

Supporting Children's Rhythm Learning Using Vibration Devices

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Introduction

Rhythms play a critical role in music, and understanding them is a fundamental issue in music learning. It has been proved that many children who are not good at musical performances do not adequately understand or recognize the rhythm patterns of musical pieces. However, to understand and learn rhythms by listening to the melody is not always easy for some children. Therefore, music teachers in elementary schools often pat each of their children on the shoulder in sync with the music, in order to make her understood her rhythm patterns more intuitively by "*feeling* through the shoulder" than by listening to the melody.

The proposed system called T-RHYTHM supports children's rhythm learning based on this teaching method: rhythm learning by providing children with tactile stimuli using vibration devices. When a group of children plays musical instruments or sings a song in an ensemble situation, T-RHYTHM transmits the rhythms of the individual children's part to their own device through wireless communications. Each child can easily recognize the rhythm of her part without being confused by the others' performances or singing voices.

Overview of T-RHYTHM

As shown in Figure 1, T-RHYTHM is composed of a MIDI instrument, a personal computer (PC), a transmitter device, and vibration devices. The software executed on the PC receives MIDI data from the music performed by an accompanist (e.g. a music teacher), and identifies which location and what note in the score are performed by using the Dynamic Programming-based pattern matching algorithm. T-RHYTHM then sends the rhythm information of all the parts of the musical piece to the vibration devices through the transmitter. The rhythm information is composed of pairs of a rhythm description (a timing, strength, and length of each note) and an identification number for a vibration device. Each device checks if the received information is the rhythm information of its own part.

The vibration device as shown in Figure 2 is composed of a receiver, a microcomputer and a vibration motor (5,000 rpm, 1G vibration quantity). The device is enclosed in a small bag: Children can put the bag around their neck and place the vibration motor wherever they like, such as, on their wrist, arm, or shoulder (Figure 3).

Current Status and Future Works



Figure 3. T-RHYTHM in use

The evaluations of T-RHYTHM have been conducted in an elementary school, Kashiwa city, Chiba prefecture, Japan. Fifth graders are asked play the etude composed of six parts in an ensemble setting. By listening to the melody of the etude from a speaker, individual children performed one of the following musical instruments in an ensemble setting: a cymbal, a big dram, a snare drum, a tambourine, xylophones, and organs.

Post-experimental interviews, questionnaires, and video analyses have proved that the children and their teacher's responses are overall positive. Our future work will be to conduct more intensive evaluation studies to deeply investigate the rhythm learning effects of T-RHYTHM.



Figure 1. System configuration

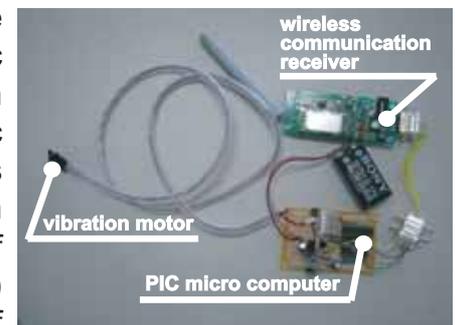


Figure 2. Vibration device