

Gamelan Sampul: Laptop Sleeve Gamelan

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ABSTRACT

The Gamelan Sampul is a laptop sleeve with embedded circuitry that allows users to practice playing Javanese gamelan instruments without a full set of instruments. It is part of a larger project that aims to develop a set of portable and mobile tools for learning, recording and performing classical Javanese gamelan music.

The accessibility of a portable Javanese gamelan set introduces the musical genre to audiences who have never experienced this traditional music before, passing down long established customs to future generations. But it also raises the question of what is and what isn't appropriate to the musical tradition. The Gamelan Sampul attempts to introduce new technology to traditional folk music while staying sensitive to cultural needs.

Keywords

Physical computing, product design, traditional folk arts, gamelan

1. INTRODUCTION

The Gamelan Sampul was created in order to rehearse playing gamelan music without having to rely on access to a full set of instruments. It is both a laptop sleeve and a musical instrument that plays notes found in traditional Indonesian music.

Most gamelan instruments are made of metal and are difficult to carry. Because the classical repertoire of central Java has music composed for two different pentatonic scales, most orchestras also require two separate sets of instruments. Unlike Western music, there is no standard fixed tuning for either scale. Each instrument in an ensemble is tuned to each other to create a unique set. It makes it difficult for an orchestra to replace an instrument without commissioning an experienced gongsmith for one [3].

The Gamelan Sampul is made of fabric and conductive polyurethane foam, creating a lightweight practice instrument that conveniently goes wherever your laptop goes. It utilizes two open source tools: Arduino for its electronic components and Processing for its software. The accessibility of its source code and design allows for modifications based on a gamelan player's needs, including the ability to change tuning based on a specific gamelan's pitches. It also promotes its distribution to people who do not necessarily have access to a full gamelan set.

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2. BACKGROUND

A classical Javanese gamelan orchestra is comprised of several heavy metallophones, large tonal pots and big gongs. Musicians can specialize with specific instruments but often must rehearse on several different types in order to keep a cohesive understanding of the music. Other performers who accompany the gamelan players such as dancers, the *dhalang* (puppeteer) and singers must also have a thorough knowledge of gamelan in order to follow and give cues to the music [4].

Providing the public at large with a tool to practice gamelan at home is appealing, but certain interpretations of what is and what isn't culturally appropriate create barriers to the introduction of new technology to its rich history.

For instance, the art of gong-making in the island of Java has undergone a radical change due to the rising costs of and decreasing supply of quality materials, and shift of demand from locals to foreign musicians [2]. Creating an alternative to metal instruments must put into account that it may be perceived as disruptive and disrespectful to the art form.

Capable and experienced musicians are also at a decline. Anecdotaly, they are worried that electronic instruments with built-in midi loops of gamelan music may be utilized to replace them, despite their sonic differences. Western instruments such as drum sets, electric guitars and electronic keyboards have also encroached upon the territory of gamelan performances, in order to entice please younger Indonesians who tend to prefer rock and roll.

3. DESIGN

3.1 Choices

Researching electronic alternatives to metal gamelan instruments provide a wealth of well made and groundbreaking orchestras such as the Gamelan Elekrika and the Gamelatron. Due to the interests of the gamelan community, however, several design choices were made in the creation of the Gamelan Sampul that are radically different than preceding new interfaces for gamelan playing.



Figure 1. Gamelan Sampul Prototype 1

3.2 Materials

Unlike other gamelan sets, the Gamelan Sampul is made largely of soft materials (see Figure 1). The underlying

structure of the sleeve is made of two large pieces of conductive foam with 13.5" x 9.5" dimensions in order to accommodate the size of a 13" laptop. The foam was sourced from leftover packaging, as the material is often used to prevent damage during the shipment of electronics. The foam provides an average resistance of 100 kilohms at its 1/8th inch resting depth, but becomes more conductive as it is pressed down.

The two large pieces of foam are attached to electrical ground, creating ground planes that further prevent electronic interference. This material is also cut into ten circles with diameters of 2" each, providing the user with a touch interface.

Cotton fabric adorned with a traditional Central Javanese batik patterns wrap around the sleeve, helping it maintain its shape and also further providing an aesthetic that references the traditional craft of Indonesia.

Two wooden dowels wrapped with conductive thread (resistance of about 14 Ohms per foot) are provided, in reference the mallets that are utilized in traditional gamelan performance. But the Gamelan Sampul utilizes capacitive sensing to trigger sound, allowing users to bypass the mallets and use their hands to play music.

3.3 Circuitry

Wrap-up wire runs from the circular touch pads to an Arduino board, sandwiched between the ground planes and the cotton fabric. Great care was made so the wires did not cross each other to prevent interference.

The Arduino utilizes the capacitiveSensor library [1] in order to sense electrical capacitance to send to the laptop. One of the digital pins of the Arduino acts as a send pin. Ten other pins act as a receive pin, with a 10 megohm resistor placed between them and the send pin. There is a 220 pF capacitor from the receive pin to ground to provide stability.

3.4 Software

The Arduino sends the sensed capacitance figures via serial. The choice of using serial communication rather than MIDI was partly due to discrimination against MIDI devices in the Javanese gamelan community. But with some alteration, the Gamelan Sampul is able to communicate with MIDI or OSC.

3.5 Presentation

Along with the choices made in construction of the Gamelan Sampul, great care was taken in presenting it as purely a practice device and not one utilized in performances. This emphasis has helped relax the gamelan community from its worries that Javanese gamelan playing is being stifled by disregarding old traditions and the introduction of new technology (see Section 2).

4. FUTURE DEVELOPMENTS

The Gamelan Sampul was first presented during for the NYU ITP thesis week, then subsequently at the NYU ITP 2012

Spring Show. It has since been shown at other venues including at the Sony Wonder Technology Lab.

At each exhibition, the Gamelan Sampul has shown mass appeal to a younger crowd, specifically toddlers and elementary school-aged children. This pleasant discovery has given new purpose for the Gamelan Sampul as an informational device that introduces non-Western music to children who haven't heard it before.

The construction of the sleeve and circuitry is also under development. Tools such as computerized embroidery can replace the wrap-up wire with conductive thread traces, making it more lightweight and strengthening its fabric structure. Because the foam's resistance changes depending on pressure, it can also be used to measure velocity information and better influence the instrument's attack time and attack levels.

The most critical feedback has been on the default way the Gamelan Sampul communicates is via serial. As noted (see section 3.5) this was a conscious decision, but it can be altered to communicate with MIDI or OSC.

User testing has also revealed that gamelan players want to utilize the Gamelan Sampul to play music with each other over a network, bridging geographic distances with the aid of technology. This key component needs to be further explored.

5. CONCLUSION

The Gamelan Sampul is part of a larger project that seeks to explore new ways of learning, recording and performing classical Javanese gamelan music. As a prototype, it performed well as a practice instrument, providing users with a portable alternative to rehearse with at home. It had the unexpected effect of educating younger generations with the concept of non-Western tuning systems. With refinement, it can help spread the knowledge of gamelan while maintaining respect to its traditions and keeping the art form alive.

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