Designing Infrastructures for Appropriation Support in 3D Printing Communities

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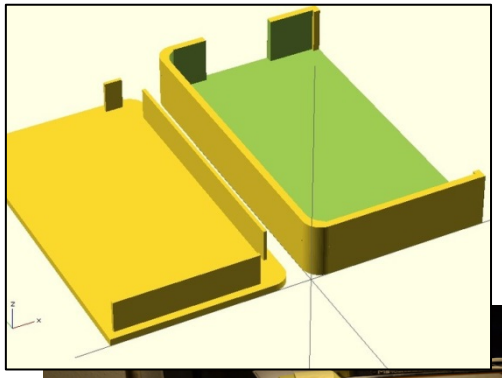
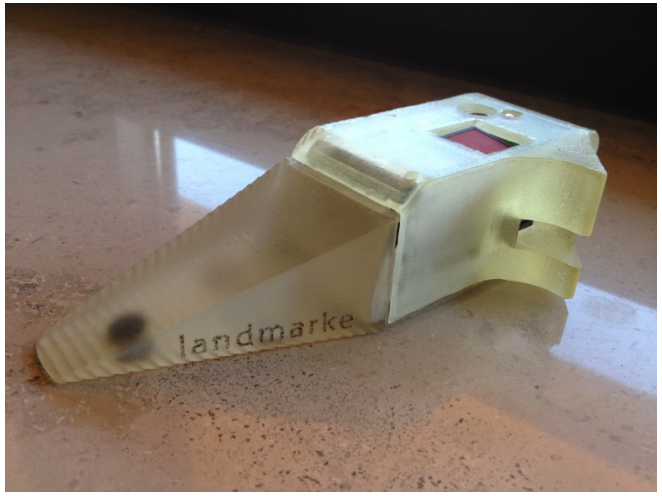
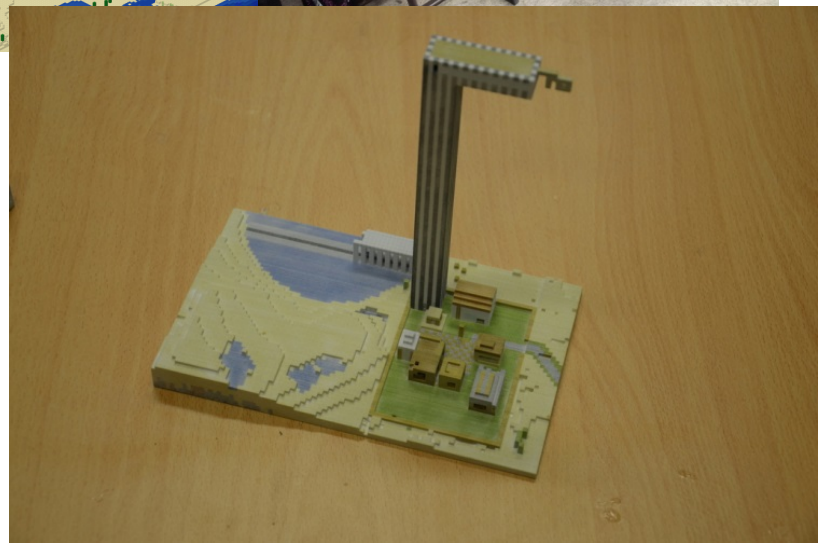
HCI Lab Siegen

- Small lab for rapid prototyping (mainly for research and student projects)
- Idea to start an “Open Lab”
- Two 3D Printers (apart of some other tools)
  - ZPrinter 650
  - MakerBot Replicator

Some projects...







Motivation (practical)

- Small community of 3D printer users in Siegen
- Learning to operate the machines is hard
- Wondering how to support new users

Motivation (theoretical)

- Research on appropriation support in Siegen
  - Volkmar Pipek: Appropriation infrastructures
  - Sebastian Draxler/Gunnar Stevens: Appropriation in software ecosystems (Eclipse study)
- 3D printers as interesting field for appropriation studies

The Concept of "Appropriation"

- Appropriation is the process of discovering and interpreting an artifact while using it
- Stresses options of the later user to go beyond the previously specified rules and ideas of the designed artifact

Pipek, V. From tailoring to appropriation support: Negotiating groupware usage. *Processing*, 2005, 103. http://herkules.oulu.fi/isbn9514276302/isbn9514276302.pdf.

