Proposal: a novel heating method for coffee

An application which utilises in-situ resources at the office and responsible use of modern manufacturing technologies

Motivation

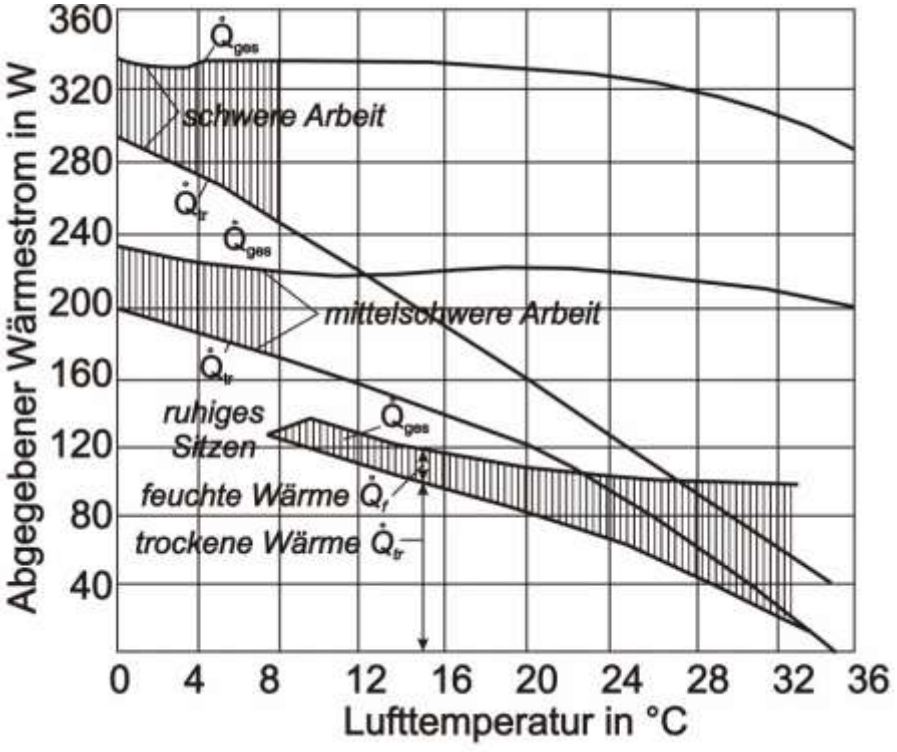
- coffee usually tends to get cold with time [1] when you are focused on your code
- cold coffee ≠ good coffee

