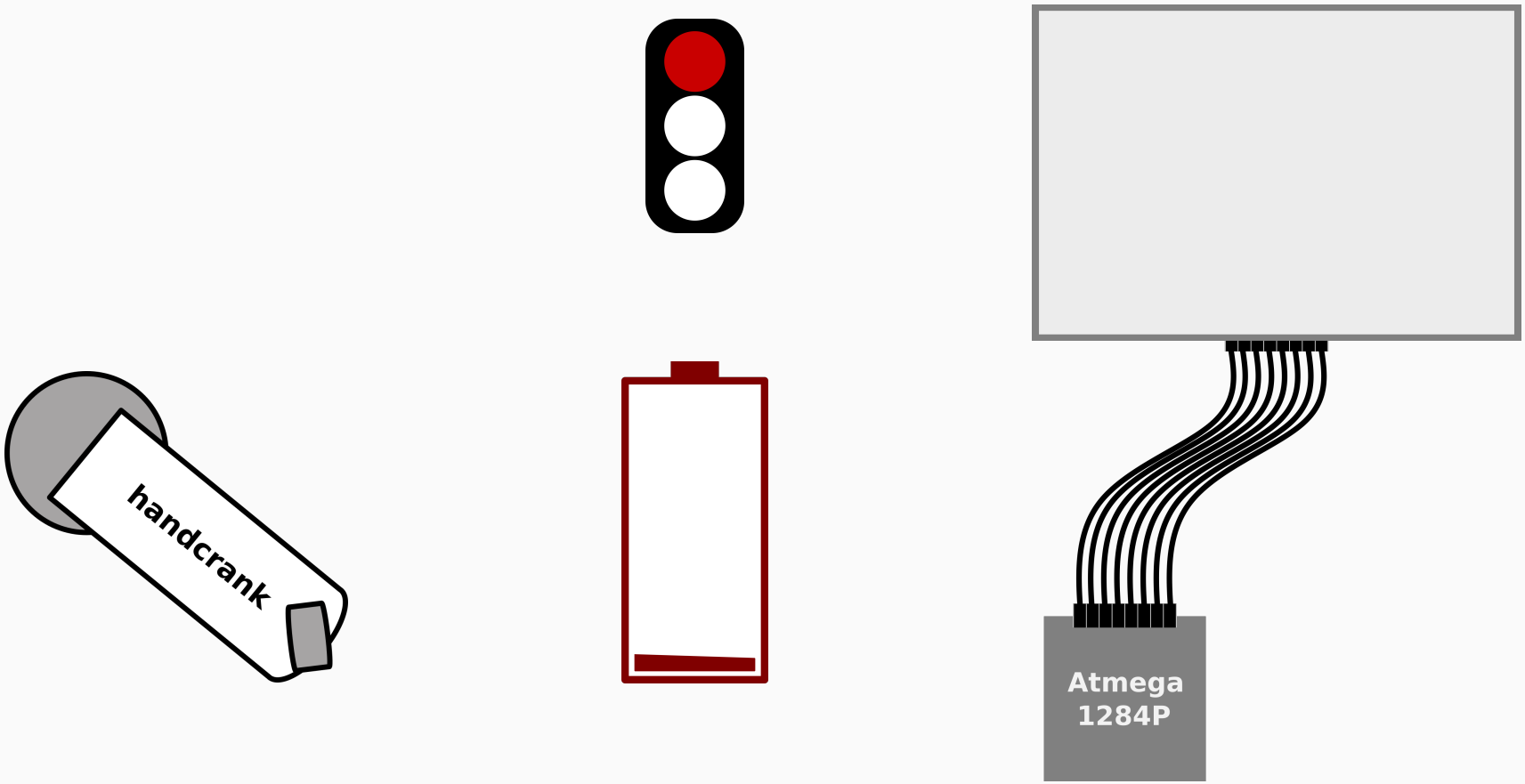

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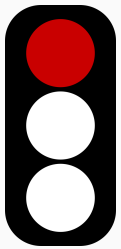

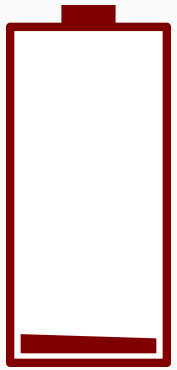

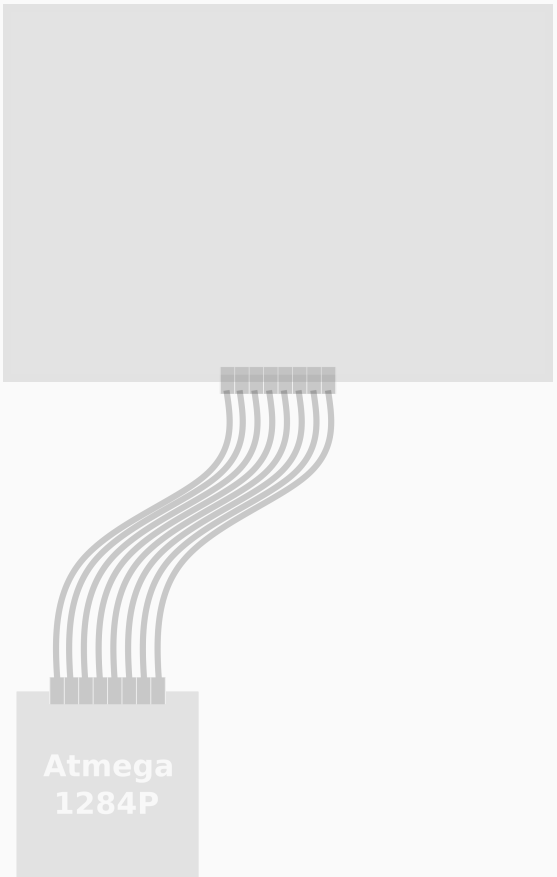

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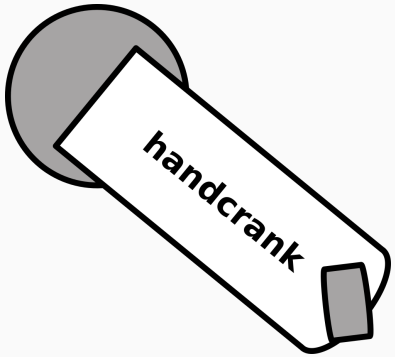

