SMART MIDI CONTROLLER FOR NOVICE USERS
GROOVESHARK STS CASE ANALYSIS

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Engineering

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November 8, 2024

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Music is a core human experience that promotes well-being by facilitating connection, meaning, and the imagination of possibilities (Schulkin & Raglan, 2014). A significant advancement that has transformed music performance and production is the Musical Instrument Digital Interface (MIDI). This technology offers an easier and more cost-efficient approach to music production. To be more specific, it provides a standard for interfacing between musical instruments and computers (Romo, 2018). Among the various tools that leverage MIDI technology, MIDI controllers play a vital role in providing greater flexibility in music production. Consequently, developing MIDI technology that lowers the barriers for new learners is important for enhancing human creativity and expression through music.

In light of this, I propose a MIDI controller model to mitigate the learning curve of such technology and further enhance the user experience. As this project involves factors from technical, social, cultural, economic, and conceptual aspects, it is important to understand their interrelationships and interactions. To effectively accomplish this goal, I will draw on the science, technology, and society (STS) framework of actor-network theory (ANT) and evaluate Grooveshark, which was once a popular web-based music streaming service. Since Grooveshark was also in the music industry and faced challenges that involved various factors, Grooveshark's experience, particularly its failure, offers valuable insights that can inform my project and help avoid similar pitfalls. Specifically, I will identify all factors in Grooveshark's network and analyze how they acted together and led to its ultimate failure.

If we focus solely on the technical aspect without considering the broader social factors, our project risks ill-designed outcomes that could alienate certain social actors. This carelessness can lead to conflicts and threaten the stability of the technological project. If this were to occur,

our project would run the risk of resulting in negative user perceptions and potential failure like Grooveshark. Because the challenge of addressing the difficulties faced by new MIDI controller users is sociotechnical in nature, it requires attending to both its technical and social aspects to accomplish successfully. In what follows, I set out two related research proposals: a technical project proposal for developing an improved MIDI controller model with user-friendly designs and an STS project proposal for examining the customer and non-user perceptions in the Grooveshark case.

Technical Project Proposal

MIDI controllers, which resemble keyboards or drum pads, send MIDI data to digital audio workstation (DAW) software on a computer to generate audio (Audiomovers Team, 2023). Despite the variety of models available, they may not be very user-friendly, especially for novice users. For one, music production demands a foundational understanding of music theory; harmonious music requires specific notes arranged into appropriate chord progressions. As each key or pad on current models only corresponds to one note, it is necessary for music producers to memorize the corresponding notes of the chord. In addition, the relationship between notes and physical keys is often not intuitive. For MIDI controllers with a drum pad structure, users must familiarize themselves with the layout to learn the location of each note, which can steepen the learning curve for beginners. Admittedly, the keyboard structure models do not have this issue as the keys closely resemble those of a piano. However, these models typically provide a left-to-right layout with limited vertical options. Non-traditional keyboard designs, such as drum-pad controllers, allow for more keys within a compact area, which enhances portability without sacrificing user experience.

There are several MIDI controller models targeting these deficiencies on the market. Here, I will discuss two such systems. The Launchpad Pro [MK3] by Novation features the drum pad structure MIDI with an array of functionalities manipulated by its corresponding software (Novation, 2020). Users can switch to the chord mode via the software, which allows each pad to correspond to a chord instead of a note. This alleviates the need for memorizing the note-chord correspondence. However, the complexity of the software is more suitable for professional use and can pose a steep learning curve. Another downside is that users must manage both the MIDI controller software and the DAW, which can lead to overcrowded screens and constant switching. Furthermore, while the pads illuminate when pressed, identifying the corresponding notes or chords relies on the MIDI controller software. This design might be counterintuitive as users are likely to focus on the pad instead of the screen. Although several MIDI controller software such as Dexed feature a chord mode, compatibility issues with operating systems can limit usability (Rosar, 2024). Moreover, according to our survey among MIDI controller users, customers prefer the experience of physical pads or keys over virtual ones on the screen. In conclusion, none of the current models adequately addresses the challenges proposed above.

This technical project aims to avoid these design flaws by constructing a smart MIDI controller that enhances the user experience, particularly for novice MIDI controller learners. The interactive screen embedded into the MIDI controller allows users to select different modes including the original mode and the chord mode. With this feature, users do not need to manipulate additional software. Below the screen is the drum pad structure with 12 pads. Each pad will show its corresponding note or chord to facilitate faster familiarization for beginners.

