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BUDMERGO: MUSIC VIBRATION CONDUCTING DEVICE FOR THE HEARING IMPAIRED

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Abstract: This article examines performing arts technology in the form of a musical vibration delivery device called Budmergo for deaf people. This activity optimizes the work of the Budmergo tool as an expression tool in the context of intermedia performance art activities. As a result, it hopes to involve deaf people in art performances according to their characteristics and realize a creative space for art that favors their unique abilities and needs. This activity is based on the mindset that each individual can absorb and internalize the phenomena around them through different means and media while also expressing them independently in art. The general objective of this activity is to conduct an art technology study of the Budmergo tool to (1) find knowledge, methods, and art media that can optimize the art activities of deaf people, (2) evaluate the technology of the Budmergo tool (3) socio-psychologically be able to raise the dignity of deaf people, considering that the participatory art creation model is full of human values with participant involvement, and (4) get recommendations for the development of unique art performance technology for deaf people.

Keywords: technology studies, budmergo, deaf, performing arts

1. INTRODUCTION

The creation of this tool was motivated by an anxiety about the lives and art practices of deaf children. Including the art learning process intended for deaf students. Performing arts activities for the Deaf still have several problems that need to be solved. Performing arts activities have indeed been carried out for a long time by people with disabilities, including the Deaf.

In schools for people with disabilities, performing arts activities such as singing, dancing, music, pantomime and drama, have been widely developed. Some of these performing arts branches have even been contested in a formal competition at the national level called the National Student Art Competition Festival (FLS2N) organized by the Ministry of Education, Culture, Research and Technology, specifically for people with disabilities. References to the development of performing arts branches such as dance competitions for school children with the Deaf, so far still use the reference of the form of dance art that generally applies to normal people without physical barriers, namely the form of regional creation dance by using music as one of the references for dance movements that are difficult for the Deaf to do. In the technical instructions, the assessment also still uses aesthetic benchmarks applied to dance art forms in general. One of them is the

precision or suitability of movement with the rhythm of music. This fact has been observed by researchers from 2006 to 2020, there has been no change in the form and assessment techniques for various dance competitions for the Deaf. Since 2020, FLS2N dance art has been abolished because there are many reviews about the problems of form and reference developed.

Learning to dance using music for normal people is common. However, learning dance with music for children with the Deaf is a complicated matter. Dance learning at SLB has a fairly high level of difficulty when compared to dance learning in ordinary schools (Agustin, 2022). This is due to students' lack of hearing ability. So far, the experience of Deaf people in performing arts events contains robotic nature (Rian Nanda, 2023). They only carry out 1) orders or instructions, 2) demonstrations based on duplication, and 3) the enjoyment of a performing art is more about placing them (people with the Deaf) as objects to be watched and fostering a sense of empathy for the audience. The aesthetic rights of a performance art presentation become one-sided that cannot be enjoyed by the perpetrators (people with the Deaf). In this context, performing arts are not a space for freedom and independence of expression, and provide an aesthetic experience that is in accordance with the characteristics and abilities of deaf people (Manggala, 2014).

2. METHOD

This research focuses on examining Budmer Golbrator technology as a finding of a musical vibration transmitter that helps form a model of collaborative, performative and intermedia art creation through the exploration of gestures, responses to music, literature, and visual production activities as well as artistic expression of the blind and deaf from the discovery of a device that converts sound vibrations into waves and physical vibrations called Budmer Golbrator which was discovered last year. This research is an opportunity to evaluate the results of technological findings, knowledge discoveries, art methods and art presentation methods that are able to bridge the artistic interaction of people with hearing disabilities.

Initial research conducted previously (in 2014) showed that by maximizing visual media, body cues and vibrational stimuli, deaf people were able to work together creatively to participate in music learning (Manggala, 2014). In addition, other research shows that deaf people are able to form a partnership with professional artists to create new dance creations (Wardany & Widyastutieningrum, 2023); (Kuncoro, 2016). These findings make it clear that hearing impairment is not an obstacle to expressing personal artistic value into performative and intermediate artworks.

To support the process of exchange as well as strengthening knowledge from various parties involved, the entire research process will be carried out collaboratively, which this time also involves blind people. Research activities that previously investigated the possibility of musical and dance activities with deaf people, will be explored again to become a forum for experimental encounters between people with different disabilities (between blind and deaf) as well as

become a common thread of the purpose of this research, which intends to create: 1. Performative artwork (Supriyanto, 2018). 2. Intermedia artwork (Satriana Didiek Isnanta et al., 2020). 3. Model of creating artwork with deaf people (Syofia & Suharti, 2017). 4. Inclusive arts ecosystem.

