AMAROK PIKAP: INTERACTIVE PERCUSSION PLAYING AUTOMOBILE*

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ABSTRACT

Alternative interfaces that imitate the audio-structure of authentic musical instruments are often equipped with sound generation techniques that feature physical attributes similar to those of the instruments they imitate. Amarok Pikap project utilizes an interactive system on the surface of an automobile that is specially modified with the implementation of various electronic sensors attached to its bodywork. Sur-faces that will be struck to produce sounds in percussive instrument modeling are commonly selected as distinctive surfaces such as electronic pads or keys. In this article we will carry out a status analysis to examine to what extent a percussion-playing interface using FSR and Piezo sensors can represent an authentic musical instrument, and how a new interactive musical interface may draw the interests of the public to a promotional event of an automobile campaign: Amarok Pikap. The structure that forms the design will also be subjected to a technical analysis.

Keywords: Interaction, Physical Computing, Human-Technology Interaction, Outdoor Interfaces, Musical Interfaces, Music Performance

1. INTRODUCTION

Throughout history, musical instruments have been ordered and classified according to methods of playing, or their sound intervals. However, DIY productions and hard-ware hacking techniques that are now increasingly widespread as information technologies rapidly become part of everyday life in the 2000s have led to a differentiation of standards and allowed for the wider production of musical instruments that do not conform to convention. Musical instruments could also be described as sound generators; and the means of technology allow sound generation to be carried out not only through acoustic methods, but also with a sensor structure triggering a sound that exists in the processor to generate sound. One criterion of success in sound synthesis methods is the degree of semblance to the original sound of the sound generated by the triggering of the sound sensor.

The sound sampling method used widely today in sound synthesizing is based on the principle of playing back pre-recorded sounds, and is thus used in generating simulated sounds. However, a recorded sound library features limited options. Potential sounds that musical instruments may produce can vary according to the approach and interaction of the performer with the instrument. As for percussion instruments, many factors, ranging from the impetus of the force exerted on the surface that generates the sound, to the material qualities of the object that is used to establish contact with the surface serve to increase the number of possible timbres. Since various gestures may generate different sounds from musical instruments, the number of recorded sounds depending on probable scenarios in instrument modeling is theoretically infinite. However, although interactive units known as gestural controllers allow the transfer of the movements of the performer to the digital instrument [1] the number of gestural movements achieved via sensors still remains limited. Therefore, although the modeled new instrument features common attributes with the original instrument it imitates in terms of its sound, it is nevertheless impossible to compare these two instruments on a one-to-one basis other than according to their fundamental features.

Attempting to produce the same performance as a traditional percussion instrument using the different surface of a simulated instrument poses a number of difficulties for the performer. Often, the surfaces of the percussion instruments played using hands do not fully absorb the impact exerted upon them and respond with their own physical tension to the hand that carries out the movement. Therefore, certain interactive surfaces, such as pads, that are designed to simulate such events, are made of materials that feature natural-like qualities. However, the reaction of the playing surface to the surface that applies the pressure may be different from that of the original musical instrument, and such differences must be considered both with their advantages and their disadvantages [2]. As we observed in the Volkswagen Amarok Pikap Truck project, musicians who play a percussion instrument can easily develop mastery of the new types of instruments that are produced by the application of a different interface by blending different techniques.

2. MOTIVATION

The Amarok Pikap Project that we examine in this article aimed at developing a concept that would allow it to become the focus of attention at events organized for product promotion –for a reason other than its most

significant feature as a transport vehicle. The aim was to dispel the prejudice that since Amarok was a pickup, it would not be the vehicle of choice for metropolis dwellers. The design was planned so that users would physically interact with the various sensors installed on the outer shell of the car to play percussion with an interface they were not accustomed to. The purpose of this study was to determine how participants' interaction with this new musical interface is empowering the perception of the promotional campaign of the product.