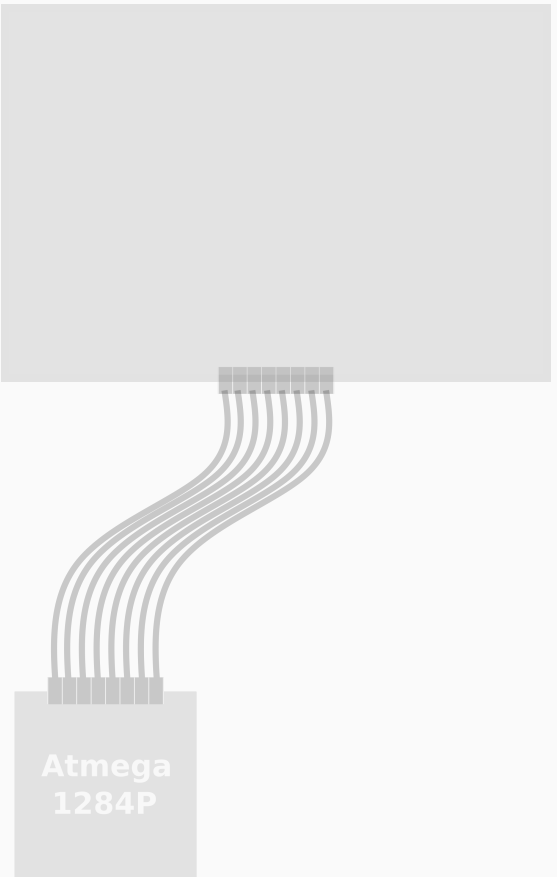

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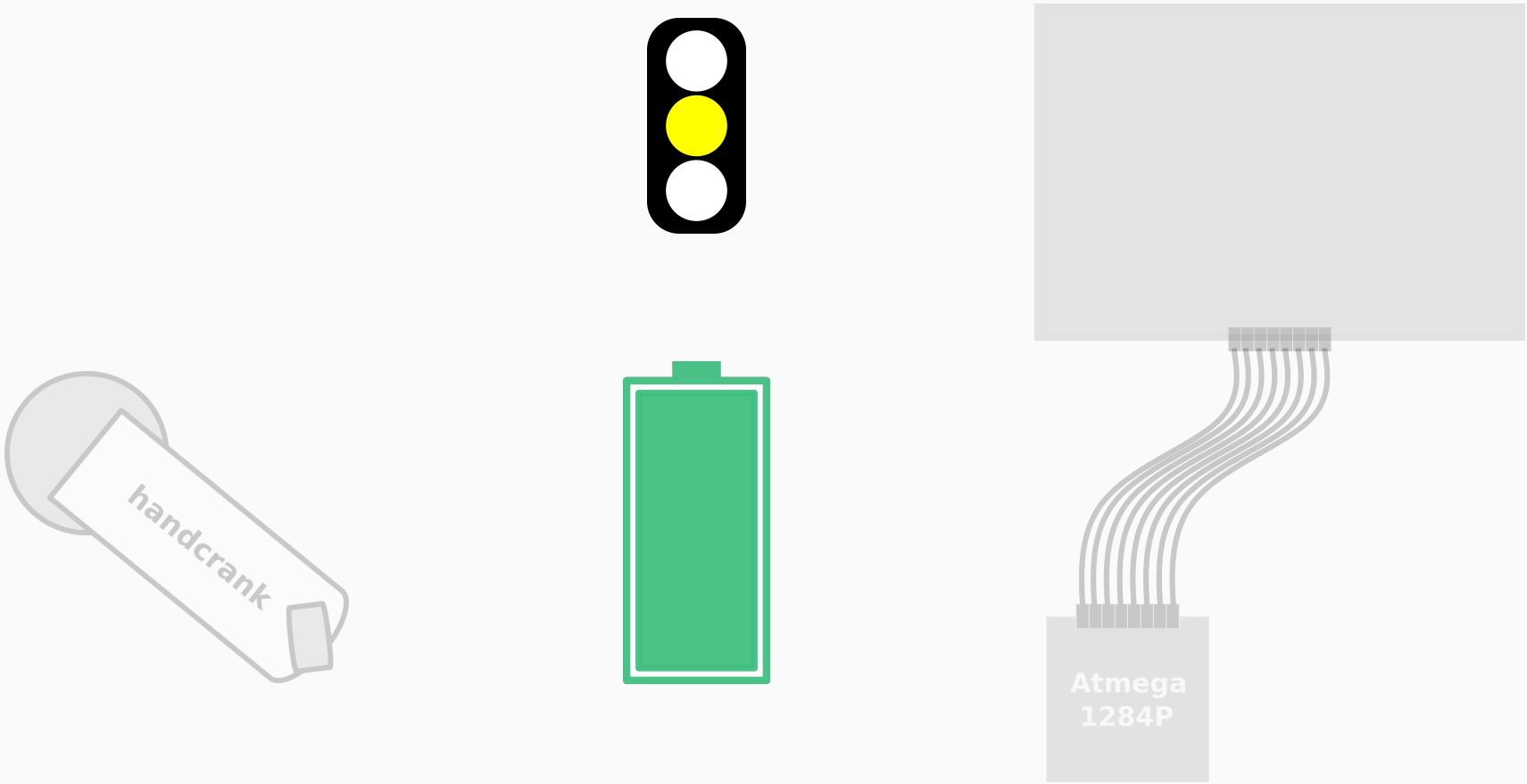