The basis of this research is to place artwork as a medium of freedom for the expression of its creator, namely individuals who have a distinctive and personal way of understanding and have the ability to internalize a certain phenomenon, without being limited by the shortcomings of their biological body. This research is a qualitative model with field research, which is certainly participatory, with the focus of activities on efforts to evaluate the findings and discovery of knowledge about technology and its application methods in the performing arts of people with hearing disabilities (Kuncoro, 2016). Research is a vehicle to realize a series of mutual understanding cooperation between the two parties—the research team with people with hearing impairments—in order to seek an understanding of knowledge on each other's weaknesses and strengths, strengthen each other's potential, and then find problem solving in the case of art creation (Kemmis & Mc.Taggert, 1988). Indicators of the success of the research with this participatory art creation model include (1) the discovery of knowledge, methods, and art media that are able to optimize the art activities of the deaf and blind (HB et al., 2020), (2) technological evaluation of the Budmer Golbrator tool, (3) socio-psychologically able to raise the dignity and dignity of participants, in this case the deaf and blind, considering that the participatory art creation model is loaded with human values with the involvement of participants (Laksono, 2018), and (4) get recommendations on measures to develop special performing arts technology for people with the Deaf (Sinaga & -, 2020).

3. RESULTS AND DISCUSSION

3.1 Description of Budmergo Tools

The device, named Budmer Golbrator, is a device that converts sound waves into *micro dynamo* vibrations that can be felt by the skin and body. Through this tool, music and sounds can not only be heard by the ears, but also the sensation of the waves can be felt through vibrations that can be felt by the skin and body. This tool began to be created in 2021 which is specifically intended for the deaf. As a tool to respond to sounds/sounds/music that are diverted from sound sensations to perceived sounds. Through vibration signals, people who are deaf can express the reception of musical signals into expressive activities such as sketching brushes to paint abstracts or gestures to dance.

The sound capture input is processed in the *integrated circuit* (IC) and other components into electrical signals that are in accordance with the capacity of the motor (micro dynamo). Micro dynamo works to adjust the received electrical input and produce an output in the form of vibration waves that are able to replace sound sensations into vibrational sensations that can be felt by deaf people through their sense of touch or skin. Here is a picture of the circuit of the Budmer Golbrator tool.

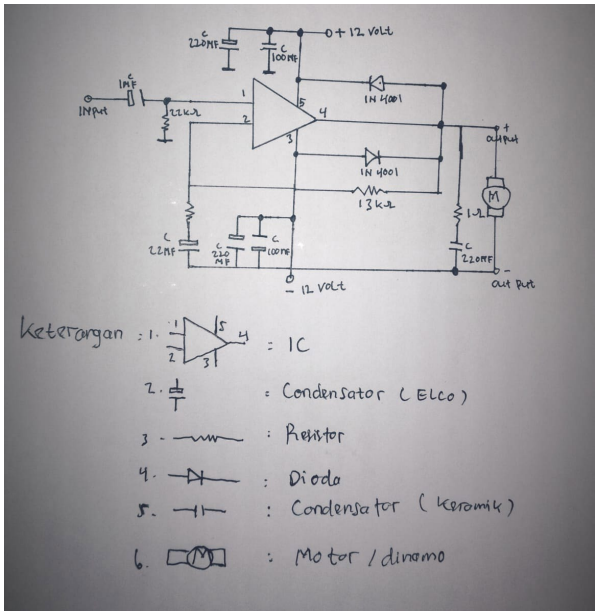

Figure 1. Golbrator Budmer Electronic Circuit Design.

A type of IC that is able to convert audio input into an electrical signal that corresponds to the character of the received audio signal level. If the audio received in the character is a large sound level, it will produce an electrical signal output with a large level character as well. On the other hand, if what is received is a low-level audio character, then the electrical signal produced is also weak. In addition to being able to distinguish between strong and weak input signals, the IC is also able to adjust the length and short character of the received audio signal.