We divide the project into three subsections to be developed concurrently, and will use a Gantt chart to ensure equitable labor division and monitor project progress. The first subsection

is the microcontroller programming. We will utilize the Raspberry Pi Pico to send MIDI data, communicate with the screen, and construct a user interface with Circuit Python programming. The second subproject involves printed circuit board (PCB) design. We will mount the microcontroller on the main PCB, and physically wire it to the sub-PCBs, which transmit the signal of the pad pressed. Lastly, we will utilize Computer-Aided Design software (CAD) to model the exterior case for 3D printing.

The initial design concepts relied highly on research and project data relevant to our design. As we transition into the implementation stage, we will need the documentation and tutorials relevant to Circuit Python and CAD design. Specifications of components and background knowledge obtained in previous electrical engineering courses will also support the circuit design for PCBs. In the final phase, we will integrate all subsystems and test the design as a whole to prove that it achieves the expected performance.

STS Project Proposal

Launched in 2007, Grooveshark was one of the pioneering music streaming platforms that helped spark the music streaming revolution. Grooveshark featured free music streaming with user-friendly design, which once attracted 35 million users (Greenberg & Tarantino, 2006). Yet, as it struggled with funding, competition, and copyright infringements, the business marked its closure in mid-2015 (Ingham, 2015).

From the financial aspect, Grooveshark failed to secure approval from labels and thus had difficulties in obtaining investments from venture capital. Despite having a large user base, the company still struggled to make payroll. Another major contributing factor to its decline was copyright violation. The company tried to sign a contract with EMI in 2009 to become legitimate, but it failed to implement the contract. A crackdown followed. The mobile market

place removed the application, which forced Grooveshark to move back to the desktop (Witt, 2015). During the course of the early 2010s, Spotify grew exponentially, which significantly reduced Grooveshark's users. In 2014, Grooveshark was sued and faced up to $736 million in statutory damages, which marked the final termination (Failory, 2023*)*.

While all the factors proposed were essential in Grooveshark's demise, I argue that they did not fully address the downfall. First, all stakeholders involved in the lifetime of a technology must be evaluated when examining the reason that it falls apart. Current approaches fail to account for consumers and non-users. They do not analyze from these two stakeholders' perspectives nor fully consider their impact. In addition, as relevant individual components react to the technology at the same time, they are interrelated and affected by each other. The blame for the failure should not solely lie in separate factors. The interaction between them was also a main culprit that is neglected by previous analysis.

Evaluating each and every component the technology interacts with offers a more accurate understanding of the environment that leads to the collapse of Grooveshark. For this case specifically, the consumer and non-user aspects should not be overlooked. Otherwise, with an incomplete view of the situation, a false analysis might be drawn accidentally. After constructing a thorough picture, each component should be analyzed, and most importantly, their interconnection must be evaluated to holistically comprehend the case. Hence, the interaction between funds deficiency, intense competition, copyright violation, and customer and non-user perspectives are critical in understanding the cause of failure. Particularly, I contend that the interaction escalated the downfall of Grooveshark. That is, each component further exacerbated another, which quickened the technology's demise.

To analyze the Grooveshark case, I will utilize the STS concept of ANT. STS scholars including Michel Callon, Bruno Latour, and John Law claimed that an engineering project can be viewed as a technology network, where heterogeneous human and non-human actors are recruited by a network builder to accomplish a certain goal. The interaction between individual actors is particularly important as this bond endues actors with power (Cressman, 2009). Additionally, I will draw on the translation concept proposed by Michel Callon. Translation is the process of creating connections and communications within a network. I will evaluate the Grooveshark network from the very beginning of its foundation to how it failed to interest and enroll certain actors, and ultimately the collapse of the network (Callon, 1984). I will use several pieces of evidence to support my argument. This includes user data graphics in case studies such as Mike Masnick's *Band Embraces Grooveshark and Catapults Its Career* (2013), along with customer reviews, end-user comments, and social platform discussions.

Conclusion

In summary, I propose a technical project of a smart MIDI controller model whose chord mode will effectively address the challenges of people who are new to MIDI controllers and lack music theory knowledge. The interactive screen will also display assistant text, which will further enhance the user experience. Meanwhile, the STS project will provide a more thorough view of Grooveshark's failure. More specifically, I will include the consumer and non-user aspects in the evaluation. This will provide a better understanding of how the interactions of social factors lead to Grooveshark's demise, and thus prevent the technical project from failing due to similar reasons. Utilizing the ANT framework underscores the importance of recognizing all individual actors and their interactions in building successful technology networks. Applying

these lessons to our technical project will facilitate smoother implementation and increase the likelihood of success.

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