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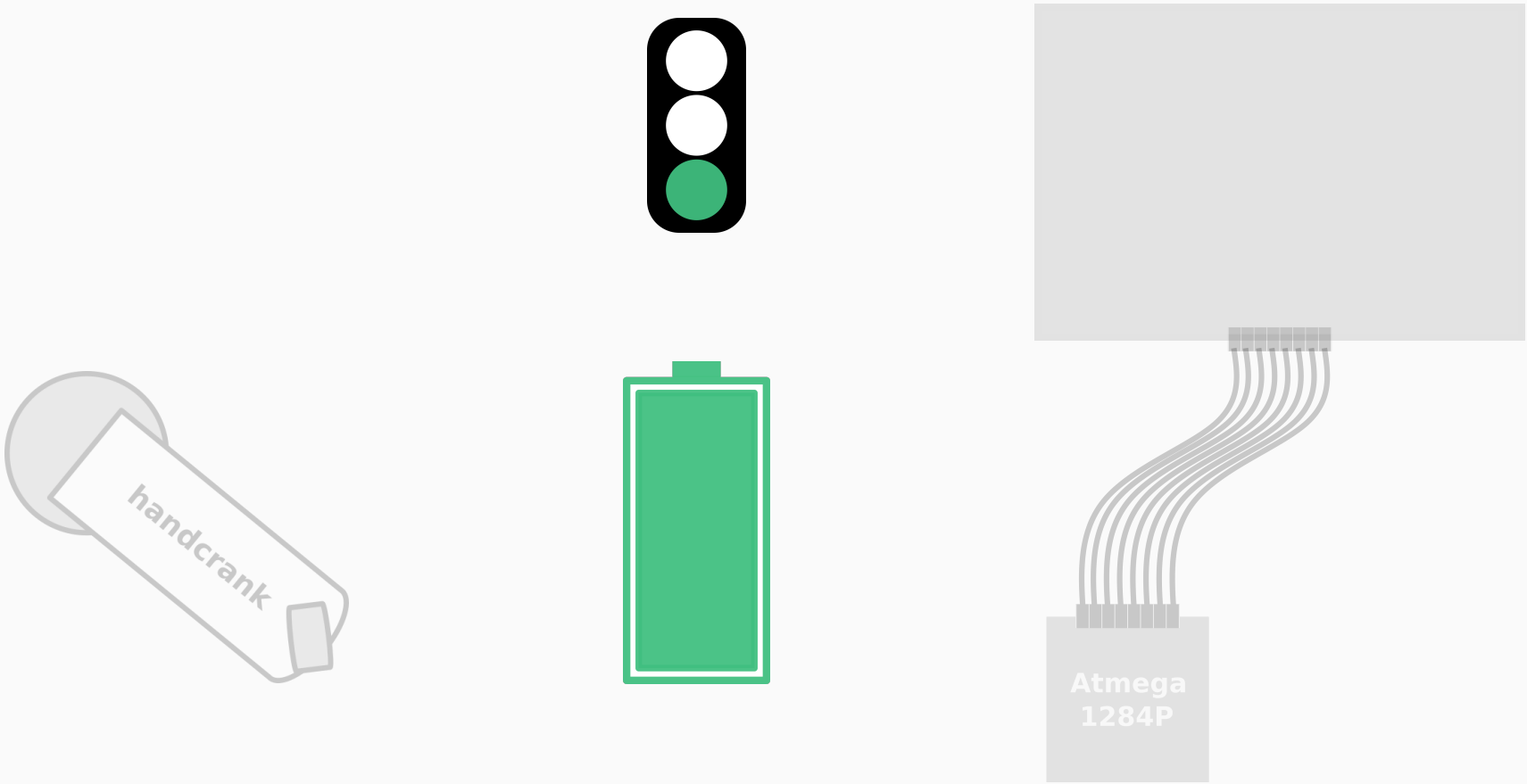