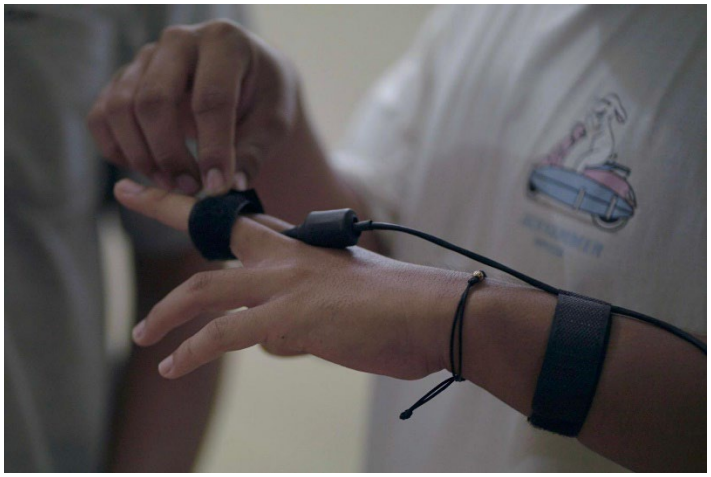

Figure 2. A Budmer Golbrator that is being installed on the hand of a Deaf person.

Figure 3. Budmer Golbrator devices that have been manufactured

The tool, named Budmer Golbrator (Budmergo), is a tool found as a result of the design of Jonet Sri Kuncoro and Bondan Aji Manggala with the team in 2021. The Budmer Golbrator (Budmergo) is a device that converts sound waves into micro dynamo vibrations that can be felt by the skin and body. Through this tool, music and sounds can not only be heard by the ears, but also the sensation of the waves can be felt through vibrations that can be felt by the skin and body. Through vibration signals, the problems of the deaf and blind in terms of performance communication using music can be reduced. The reception of musical vibration signals produced by Budmer Golbrator (Budmergo), allows deaf people to express the reception of musical signals into expressive activities such as scratching brushes to paint abstracts or gestures to dance.

3.2 Use of Budmergo for Deaf Disabled People

Budmergo is a device that converts sound waves into micro dynamo vibrations that can be felt by the skin and body. Through this tool, music and sounds can not only be heard by the ears, but also the sensation of the waves can be felt through vibrations that can be felt by the skin and body. Budmergo has been finalized into a device that can be used by two Deaf people in one device through the addition of a mixer device as an output signal divider. In addition, Budmergo is currently using *Wireless* technology (without Cable) which makes it easier for Deaf people who use free movement and artistic expression when responding to the vibrations of music they feel.

The logical awareness believed in the creation of this work of art is to place the performing art work as a medium of freedom for the expression of its creator, namely individuals who have a distinctive and personal way of understanding and have the ability to internalize a certain phenomenon, without being limited by the shortcomings of their biological body. The emphasis that is the basis of this

performance, in the end, sets 4 success targets, namely; (1) the discovery of knowledge, methods, and art media that are able to optimize the art activities of the deaf and blind, (2) the creation of new works of art, (3) socio-psychologically able to raise the dignity and dignity of the participants, in this case the deaf and blind, considering the participatory art creation model is loaded with human values with the involvement of participants, and (4) the creation of art for the hearing impaired.

Through vibration signals, Deaf problems in terms of performance communication using music can be reduced. The reception of musical vibration signals produced by Budmergo, allows people with Deaf people to express the reception of music signals into expressive activities such as scratching brushes to paint or gestures to dance as a result of their response to designing music.

Figure 4. Use of Budmergo at a Show involving deaf students

In addition to unlocking the potential for Deaf people to be able to carry out performing arts activities that use music, Budmergo also has the potential to be used as a learning tool in schools, especially in Perspective and Sound Image subjects. By connecting the Budmergo device to the sound source that the teacher wants to tell the story in class, Deaf students can feel the sensation of a sound through its vibration symptoms that are precise with the sound symptoms. Thus, students no longer recognize sounds through image symbols or written symbols, but can be closer to sound knowledge through feeling the sensation of the sound vibrations.

3.3 Implementation of *Tribal Electronic Dance Music* (EDM) for Budmergo

Electronic music is music produced through computer technology that is thought to be able to produce stable frequency and vibration signals, in contrast to signal production in acoustic instruments (Brøvig-Hanssen et al., 2022). Media use *Electronic* It is thought to be able to be an alternative to musical experimentation that can be applied in the Budmergo tool. Tribal music genres are chosen as the solution of choice of compositional characters. Tribal music is a genre of African electronic music that features several

percussive instrument characters with frequencies *Low* towards *Midlle*. The frequency range in Tribal music compositions is considered to be in accordance with the signal capture capabilities of Budmergo technology. Tribal musical characters, are also suitable to be worked on as dance music or what is often called *Electronic Dance Music* (Jóri, 2018).