→ a solution which utilises the in-situ resources is needed

[1] citation needed

Sources of thermal energy

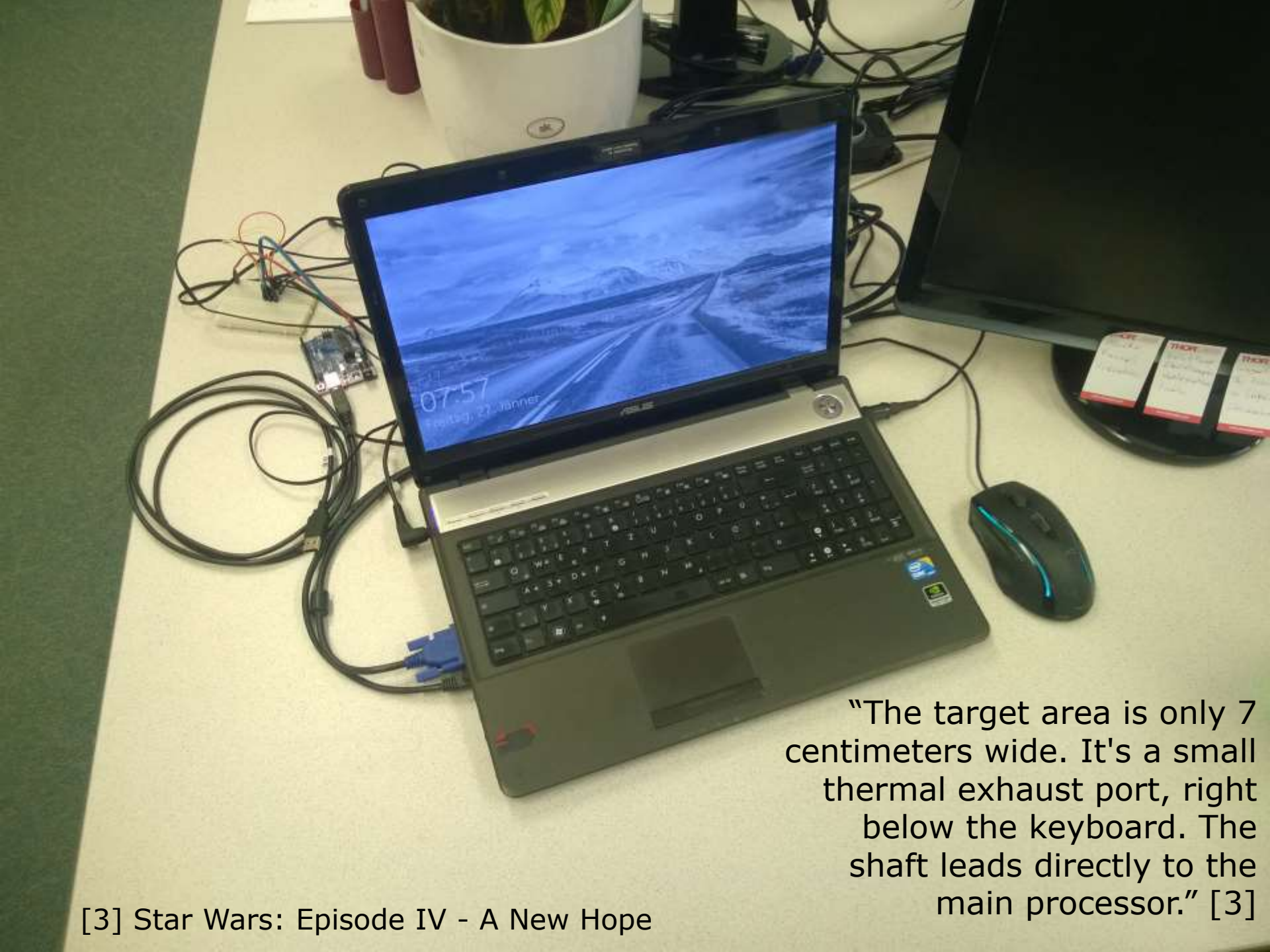
humans: an average adult produces around 100W of thermal energy when working at the computer [2]



[2] Prof. Dr.-Ing. E. Specht, Der Mensch als wärmetechnisches System, Otto-von-Guericke-Universität Magdeburg, 2005

Sources of thermal energy

electricity: an omnipresent power source but requires an additional heating device (resistive, peltier element)