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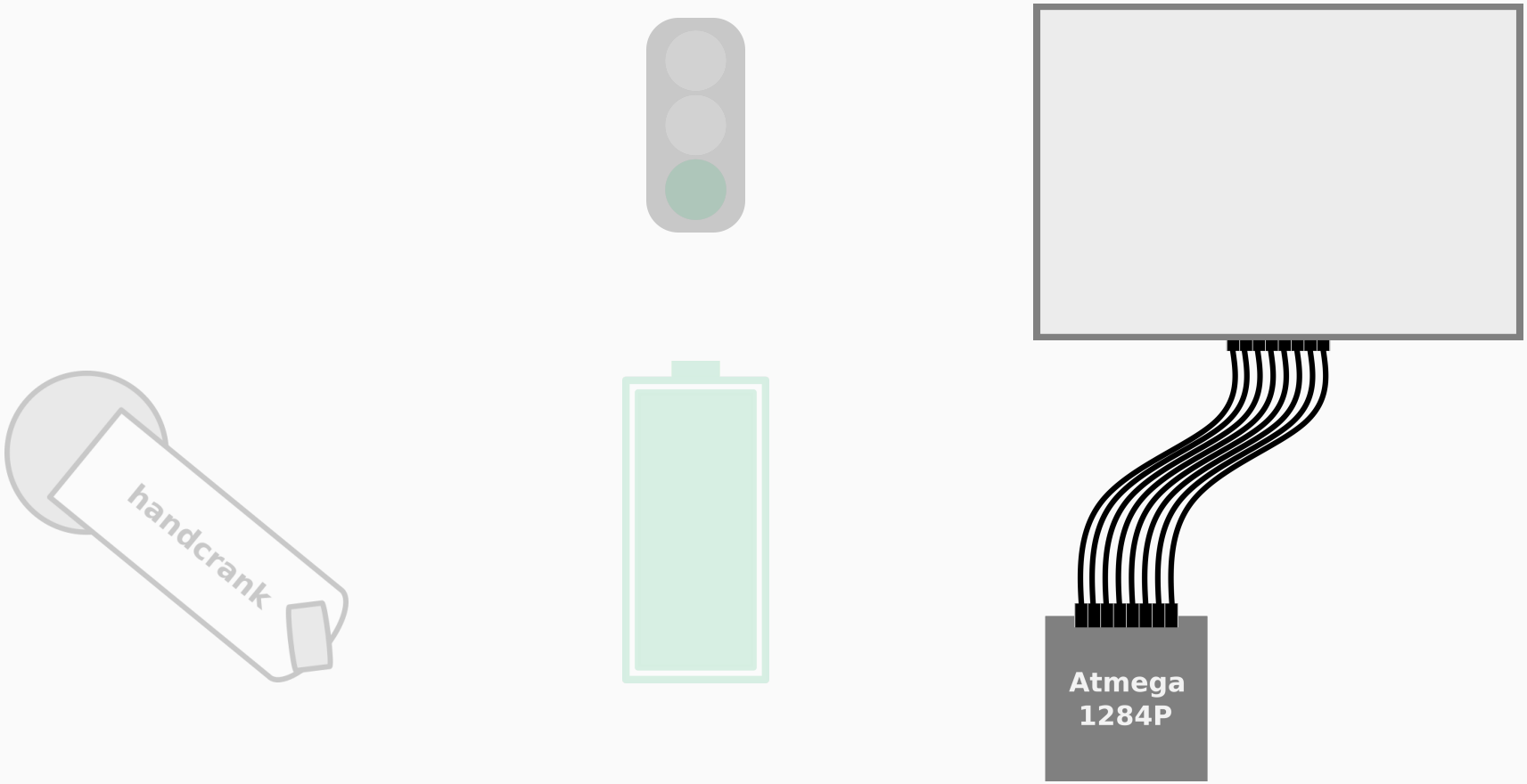

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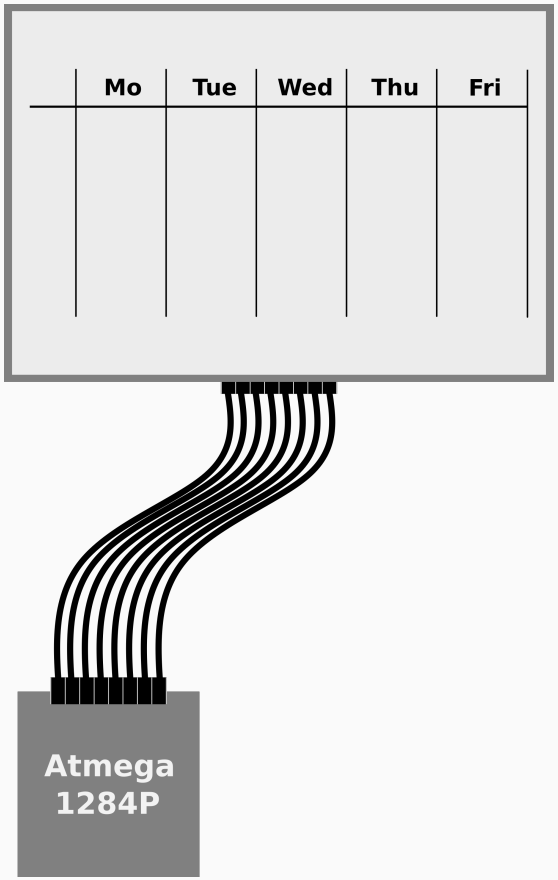
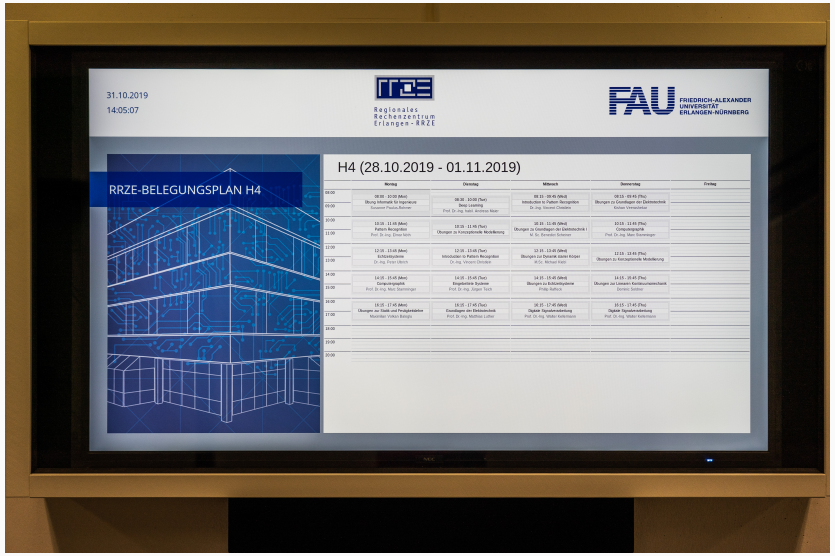