There are two main considerations that are used to ensure EDM can be chosen as a genre of music applied in Budmergo. The first consideration is related to the magnitude of its magnitude or density of vibration called amplitude(Stuart et al., 2017). A large amplitude in a sound character will be chosen as the sound material, because it will create large vibrations that are more capable of being felt by the deaf body.

The next consideration is about the variety of wave motion. A variety of wave movements may occur due to different periods or time sizes of wave movements. Periods of fast wave motion will allow for tight wave motion, while periods of slow wave motion allow for the emergence of loose forms of wave motion. The period of wave movement with different levels of density, the peak of the wave (B) that will be felt as vibration by the body will also feel different. Therefore, the variety of wave motion based on the period can be used as a substitute for the variety of sound colors (*colour*). If hearing people will hear a variety of sounds due to different sound colors, then through the difference in the time period of this wave will be able to replace the sound color with a difference in the sense of vibration felt in the body. The difference in vibration period that allows creating different vibrational sensations as well as a substitute for the variety of sound colors in music, will be more visible if it is assisted by the visual media of waveforms. In different periods, visually sound waves will appear visuals that are not much different from the sound sensation or vibration felt (Burger & Toiviainen, 2020).

EDM is a genre of music that is chosen to be a model or *prototype* and applied in Budmergo. The selection of this genre is determined based on the musical characters that make it possible according to Budmergo. The character of Tribal EDM that is able to accommodate the needs of vibration production for the deaf is because (1) the instrumentation character of Tribal EDM which relatively amplifies the rhythmic element at *the Middle–Low* (Midlow) frequency in the range of 55,000 – 70,000 hertz (Hz), which is the strongest frequency range that creates a vibrational sensation on the Budmergo instrument. For the time being, Budmergo devices are still limited to being sensitive to sound frequencies in the range of 55,000 – 70,000 hertz (Hz), because for renge frequencies of 30,000 – 50,000 hertz and 75,000 – 260,000 hertz (Hz) Budmergo is not able to produce vibrations. (2) In addition to the issue of frequency range, instrumentation characters in the Tribal EDM genre also provide a choice of musical instrument characters with strong punches. Strong *punch* characters are sound wave characters that have a sharp peak of amplitude, so that the sense of pulse or rhythmic beat can be more felt by the deaf.