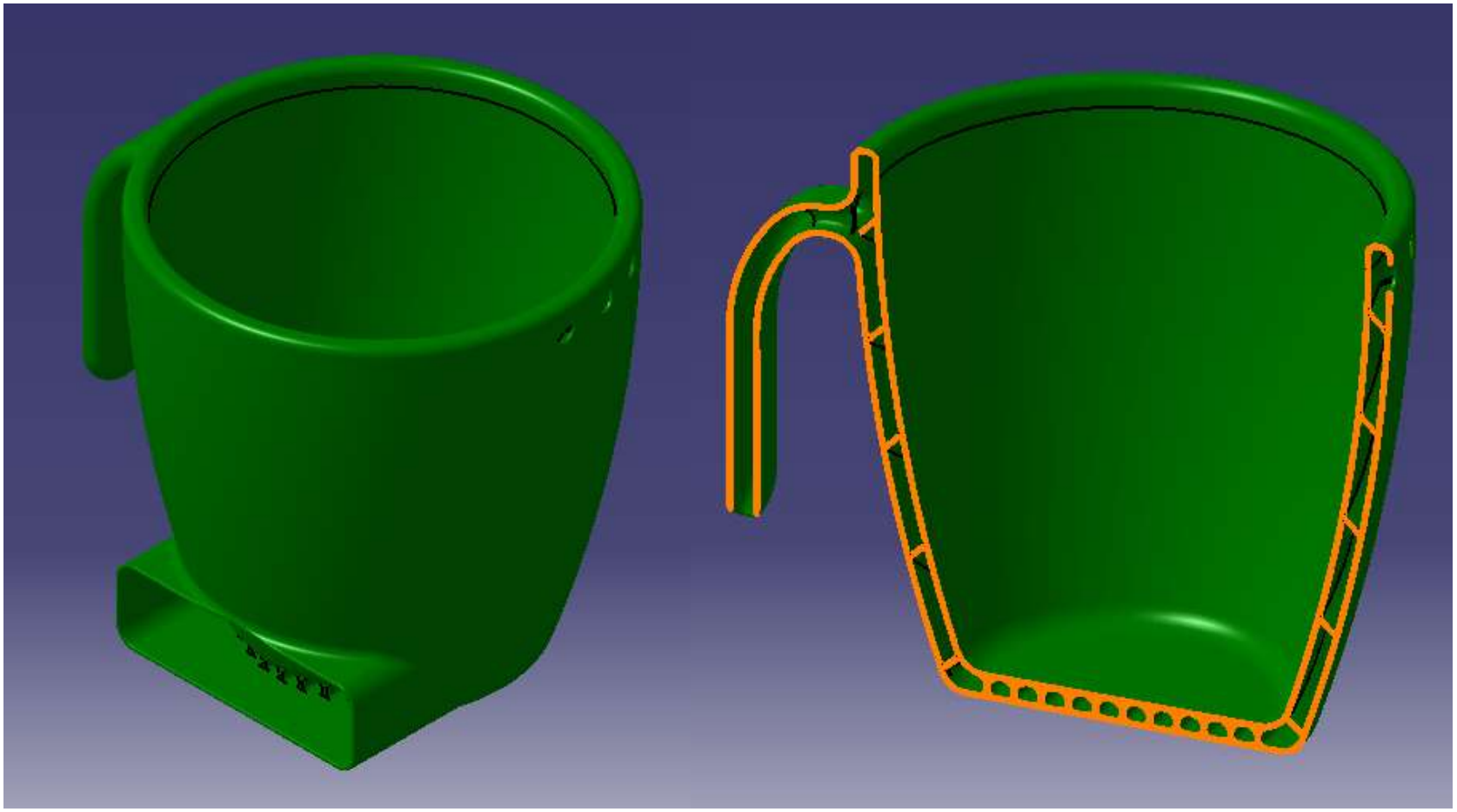


"The target area is only 7 centimeters wide. It's a small thermal exhaust port, right below the keyboard. The shaft leads directly to the main processor." [3]