HanDi vs. LCD



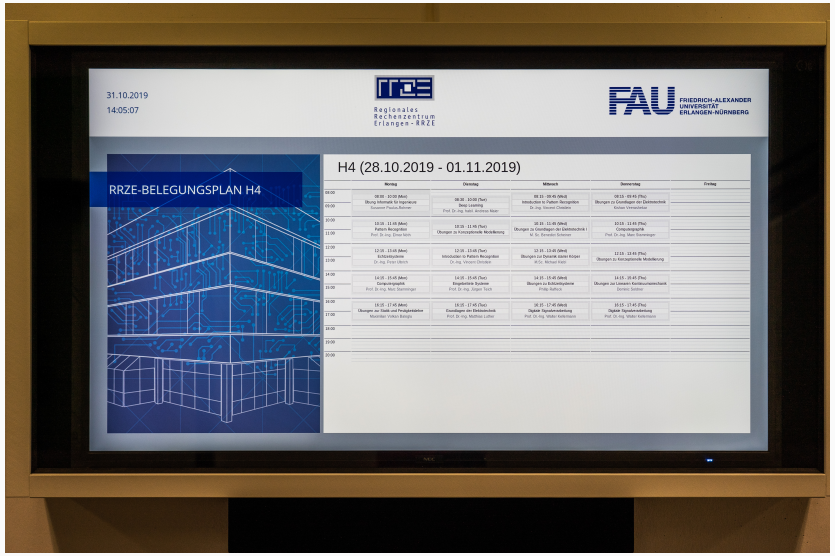
3.066 kWh

1139 kWh

0.011 kWh

569.5 kWh

HanDi vs. LCD



3.066 kWh

⇒ 106 ×

1139 kWh

⇒ 39 276 ×

0.011 kWh

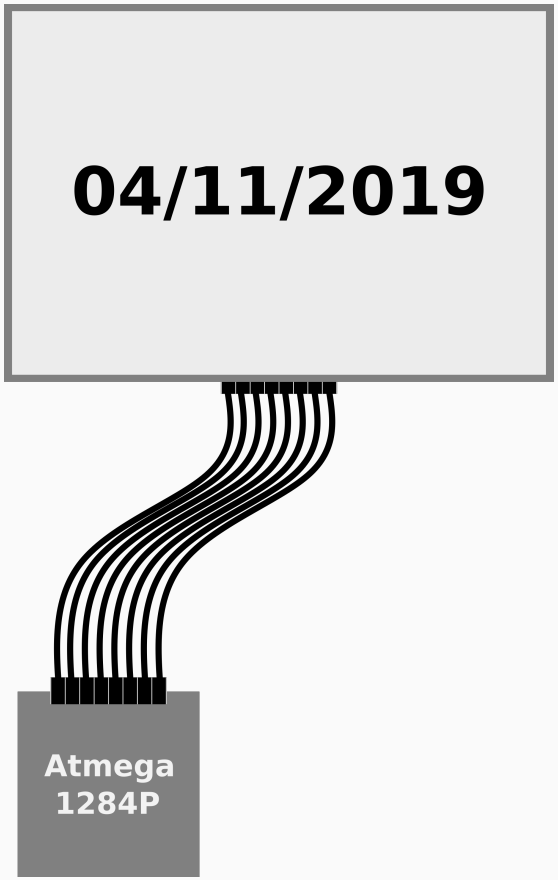
⇒

569.5 kWh

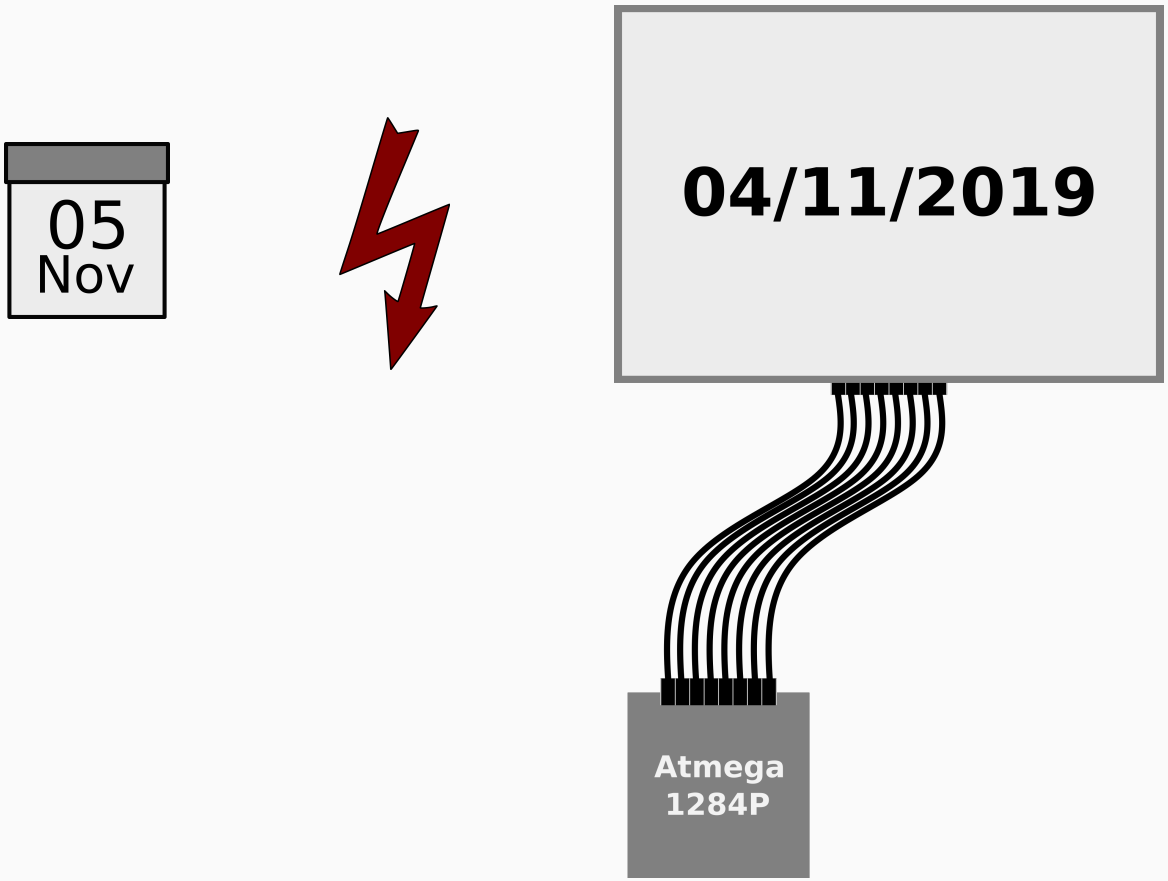
⇒ 19 638 ×

HANDI – The Science

HANDI – The Science



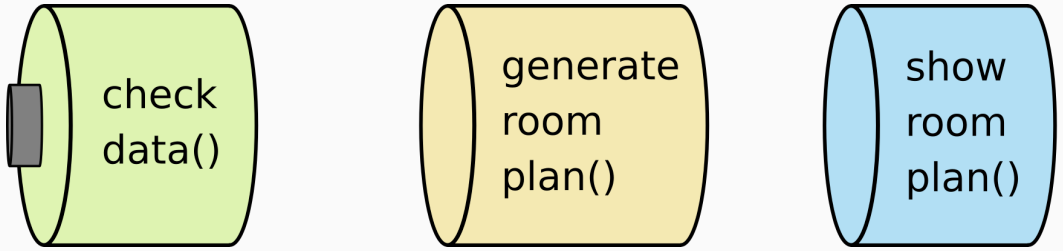
HANDI – The Science



HanDi – The Science

```
void main() {

  check_data();

  generate_room_plan();

  show_room_plan();

}