Appropriation Infrastructures

- Technical implementation of appropriation support
- Provide communication and collaboration support to stimulate knowledge sharing
- IT-enhanced artifacts as sociable technologies: towards and Internet of *things-we-use*

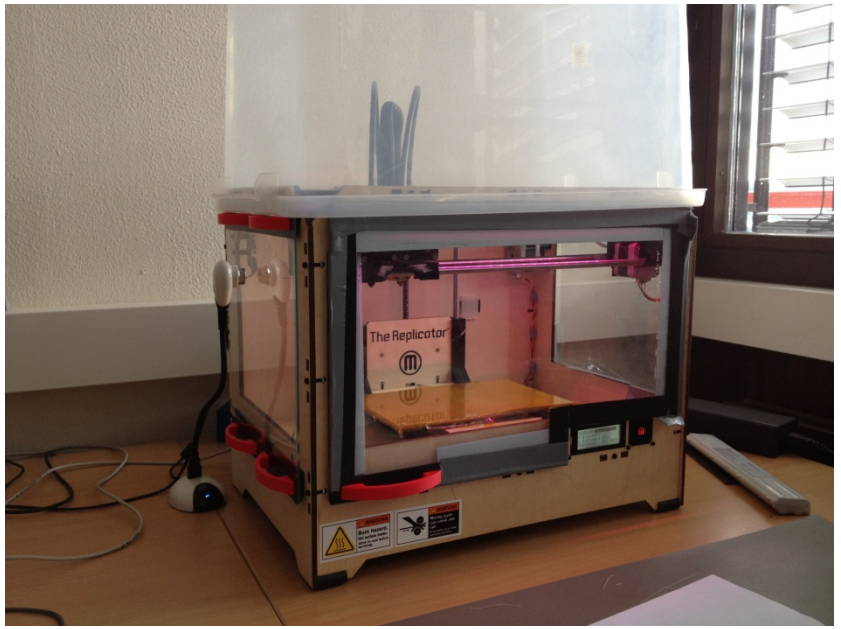
Stevens, G., Pipek, V., and Wulf, V. Appropriation Infrastructure: Supporting the Design of Usages. *EndUser Development*, Springer (2009), 50–69.

Case Study

- Aim: Support new ways of (collaborative) appropriation work of hardware-related practices in the context of 3d printers
- Empiric studies in different communities of 3D printer users
  - Siegen HCI Lab
  - Cologne School of Arts
  - Siegen Hackerspace (planned)