[3] Star Wars: Episode IV - A New Hope


ESC
Strg
Fn

Proposed energy harvesting device



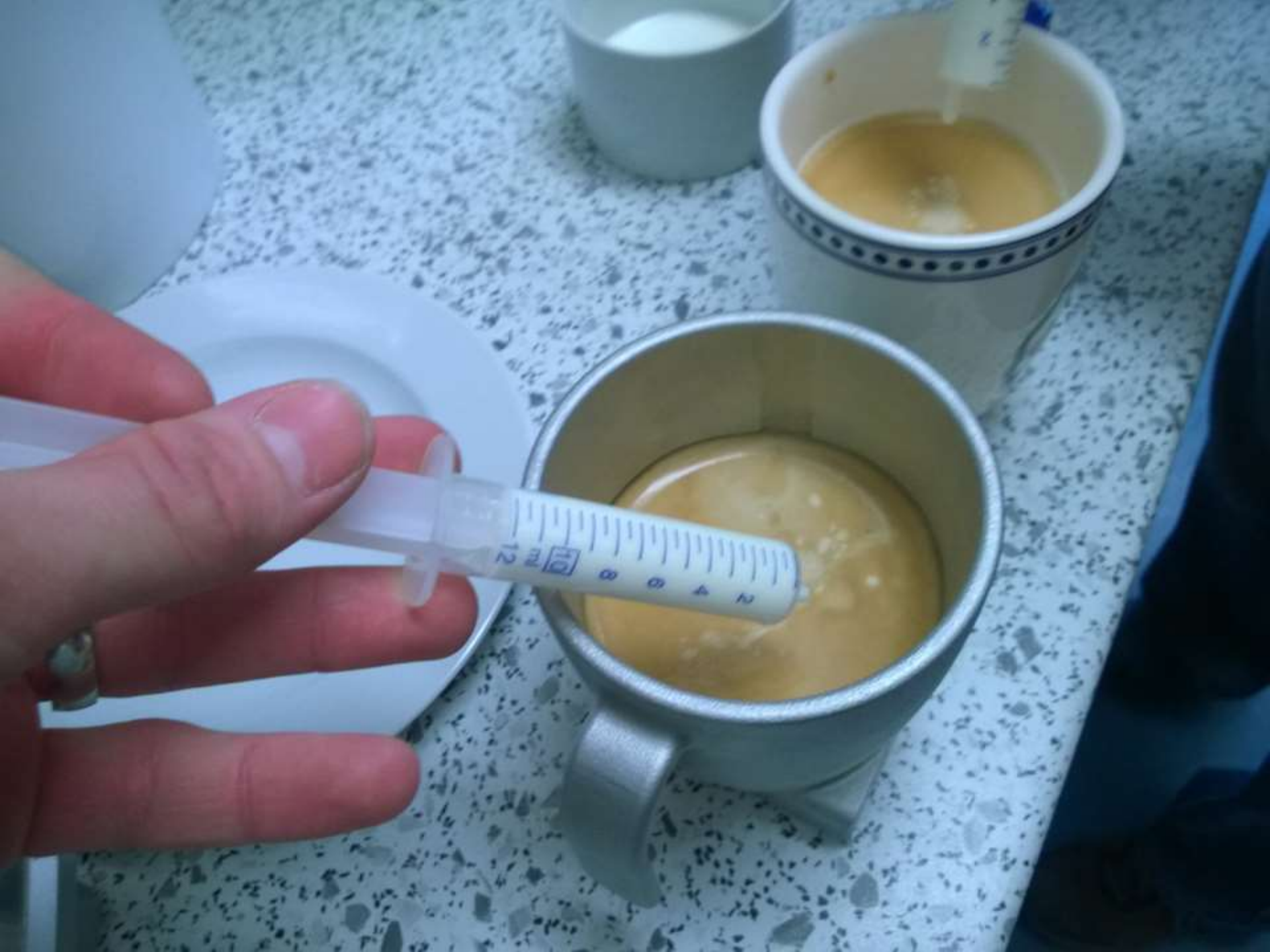
Verification

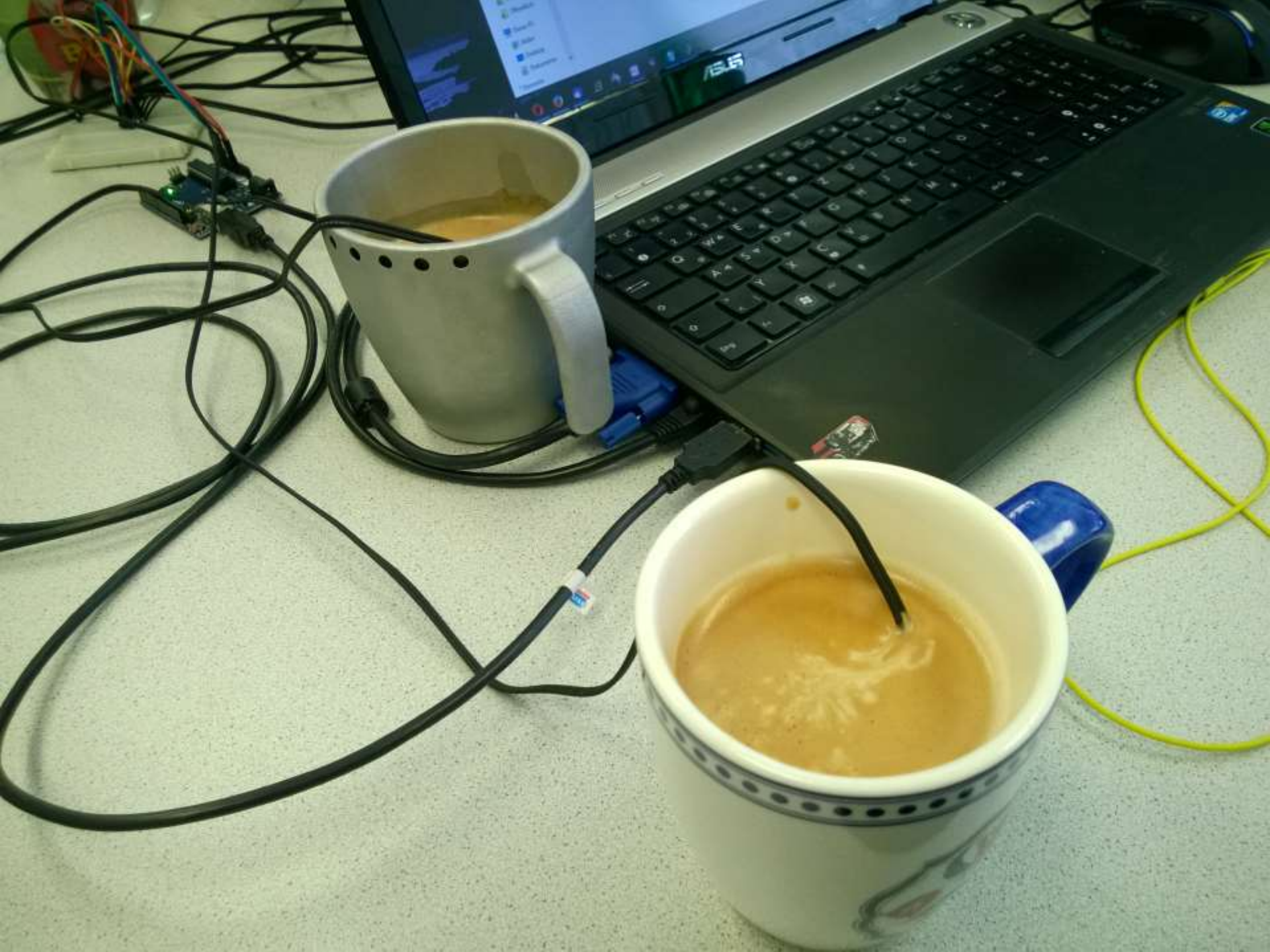
- Arduino based measurement system to acquire temperature values with 3 independent NTC sensors
- raw data is sent to a computer in intervals of 1s
- MATLAB script calculates temperature values, visualizes in realtime
- data is stored in hdf5 container for further processing