```

HANDI – The Science

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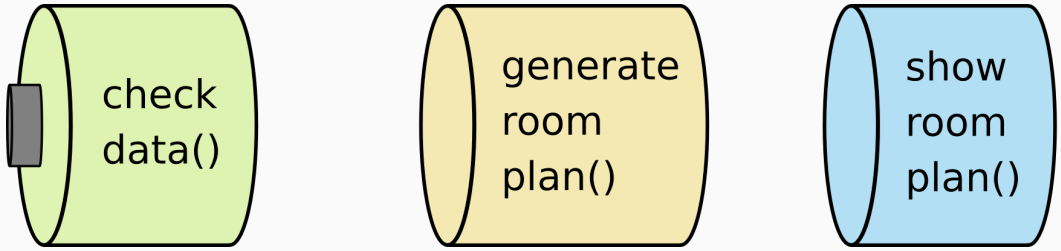


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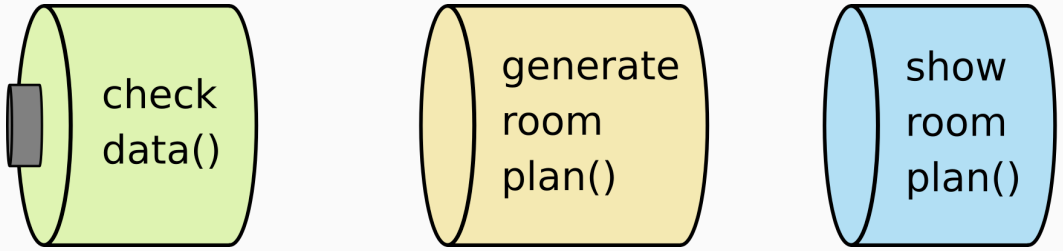
Worst-Case Energy-Consumption [4]

[4] Wägemann et al., ”Whole-System Worst-Case Energy-Consumption Analysis for Energy-Constrained Real-Time Systems”, ECRTS ’18.

HanDi – The Science

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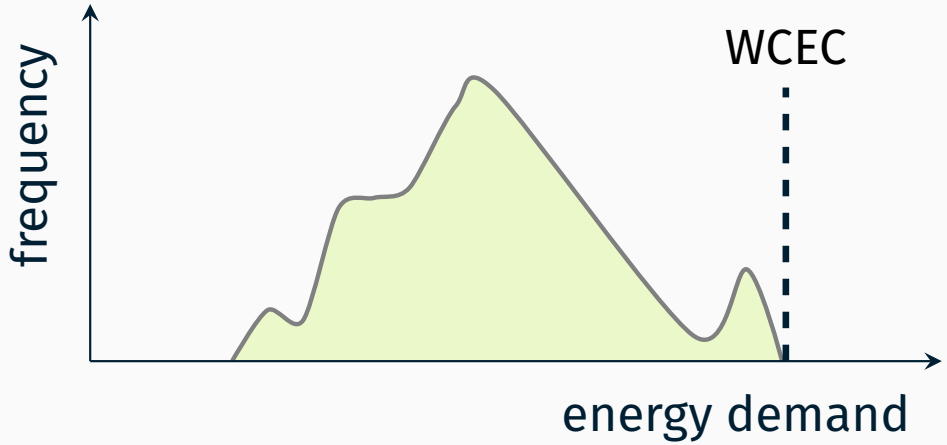

