The Music Cre8tor: an interactive system for musical exploration and education

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ABSTRACT
The Music Cre8tor is an interactive music composition system controlled by motion sensors specifically designed for children with disabilities although not exclusively for this population. The player(s) of the Music Cre8tor can either hold or attach accelerometer sensors to trigger a variety of computer-generated sounds, MIDI instruments and/or pre-recorded sound files. The sensitivity of the sensors can be modified for each unique individual so that even the smallest movement can control a sound. The flexibility of the system is such that either four people can play simultaneously and/or one or more players can use up to four sensors. The original goal of this program was to empower students with disabilities to create music and encourage them to perform with other musicians, however this same goal has expanded to include other populations.

Keywords
Music Education, disabilities, special education, motion sensors, music composition, interactive performance.

1. INTRODUCTION
The Music Cre8tor is an interactive music composition system controlled by motion sensors initially designed for the needs of people with disabilities to be used as an educative, therapeutic and emotionally rewarding artistic outlet for this population and their teachers, therapists and parents. This system was built to allow the physically and cognitively challenged population to create new music by using motion sensors which are held or attached to a person's wrist, arm, leg, etc. The sensitivity of each motion sensor is designed to be individually modified (i.e., calibrated) for each person so that even the slightest movement can be tracked and become a control for composing music in real-time electronically. Up to four people can play simultaneously, each person experiencing the cause and effect of their movements which directly correspond to rhythm, melody and the basic elements of musical composition. Another example is that one person can hold or control up to four sensors, each sensor being a different instrument (sound source or timbre). We have achieved the goal of creating a useful and fun new instrument to the extent that children and adults can easily play with this software with little knowledge of how it works.

2. SET-UP
All musical aspects of the Music Cre8tor were programmed in Max/MSP. A stand-alone file has been designed for use in any computer without the need for specific software. The computer hardware requirements for using the Music Cre8tor are: 700 MHz processor or faster, 128 MB of RAM, 60 MB of hardware space, 1024 x 854 screen resolution, USB port and cable (2.0 preferred). This program is both Windows XP and Mac OS compatible.

At the time of this paper, the Music Cre8tor system includes a custom-made sensor interface box, 4 sensors, a midi-interface and a tutorial guide/instructions as well as free demonstrations by the designers.

2.1 Design
After several years of testing with children and their teachers, the current version has been designed for intuitive functionality. The screen design simulates a look that could be a cross between an MP3 player and a tape recorder. Design modifications are constantly being updated as testing with both students and their teachers is an on-going process.

3. FUNCTIONALITY
The Music Cre8tor requires the collaboration of both a guide (one who enters data to establish parameters in the system, i.e., a player, teacher, student, parent) and a player (i.e, student, adult, teacher, parent, etc.). In some cases this could be the same person. In some situations, the guide will encourage the player to make a series of decisions regarding instrumentation. For example, a player must first decide which category of instruments to play: melody or rhythm. After this, the player must choose the type of melody or rhythmic instrument (for example: a MIDI melody instrument, one of 127 choices; or a computer-generated oscillator). Once this has been determined, the player may then move the sensor to listen/react to the results.

All instrument sounds start when the sensor is moved, shaken, agitated or wiggled and stop after the sensor is inert for a second, depending upon the tempo chosen by the player.

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The main tempo, tonal center and volume may be entered into a
global control panel by the guide or player, but the rhythmic
relationship of notes (half notes vs. 16th notes) is completely
controlled by the player(s) movement of the sensor. In other
words, whether the pitches rise or fall, start or stop, or contain
rhythmic complexity or not, is determined by the movements
of the player(s) holding the sensor(s).

Music can be created spontaneously in real-time as well as
recorded for play-back for either documentation, performance,
or composition. This program encourages spontaneous music-
creating but also promotes the composition process, which
arises out of the structure and form performed.

4. RESEARCH and DEVELOPMENT

The Music Cre8tor hopes to expand upon a variety of other
pre-existing interactive sound devices and programs by
providing new sonic and artistic options as well as more
economical choices for users. Other interactive electronic
devices use motion sensors to generate MIDI tones. The SoundBeam [1] from the UK, as well as the MidiCreator [2] are
two such instruments that have had a profound impact on
the special education population. The Music Cre8tor has increased
artistic options by adding other musical instruments
(timbres), as well as developed a design for the possibility of
deeper kinesthetic relationships between the player, the
sensor(s) and the resulting sounds. Furthermore, the Music
Cre8tor requires minimal computer system requirements and
speakers, thereby reducing the additional costs of buying
extra sound modules, tone generators and other gadgets. If the
user(s) already own a computer and a simple sound emitting
system, they can immediately begin to participate.

There are known interactive musical devices in which the user controls a pre-recorded sound file by moving a motion sensor
(i.e. in the shape of a baton), which triggers real-time
transformations for the tempo and volume of a pre-recorded
soundfile [3]. The Music Cre8tor expands upon this idea by
incorporating a Restart Sensitivity Threshold, where upon the
playback behavior of the soundfile is directly manipulated by
the sensor activity of the player(s). In other words, if the
player agitates the sensor more vigorously than “normal” then
the soundfile will restart at the beginning. This generates a
rhythmic activity similar to the “scratching” effect of a DJ on a
vinyl record. A new rhythmic pattern is created out of the pre-
existing soundfile.

This is just one of several variants in the methods of playing
and using the Music Cre8tor from other interactive sound
devices currently available.

Further tests have shown that this device is also effective for
the cognitively involved student as well as emotionally
distressed young adults. Future tests will incorporate the
blind and deaf population as well.

The Music Cre8tor has been tested in public schools in both
Alaska and New York with positive feedback from teachers,
administrators and of course, students. Reflecting upon the
video documentation taken at such demonstrations show
students engaged, focused, smiling and actively participating
in the music. Tests show that students recognize their own
chosen instrument, and make cognizant choices about the
form, structure and rhythm of the music. Students who have
shown discipline problems in the past have engaged
positively with the Music Cre8tor demonstrations and
encouraged other students to participate.

5. RESULTS AND CONCLUSIONS

The interesting aspect of this new instrument is that it can be
modified for each individual’s sensitivity of movement. In
this way a person can learn how to use this musical instrument
much in the same way a non-disabled person can learn a
musical instrument. A person with limited mobility can
immediately experience the cause and effect of sound being
created by a particular movement (e.g., slow movements = slow
moving sounds). Based on observation of the student’s pace
the teacher can adjust this instrument’s sensitivity to match
the learning curve of the student, thereby making it more
challenging if/when the student is able, or more sensitive if
not.

This particularly useful therapeutic and educative aspect of the
Music Cre8tor exceeded our expectations laid out in the
original concept. What was at first conceived as a fun,
educational tool has, through development, transformed into a
valuable instrument for experiencing the relationship between
kinesthetics, sonic creation and perception of the world
around us. Therapists, teachers, physical educators, parents
and administrators have all expressed interest in the
development of this instrument.

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7. REFERENCES