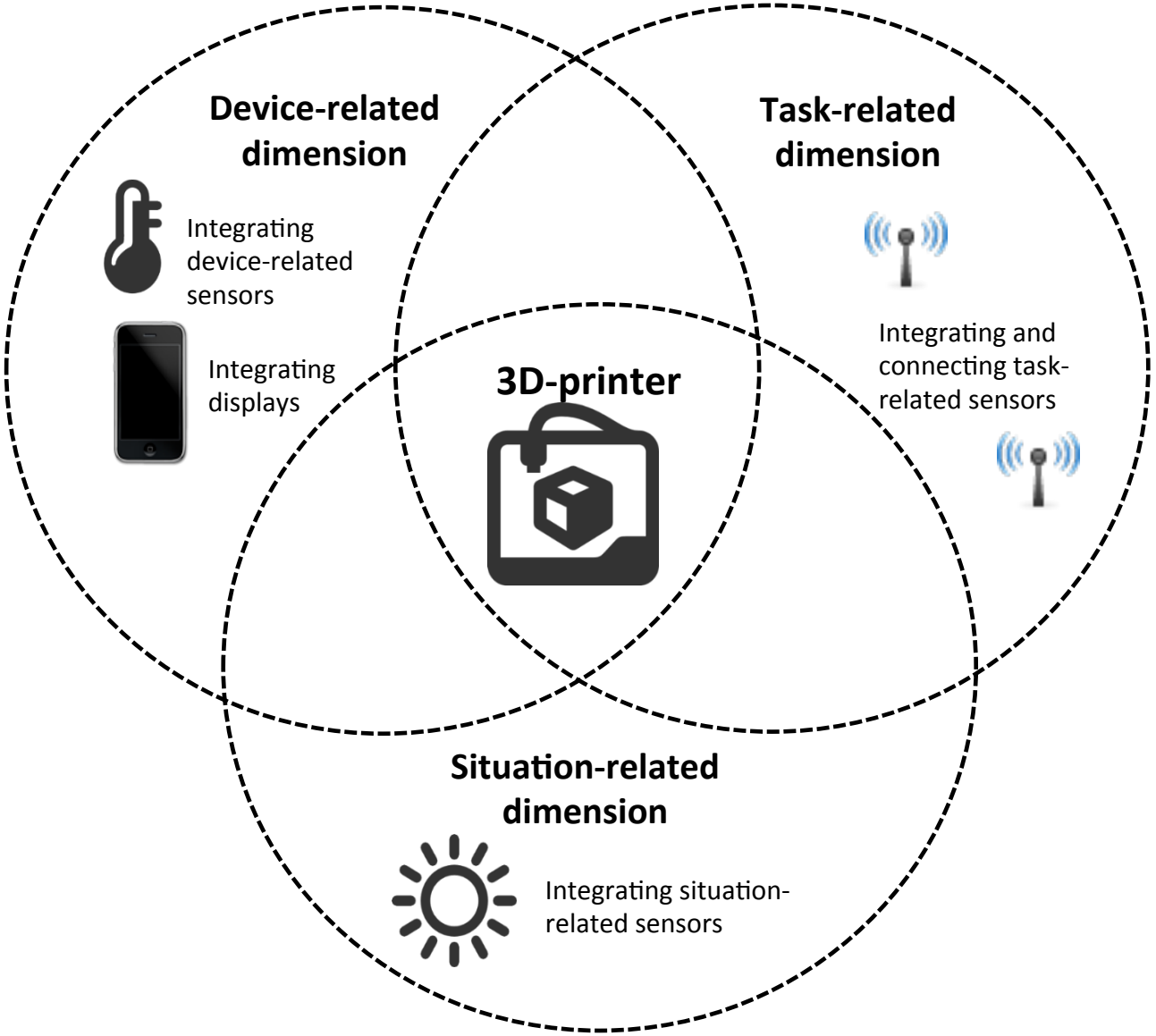
Appropriation of 3D printers

- Users make modifications to software
  - Setting up platforms for sharing models, tools, tutorials, …
- … and hardware
  - Adding covers, webcams, customized parts (plungers, spool holders, etc.