Worst-Case Energy-Consumption [4]

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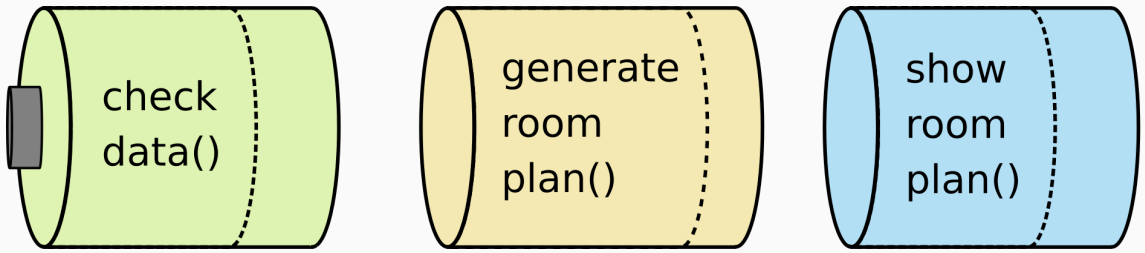
HanDi – The Science

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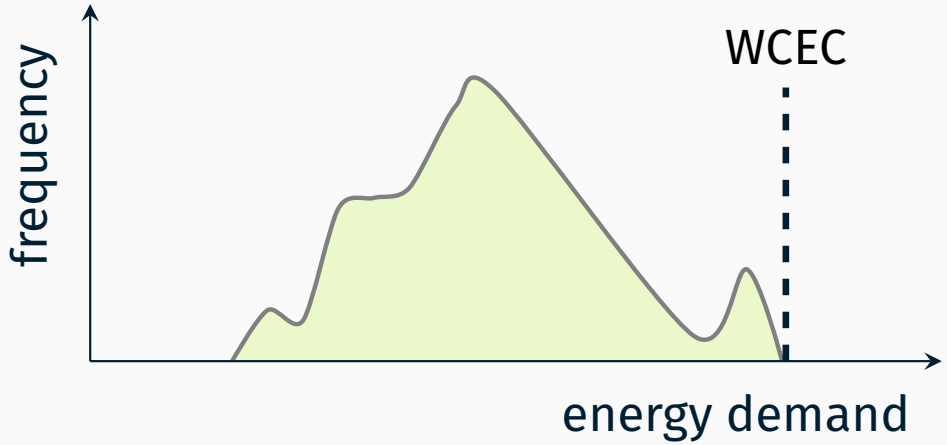

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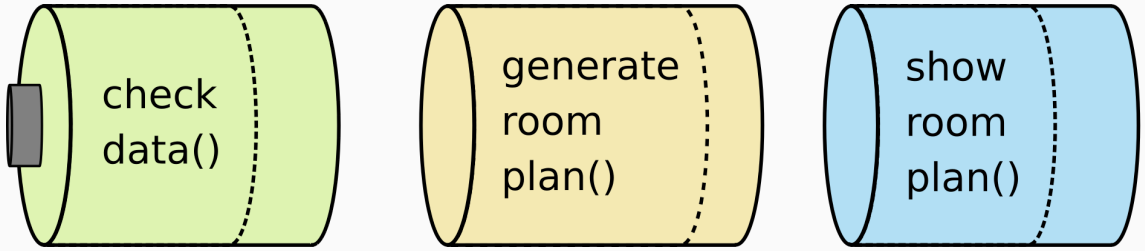
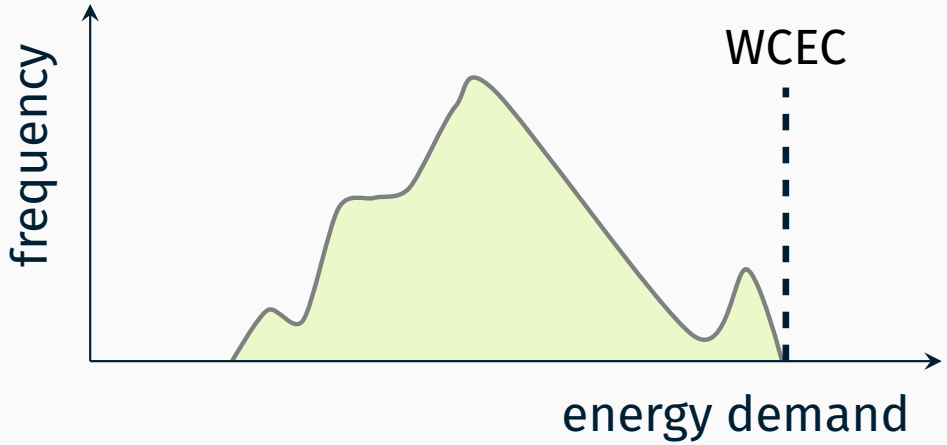
HanDi – The Science




```
void main() {

  check_data();
  /* check battery */
  generate_room_plan();
  /* check battery */
  show_room_plan();
  /* check battery */
}
```



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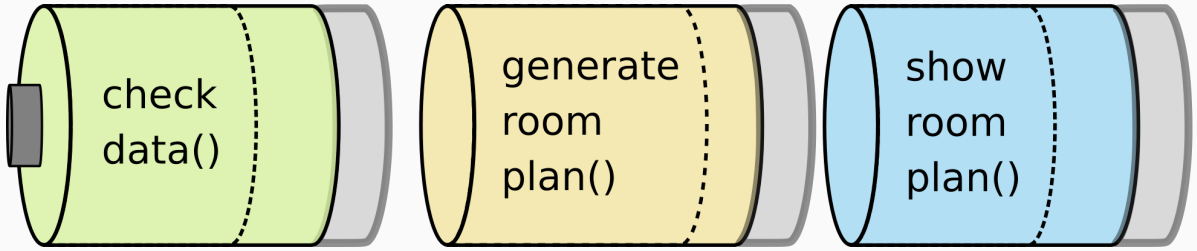