3. RELATED WORK

There are various examples of making music using the automobile as an object. In Alessandra Camnasio's project titled Music From A Car [3], acoustic sounds retrieved by strikes to the outer surface of an automobile are recorded using various microphones to form a sound library; and these sounds are then used to compose a predominantly rhythmical musical piece. Another project is featured in the music video for the band OK Go's song Needing/Getting [4] where various extensions in-stalled on the outer surface of the automobile in motion collide with the surfaces around the automobile and produce a variety of sounds. The objects in the environment of the automobile have been pre-organized, and as the automobile drives through the planned-route, the musical composition is performed. However, in both projects, the sounds produced are acoustic sounds that 'belong' to the automobile. A similar approach can be observed as in the Smack Attack project. In Smack Attack [5] a peripheral device is attached to the wheel of a car, and the device is connected to the hi-fi system via Bluetooth. Several sensors on the peripheral device enables the users to produce musical sounds while driving.

4. CONCEPT DESCRIPTION

Two different types of sensors were used on the surface of the automobile. At the front of the automobile, on the hood of the engine, Force Sensing Resistor (FSR) sensors were used to allow sensitive response to the finger strikes of the performer; these sensors also did not form an extra, thick layer on the hood. FSRs act as analogue transformers of the applied force into variable resistance of electrical current. FSRs are usually used for such applications as input devices, musical instruments, or interactive applications.

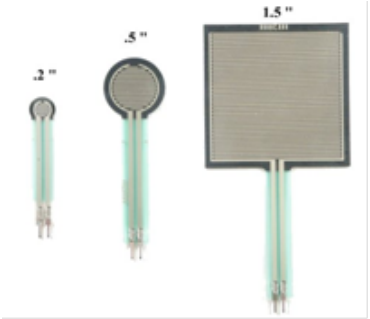

Figure 1. FSR Sensors.

For the Amarok Pikap Project several holes were drilled in the hood for cable pas-sage to carry out cable connections for the FSR sensors fixed to the outer surface of the hood. The fourteen FSR sensors fixed to the hood transmit the data they obtain to the computer in the car via their connection cables that are hidden under the surface of the cabinet.

In addition to the sensitive sensor system on the front shell of the car, Piezo sensors were affixed to the front and back windows on both sides of the car, the shell area below the windows and the shell area above the rear wheels. Piezo sensors feature a system that transforms vibrations on the surface into electrical energy. However, they do not provide the same level of sensitivity as FSR sensors. Also, since the interaction surface of Piezo sensors is not restricted to the surface of the sensor as in FSR sensors, undesired data might be collected from other, causing cross talk between the neighboring sensors.

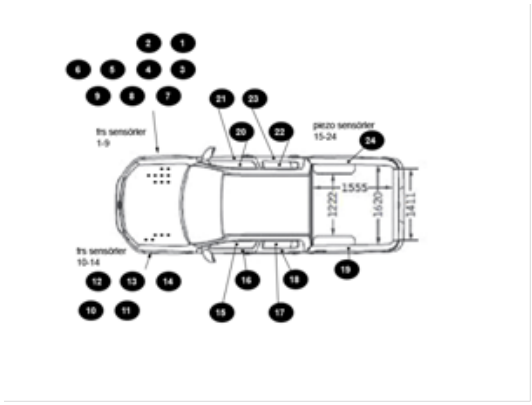

Figure 2. Sensor Positioning.

In order to obtain different gestures from the percussion played with the new inter-face, because of the restricted perception qualities of the sensors, parameters such as the attack duration and pitch of the force applied to the sensors are used in producing different alternatives when recalling the sound sample stored in the sound library. It might prove insufficient if sensors that source the spectrum of sound operate with an on-off logic, therefore an analogue structure allows for a wealth of data production. The sensors applied to the front part of the automobile allowed for a certain level of sensitivity in the playing of the instrument. This was not the case for the Piezo sensors used on the sides. Since the data produced due to the interaction of the users on the sides of the car did not allow for sensitivity because of reasons stated above, an on-off logic was deemed suitable for their use, and for values over a certain threshold, the contribution to the music of single-strike sounds in the percussion family such as a bell or a whistle were introduced.