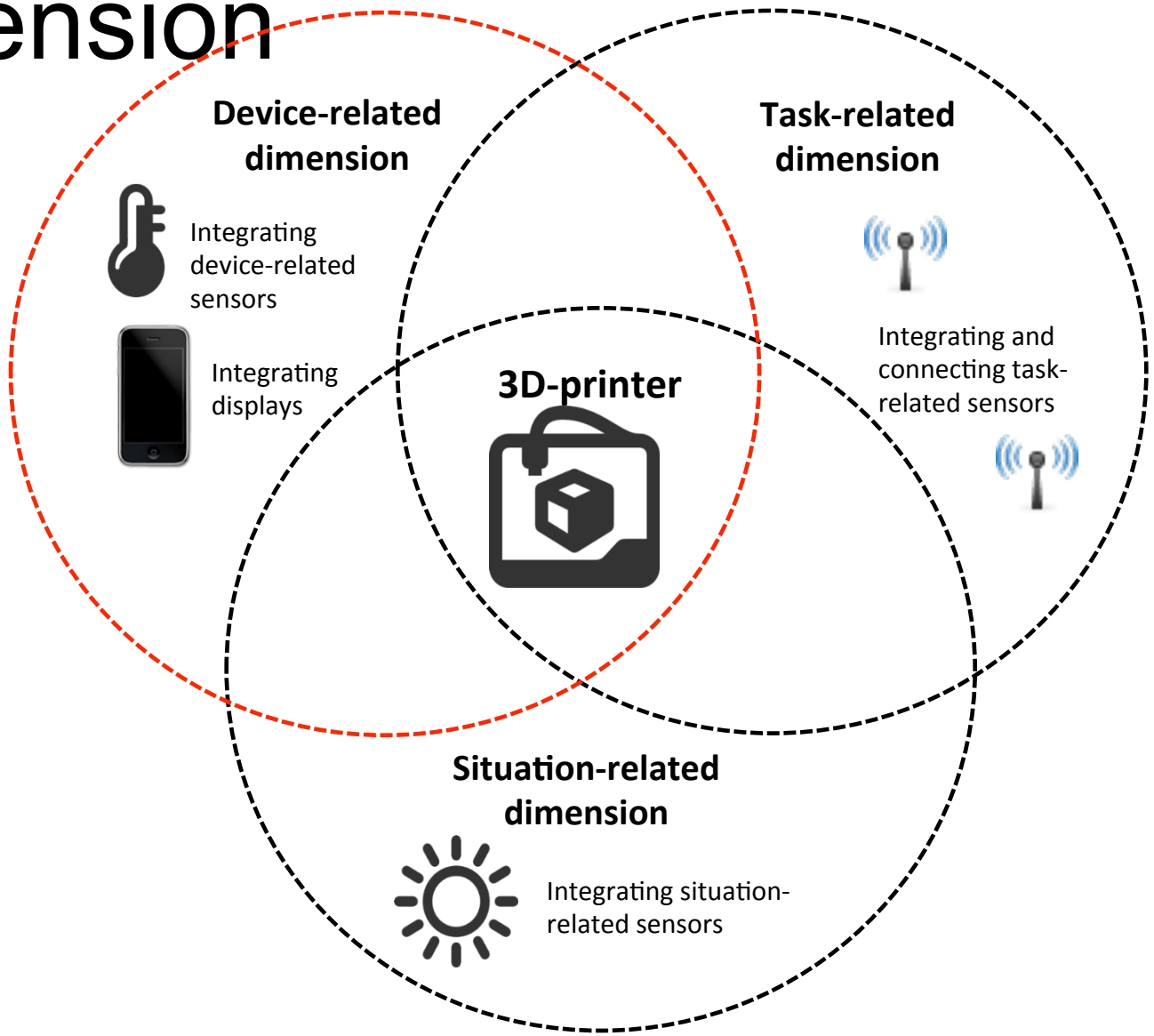
Preliminary results

- Three dimenstions of support:
  - Device related
  - Situation related
  - Task related