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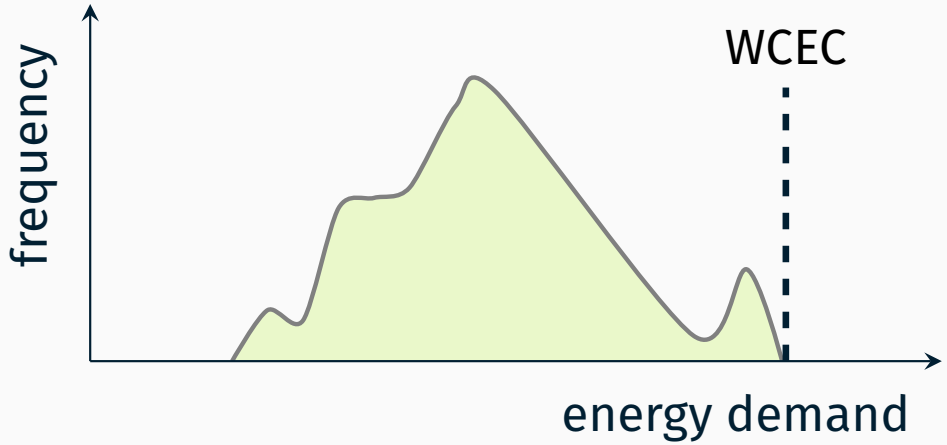

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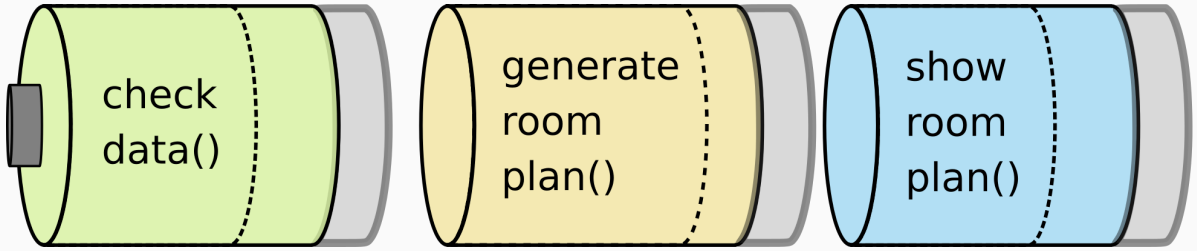
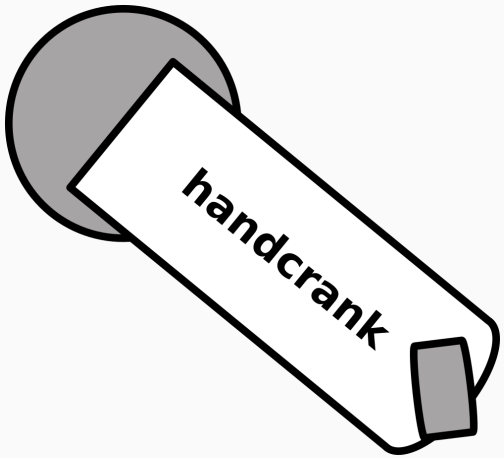
[4] Wägemann et al., "Whole-System Worst-Case Energy-Consumption Analysis for Energy-Constrained Real-Time Systems", ECRTS '18.

HanDi – The Science

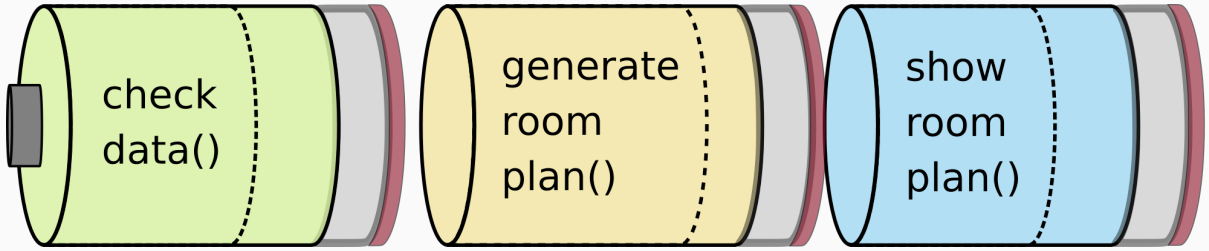



```
void main() {

  check_data();
  /* check battery */
  generate_room_plan();
  /* check battery */
  show_room_plan();
  /* check battery */
}
```



HANDI – The Science

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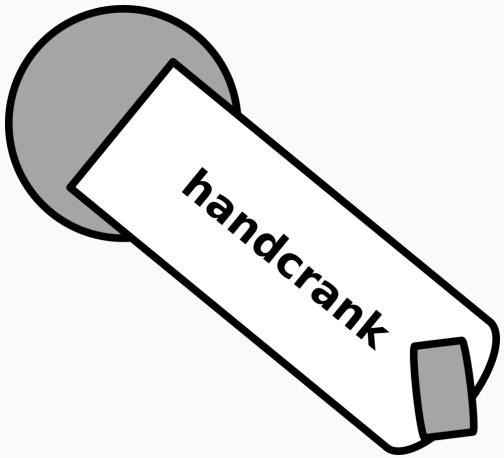

Would You Use It?

`https://gitlab.cs.fau.de/handi`