
Advanced Prototyping with Fritzing

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Abstract

This studio will give participants a hands-on introduction to Fritzing, a free software tool for advancing electronic prototyping for researchers and practitioners of tangible, interactive electronics. Participants will bring one of their hand-wired prototypes (or a concrete concept) and in several steps learn to document it properly, share it with the community, and turn it into a professional printed circuit board.

Keywords

interactive electronics, physical computing, prototyping, tangible user interfaces, toolkit, workshop

ACM Classification Keywords

H5.2. User Interfaces, Subject: Prototyping.

General Terms

Design, Documentation, Experimentation

Introduction

The TEI community consists of researchers and practitioners who are building functional physical prototypes to explore and test their concepts. This often requires a wide variety of skills, especially in programming and electrical engineering. Due to the history of HCI as a heavily software-oriented discipline, most community members have a background in

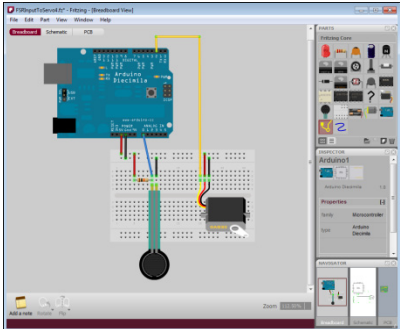


Fig. 1 Prototype documented in Fritzing (Breadboard view)

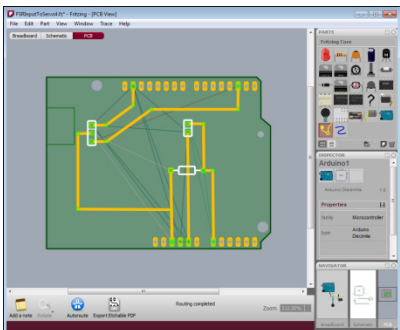


Fig. 2 Prototype turned into a PCB layout with Fritzing

programming, but knowledge about electrical circuitry is sparse. But prototyping with electronic circuits is now becoming easier, because hardware toolkits like the Arduino turn the hardware problem into mostly a software problem, and because vendors like Sparkfun supply ready-to-use hardware modules for more complex circuits.

Fritzing is essentially an Electronic Design Automation tool for people who are not practicing electrical engineers. It is a free and open-source software toolkit that can be used at several points in prototyping. It allows its users to document their prototypes, share their knowledge with others, and produce professional printed circuit boards (PCBs)

Studio Proposal

In this hands-on studio, participants will learn how to use Fritzing to improve their prototyping skills in various ways (see "Learning Goals"). The workshop is framed around the task of turning a pre-existing prototype (or at least a concrete concept) into a printed circuit board. This challenge will guide them through the different use cases of Fritzing.

Requirements

Even though no specific knowledge about Arduino is required, the workshop is most rewarding to those who:

- have experimented a bit with Arduino or a similar microcontroller,
- are principally aware of the concepts of hardware prototyping,

- are bringing an existing, self-built prototype (ideally breadboarded).

Otherwise, participants can follow the workshop by using one of the prototypes prepared by the studio team. The technical level is entry to intermediate.

Phase 1: Introduction to Fritzing and the Context

A quick introduction of the context is given: what Fritzing is, how it integrates into the ecosystem of tools, and how it is useful to the participants in their daily work as researchers, teachers, and practitioners. An outline of the day is given.

Phase 2: Digitizing a Prototype

Participants will briefly present their prototypes. They will be shown how to transfer these into the Fritzing software (Fig. 1). Several related issues will be explained, for example: creating custom parts; using the schematic view for checking circuit errors; and collaborating with others.

Phase 3: Designing a PCB layout

A quick explanation of PCBs, their design process and various manufacturing options is given. Participants will use Fritzing's PCB view to turn their digitized sketch into a proper PCB layout (Fig. 2).

Phase 4: Sharing with the community

The Fritzing website allows people to share their prototypes. (Fig. 3, <http://fritzing.org/projects>) The participant's finalized documents will be uploaded and enriched with explanatory text and images.

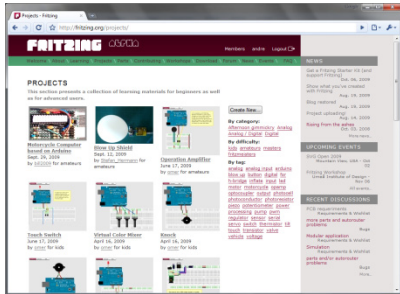


Fig. 3 Open project sharing on the Fritzing website

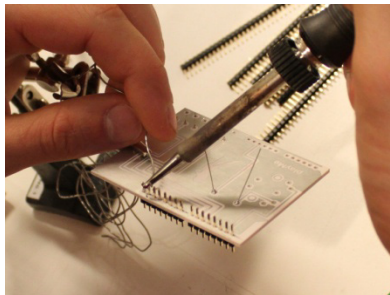


Fig. 4 Soldering the self-produced PCB, to be used as an Arduino Shield

Phase 5: Producing the PCB

Participants will be instructed in various manufacturing techniques. Due to temporal and logistical constraints it will not be possible to produce the final PCBs on site. We will therefore have the boards made and sent to the participants after the conference. (Fig. 4)

Studio Topics to be covered

As cross-domain tools are becoming more and more important enablers for innovation, participants of this studio will experience how a dedicated tool chain (Arduino and Fritzing) empowers them to rapidly turn an idea into a robust, functioning electronic prototype – even with few domain-specific skills. They will discuss how this ability depends on the lively exchange of experiences and sharing of example projects in a community. On a more technical level, the rapid design and manufacturing of PCBs as well as its advantages and disadvantages will be debated. Finally, the story and design of Fritzing itself as a successful tool resulting from a research project is a topic that will be helpful to other researchers.

Studio Learning Goals

Participants of this studio will learn how a tool like Fritzing can empower and bring their prototyping skills to a more advanced level. Consequently, they will become freer to imagine and realize complex ideas.

Documenting and Sharing

Participants will learn how to properly document their prototypes, for archiving and future reference, for collaborating with experts, and for exchanging knowledge with their peers.

Learning and Teaching

Fritzing helps participants to learn and extend their knowledge through example circuits, and using built-in features like the schematic view. Additionally, they will learn how to use Fritzing as a tool to enhance teaching practical electronics in the classroom, employing it for presentations in lectures, homework assignments and project troubleshooting.

Producing and Manufacturing

Participants will learn hands-on how to design a robust printed circuit board from their prototypes and how to prepare it for one-off or mass manufacturing. They will be directed to resources on how to produce them in their own lab.

Studio Supporting Web Documents

The Fritzing website contains an extensive learning section (<http://fritzing.org/learning>) that will also assist this workshop. It offers tutorials on how to document a prototype, how to create custom parts for use in Fritzing, how to design a PCB, and how to produce a PCB by oneself.

References

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