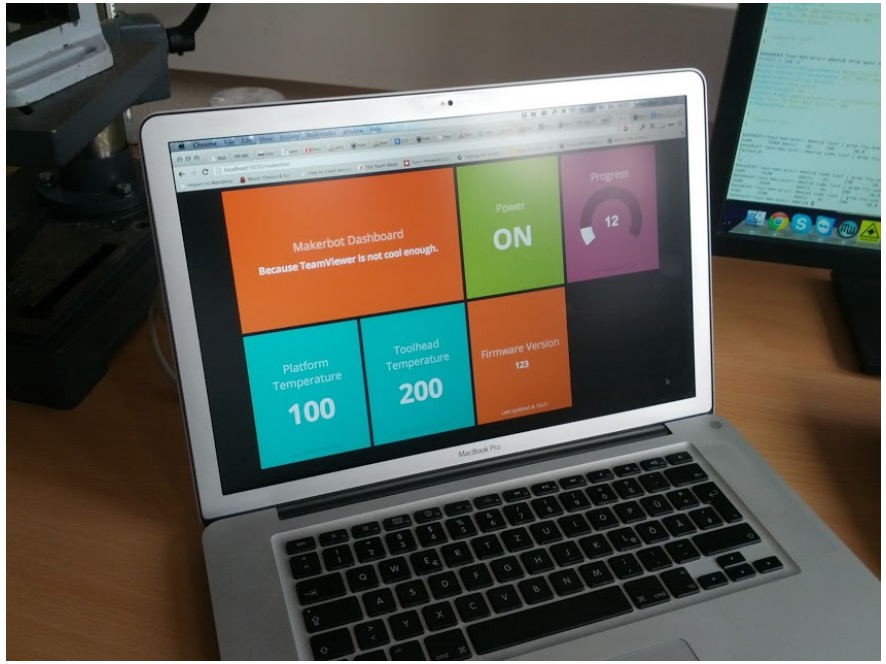


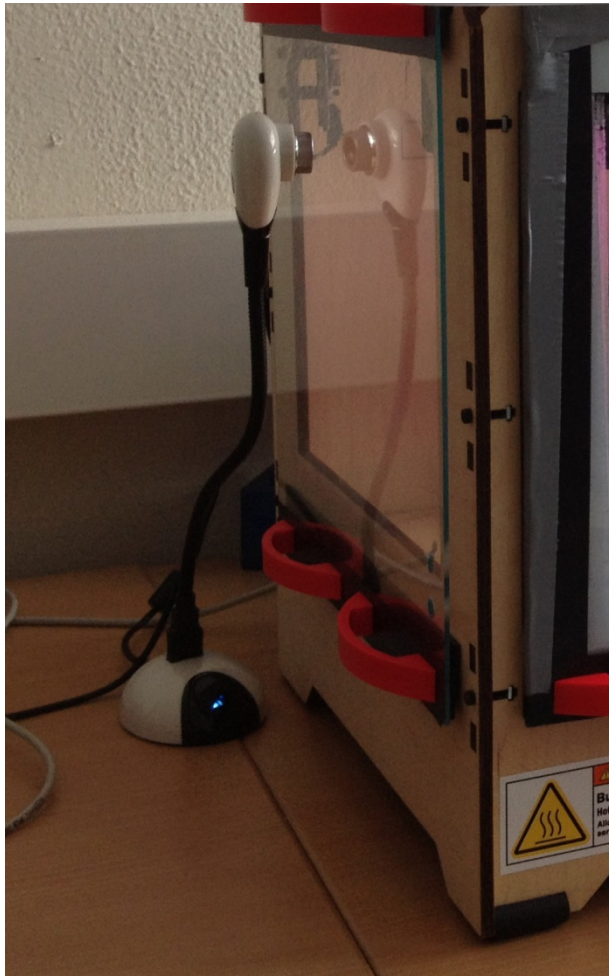
Device-related dimension

- How can appropriation work be supported by extending the internal hardware capabilities of the 3D printers?
- Aim: New ways of capturing and monitoring current printing details and status