Verification

- a similar shaped conventional mug is needed for reference
- both mugs are filled with the exact same amount of coffee simultaneously using highly scientific methods
- 24ml of milk are added afterwards


ECO





Task-Manager

Datei Optionen Ansicht

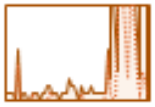
Prozesse | Leistung | App-Verlauf | Autostart | Benutzer | Details | Dienste

CPU
89% 2,49 GHz

Arbeitsspeicher
5,1/7,8 GB (65%)

Datenträger 0 (C: D
0%

Ethernet
Nicht verbunden



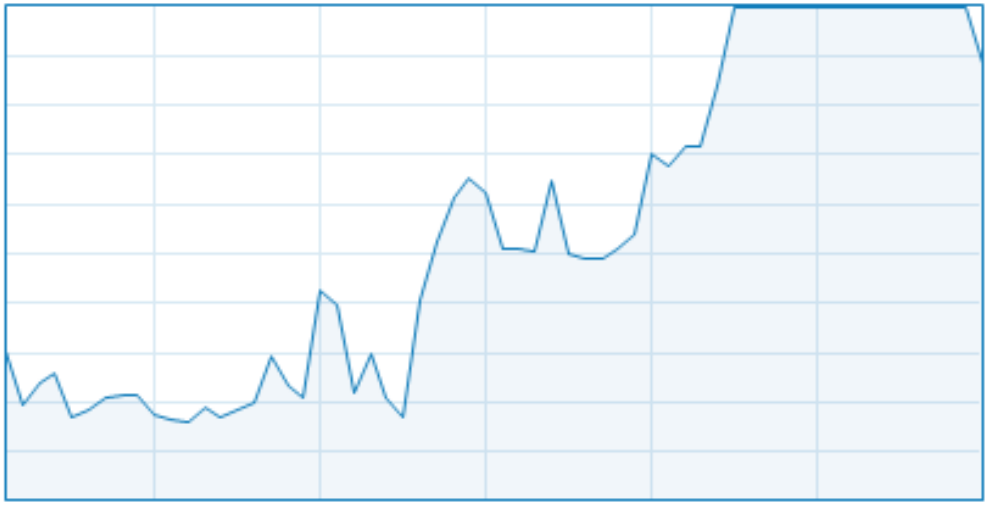
Ethernet
Ges.: 0 Empf.: 0 KBit/s

WLAN
Nicht verbunden

CPU

Intel(R) Core(TM) i5 CPU M 430 @ 2.27GHz

% Auslastung 100%



60 Sekunden 0

Verwendung	Geschwindigkeit
89%	2,49 GHz

Prozesse	Threads	Handles
169	2614	69846

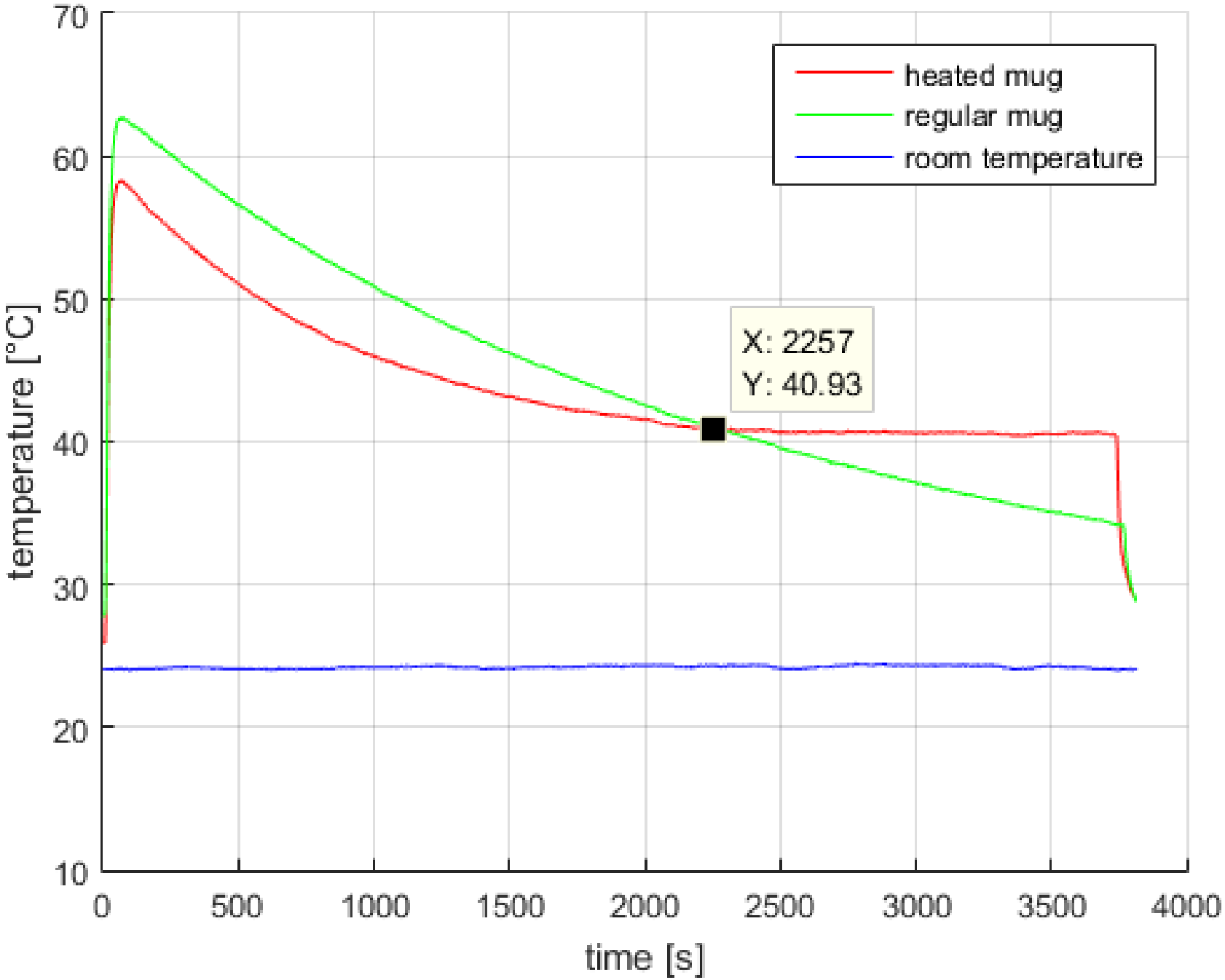
Betriebszeit
0:05:12:13

Maximale Geschwindigkeit:	2,27 GHz
Sockets:	1
Kerne:	2
Logische Prozessoren:	4
Virtualisierung:	Aktiviert
L1-Cache:	128 KB
L2-Cache:	512 KB
L3-Cache:	3,0 MB

Weniger Details | Ressourcenmonitor öffnen

Results

- > 60°C is too hot
- ~ 50 – 60°C is nice warm coffee
- 40 – 50°C is acceptable
- 34°C is definitely too cold
- drinking coffee with a wire stuck in the mug is weird
- drinking coffee out of a warm aluminium mug is weird too


heated mug
regular mug
room temperature
X: 2257
Y: 40.93
temperature [°C]
time [s]
70
60
50
40
30
20
10
0
500
1000
1500
2000
2500
3000
3500
4000

Conclusion

- proposed device did not show the expected performance
- Aluminium acts as heatsink by transferring heat to the outside

→ outer shell with less thermal conductivity is needed while maintaining the metal inner shell