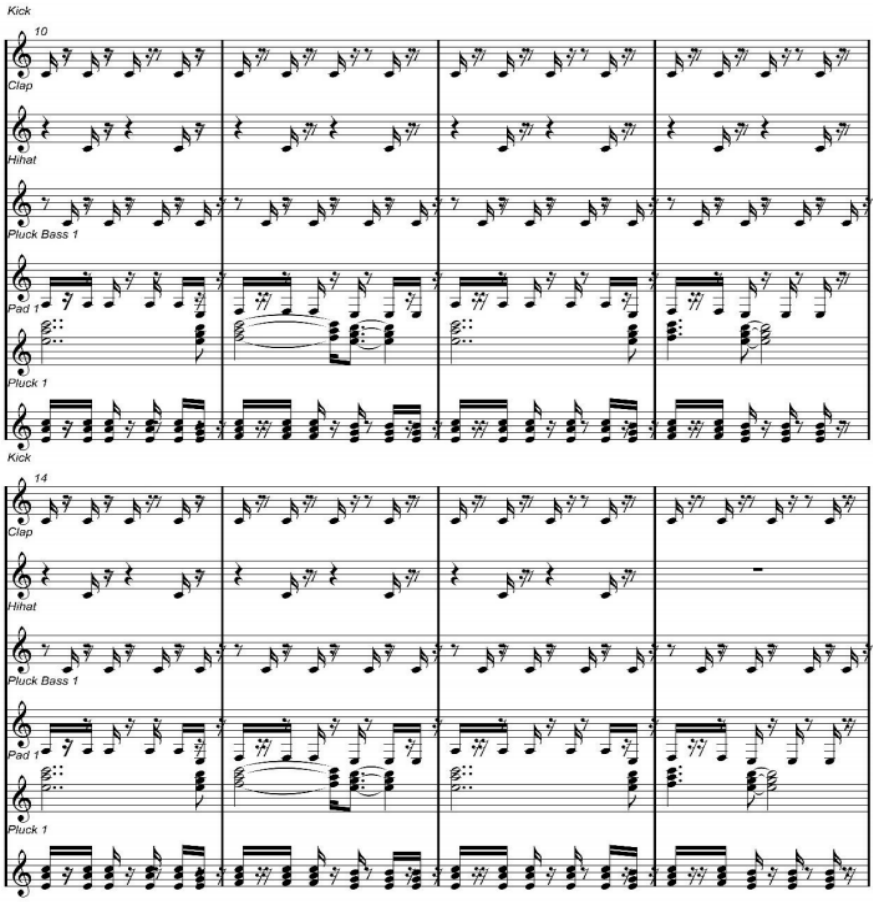

Figure 5. Notation of the Tribal EDM music composition section with Budmergo showing the alternating musical instrument composition patterns

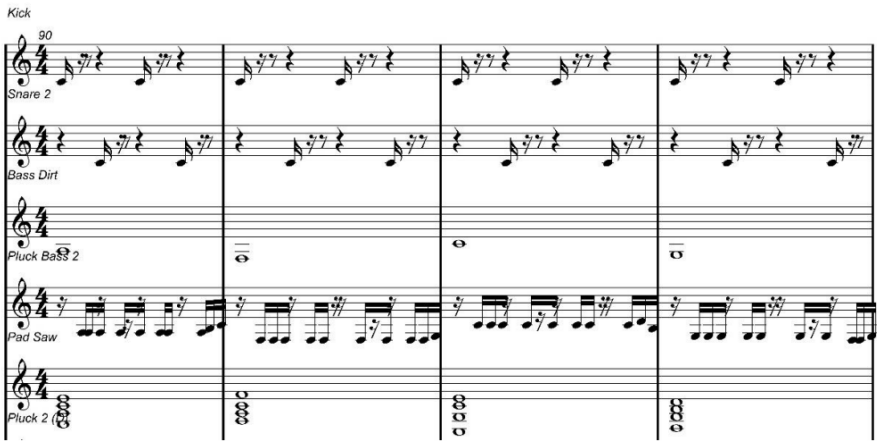

Figure 6. The notation of the final part of the Tribal EDM music composition with Budmergo is the ideal level of density.

4. CONCLUSION

The Budmergo tool as a result of technology developed for performances with the involvement of the deaf and blind resulted in

several research records. The Budemergo device made using a simple electronic device using *a micro dynamo* is able to convert sound waves into vibrations that can make music received by the deaf through the sense of touch or skin that is equally clearly accepted by all performers. The musical vibrations that Budmer Golbrator is able to convey on the skin of the deaf are only limited to the sensation of rhythmic vibrations, not tones. The form of vibration that can be produced is at least in the form of vibrations 1) long, 2) short, 3) large and 4) small, the diversity of which depends on the type of blow from the musician to the gong instrument being played.

EDM Tribal is a character of the recommended music genre to make music related to the use of Budmergo. The instrumentation character of Tribal EDM which relatively amplifies the rhythmic elements in the *Middle–Low* (Midlow) frequency in the range of 55,000 –70,000 hertz (Hz), which is the strongest frequency range creating a vibrational sensation on the Budmergo instrument. Strong punch characters are sound wave characters that have a sharp peak of amplitude, so that the sense of pulse or rhythmic beat can be more felt by the deaf.

AUTHOR CONTRIBUTIONS

Bondet Wrahatnala as the head of the research team who plays a role in coordinating all activities in research activities to the creation of the Budmergo tool and as the author of the correspondence in this article. Bondan Aji Manggala as a researcher who plays a role in drafting the concept, director of making tools and video activities and the main implementer in this research, as well as a compiler of Tribal EDM music for Budmergo. Including providing workshops, tutorials, and designers of this tool. Jonet Sri Kuncoro as the designer of the training workshop and the use of this tool. Muhamad Nurhadi and Agus Budiyanto acted as technicians to design and manufacture Budmergo tools. Dana Adi Arya Pradipta and Joi El Java acted as workshop companions, data processors and compilers of audio visual documentation in this activity. Riana Kapri plays the role of a researcher and visual data processor.

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