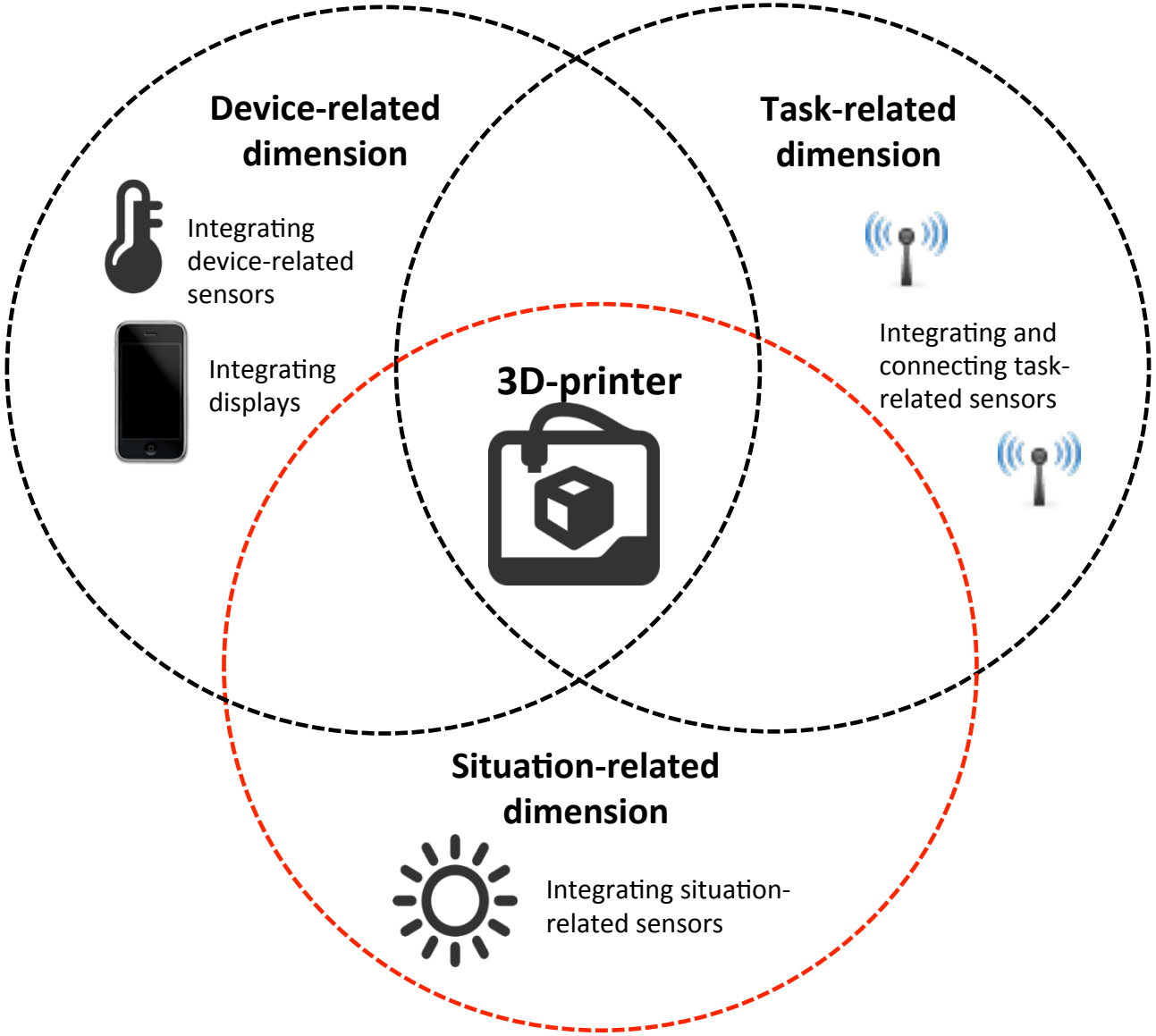
Example: Dashboard & Webcam



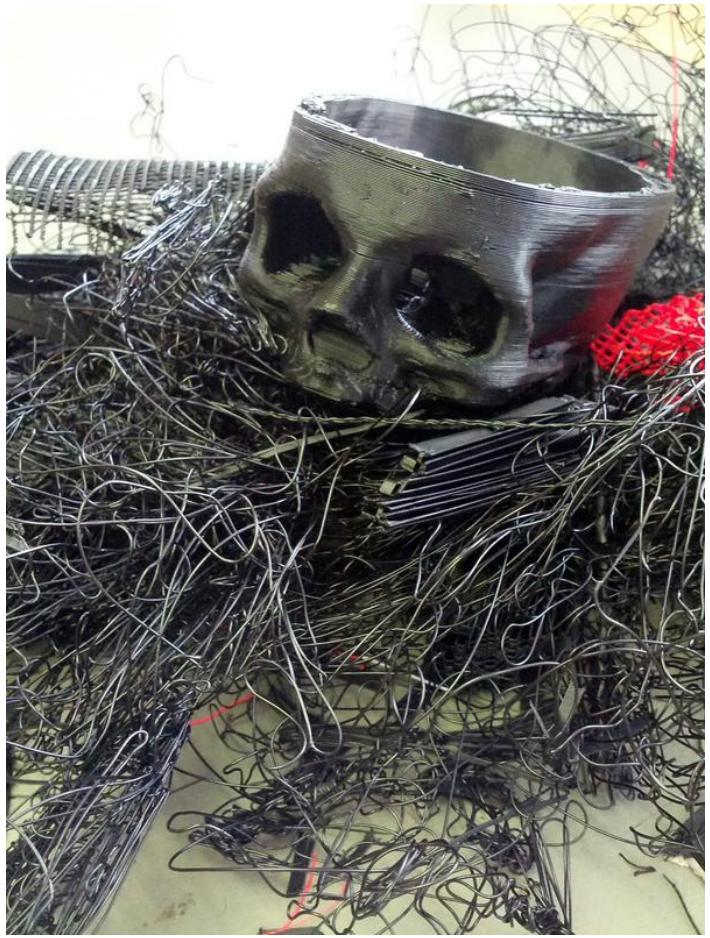


Situation-related dimension

- How can appropriation work be supported by monitoring the devices' environmental context?
- Aim: New ways of capturing and monitoring current printing situations

