Screen Printing with Sound: Exploring Open Design through DIY Fabrication of Digital Musical Instruments

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Abstract

Within the context of the revolutionizing relationship between mass production and personal fabrication, this project explores how technology (e.g. sensors, music processing software, digital and networked tools) and hand-making process (e.g. screen printing) can help practitioners create personalized wearable musical instruments, with dynamic interactions between audio, visual, touch and movement. We aim to further our understanding of motivations, practices, methods, and communities around DIY musical instruments and how open design can help design better musical instruments. We also seek to find how to combine the physical and digital elements of our musical instruments to create tangible, embodied and embedded interactions.

Author Keywords

Open design; DIY musical instruments; screen-printed circuit; tangible interaction.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; See http://acm.org/about/class/1998 for the full list of ACM classifiers. This section is required.

Introduction

The use of musical instruments has a history dating back thousands of years. With the development of new technology, how people make, perform, and appreciate music has continued to evolve. Throughout the history of musical instruments, one central question has been how context pushes music innovation.

Traditional musical instruments are usually hard and heavy, expensive, and require users to invest a lot of time in learning to play them. While many people enjoy the convenience music making software can bring, most still prefer the physical " touch and vibration" feedback from traditional musical instruments. While they are playing traditional musical instruments, musicians can see a conversation and connection going on. This interaction is missing in music making software. Thus, we want to explore and solve how to make a musical instrument with both physical materiality and digital, moveable convenience.

Background

Within the domain of DIY making, recent HCI community has seen an evolution of printing mechanisms beyond producing static visual components to create interactive artifacts such as paper circuits, printable touch sensors, and printed thin-film displays. In our project, we focus on screen printing as a DIY fabrication process that uniquely complements existing processes for creating low-cost and easily replicable interactive systems. We use screen printing because it is extremely versatile and can be applied to a variety of substrate materials, ranging from paper and vinyl, to wood, plastic, or metal. Screen printing also supports different stencil design methods: the images to be printed can be created by vinyl cutting, hand-drawn with screen filler and drawing fluid, or developed with photo-emulsion, to name a few. Because of its versatility, screen printing also has a very low barrier to entry. DIY-level screen printing set-ups are accessible to amateurs and screen

print designs can be easily replicated and altered (see Figure 1). When coupled with interactive or conductive inks, screen printing presents a range of new opportunities for producing interactive tangible artifacts (see Figure1 and Figure 2) [1]
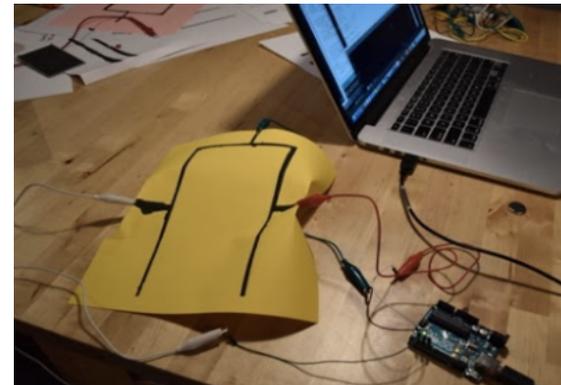
Figure1: Measuring resistance of screen printed circuits
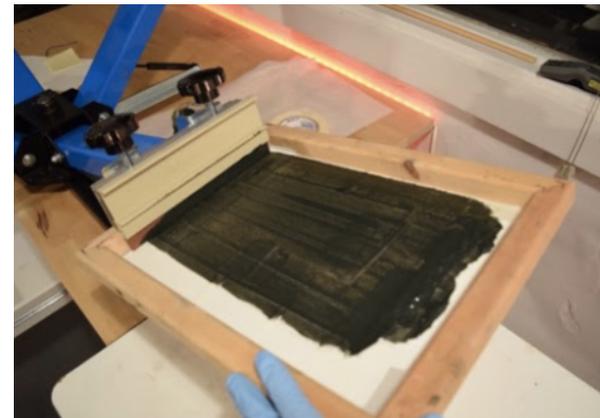
Figure2: Screen Printing with DIY conductive ink

What is more, recent HCI research regarding personal making goes beyond an engagement of diverse materials, but also explores it as a strategy for open design, sharing and community formation [2].

Thus, we want to explore how open design can help DIY fabrication of digital musical instruments in our survey and workshop-based studies.

User Study Design

First, we will conduct an online survey to collect preliminary data about motivations, practices, methods, and communities around DIY musical instruments. Then evaluate our methods and materials in a workshop-based study.

This workshop is situated at the intersection of various interdisciplinary research themes involving design, human-computer interaction, and tangible media. We hope to gather participants from a range of backgrounds, including digital musical instrument design, music composition, visual design, and interaction design. Together, our participants will draw upon their collective expertise to explore the various interaction modalities screen-printed instruments have to offer.

The workshops will include a basic introduction and overview of our printmaking methods as well as methodologies of making Digital Musical Instruments (DMI), and have an open-ended work session where participants design and create their own printed musical instrument. Some of the workshops may also include discussions and exercises in which participants speculate on potential future applications for our tools [1,3].

In the workshop, we will provide users with soft, low-cost, portable, and personalized musical instrument prototypes. In addition, with our method users can explore and define how they play music rather than learning from others. When users create a screen-printing design using our method, they have complete freedom over what image or design they create, allowing for greater self-expression. Because of this, the screen-printed image is not only a musical instrument, but may also act as an identity or special memory capable of generating dynamic sounds for the users. This potential for unique expression in design creates a sharp contrast between our screen-printed instruments and manufactured mass-produced musical instruments.

Here is the link for our prototype demo: https://www.youtube.com/watch?v=R1tpGsGx9R8 And we are continuing to work on making it more portable and sensitive to different materials.

Future Work

Since this project is still ongoing, we have not yet arrived at any conclusions. By conducting surveys and workshops in the future, we are interested in answering many questions such as: What are the opportunities and challenges for applying screen printing to the design of digital musical instruments? What new visual and physical manifestations of musical instruments will arise when practitioners design their own layout and replicate it across a range of substrate materials? Participants will be encouraged to experiment playfully with the materials involved. What implications does a playful, collaborative design process have for collective and distributed creativity? How can digital and networked technologies help the collaborative design process?

Author Biography

Yue Liu is a PhD student in SANDS (Social and Digital System) lab at Arizona State University. She is interested in DIY making, interactive art and technology and how to use physical materials and digital technology to create playful interactions.

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