Participants were given the chance to accompany with percussion sounds the high-tempo music played during the event from the DJ booth that was installed in the luggage department of the automobile. This allows for the automobile to become, in addition to its main use as a vehicle of transport, a sound-generating instrument –a veritable surprise for the viewers.

Amarok Pikap project, thanks to the car's ability to move easily, enabled the project to be a center of attention and to reach a wider audience in several places. The project has circulated in different public spaces where thousands of people experienced with amusement. Participants explained their experience extraordinary and as being at a level close to the real experience of playing a percussion instrument. Moreover professional percussion players also noted that the system works much better than they have expected in realizing gestural sensitivity.

5. DEVELOPMENT

Force data obtained when performers strike the sensor areas with their fingers –'play' a percussion instrument- is transformed into digital data in the Arduino development card. Then, the digital data is transformed into Midi data in the Max/MSP/Jitter application and a valid protocol standard for sound generation is achieved. The obtained midi data is transferred via Max/MSP/Jitter to the Ableton Live application and the percussion simulator that operates as a plug-in of the application is transformed into percussion sounds.

Figure 3. Max/MSP Jitter Patch.

The system progresses as a series of data transformation and transfers; and the obtained interaction data is transmitted to the Midi transformer application not via Serial Protocol but by OSC (Open Sound Control Protocol), so the delay in the sound that responds to the physical interaction is very short. The performance features of the sound module and the computer are factors that influence the delay parameter. The interactive system produced for the Amarok Pikap Project received highly positive feedback for its performance from various users including professional percussionists.

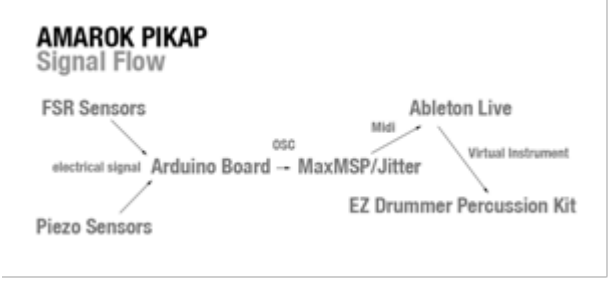

Figure 4. Signal Flow.

Amarok Pikap, the interactive percussion-playing automobile, was showcased in four beaches (Burç Beach, Alaçatı, Bodrum, Caddebostan) in Turkey during the summer months of 2012, switched location easily thanks to being a vehicle, and the interactive percussion system was easily set up and presented for use very easily set up and quickly presented for use. Although the temperature levels of the surface areas were quite high due to direct sun light exposure, there was no failure of FSR sensors.
In addition to the outdoor popularity of the activity, the event documentation video was viewed over a thousand times in a month on Youtube, and the project has been listed third on Cycling74's Popular Projects website.

6. CONCLUSION

In interaction design, the presentation of familiar phenomena in unfamiliar ways results in a human-technology relationship that swiftly produces results; since it creates curiosity in users at a level they are accustomed to. New interfaces produced for sound generators allow attractive implementations in brand promotions that create significant surplus value.

Figure 5. User Interaction.

At the end of the project, a distinct increase in brand awareness in terms of poten-tial buyers was observed. Today, music is among methods most widely used to con-vey a message to the masses. In this context, to allow the user/potential buyer to get involved in the event was among the main success criteria of the project that created difference.

The Amarok Pikap Project that presents a new interface for percussion, a widely used family of musical instruments, is important since it is the first of its kind. There are various examples of making music via acoustic sounds generated by striking various surfaces of an automobile. However, research has revealed no previous examples of playing a real instrument via strikes to the body of the car.

7. REFERENCES

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** See www.youtube.com/watch?v=wynafHRGk9A for the documentary of the project*