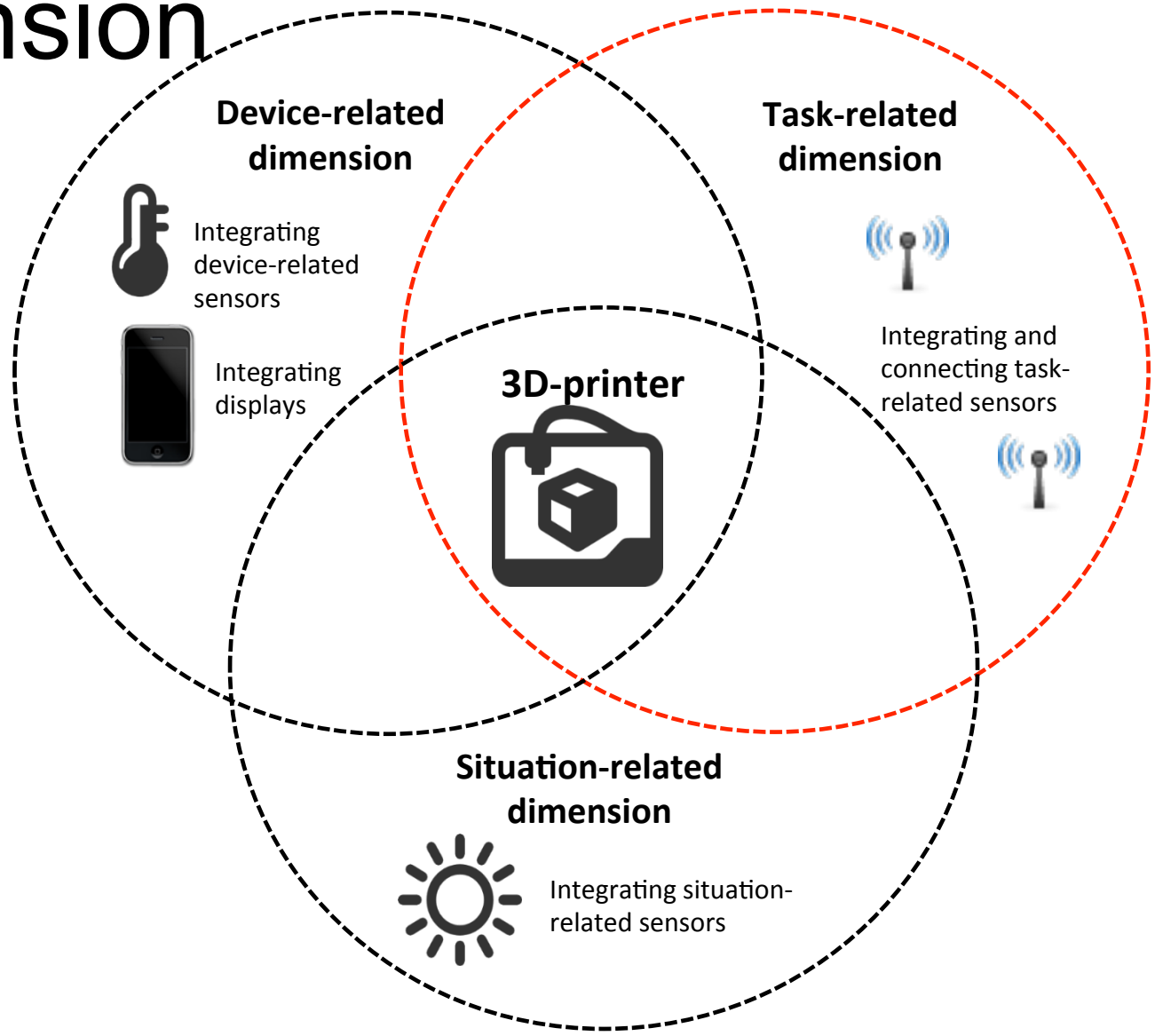


Example: Mishappen prints due to ventilation

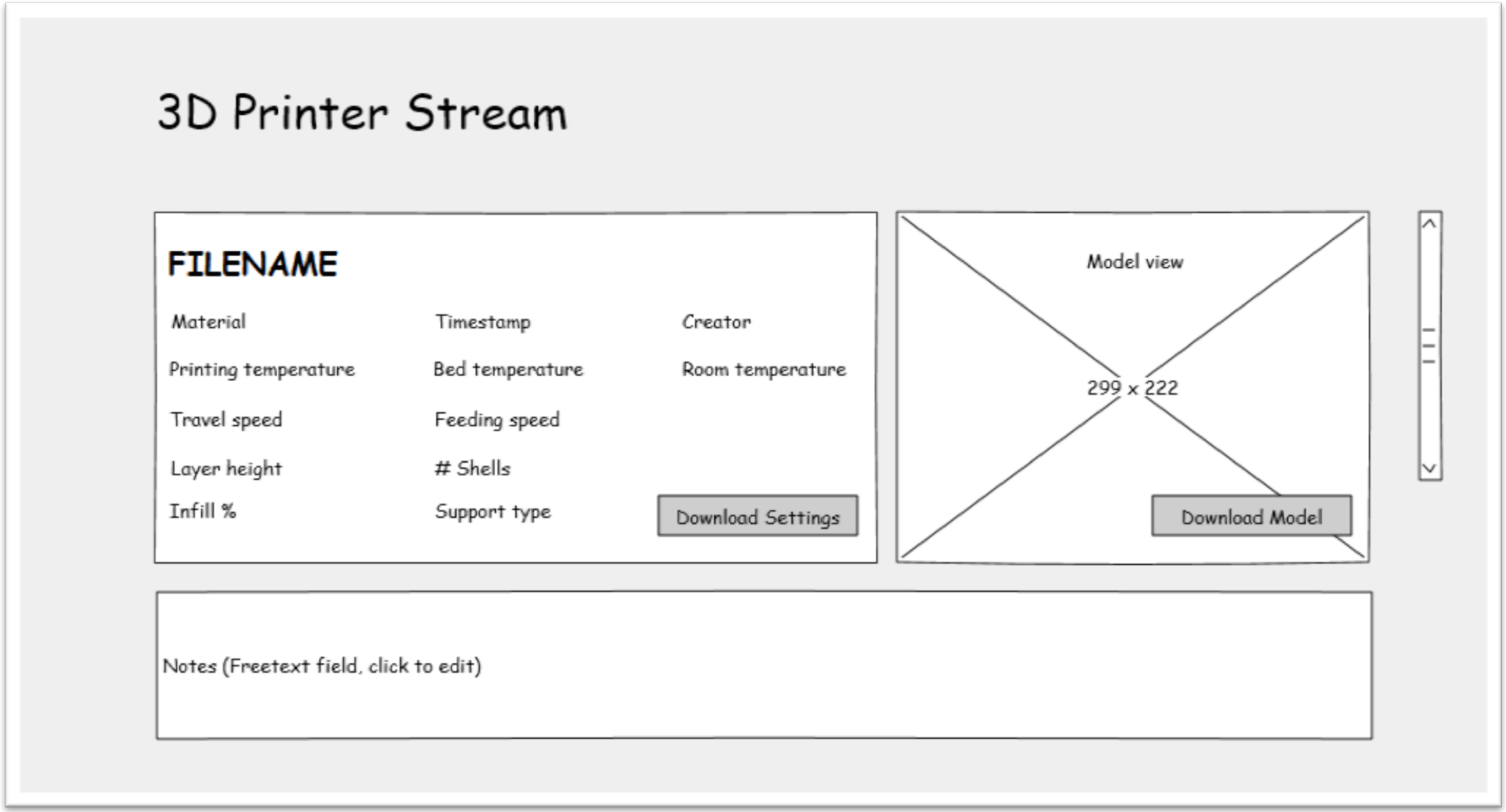


Task-related dimension

- How can appropriation work be supported by extending and connecting the 3D-printers with web-based services
- Aim: New ways of hardware-based collaborative appropriation work of 3D-printing practices



Example: Print History



Summary

- Dimensions as first ideas for designing appropriation infrastructures
- But: practices are different, better understanding needed
- Hence: further users studies needed, experimenting with supportive technologies and tools

Thank you!

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