

SWITCHENSEMBLE: A SPECIAL NEEDS MUSIC APPLICATION

SwitchEnsemble is a program that allows students with disabilities to play music using a wide variety of computer input devices as musical instruments. It combines computer-assisted adaptive technology and computer-generated musical sound in one package that allows teachers, therapists, and parents to provide meaningful and highly motivating activities to the disabled student.

INTRODUCTION

SwitchEnsemble is the result of my own frustrations as a music teacher in a special needs classroom. Although the students clearly enjoyed music, I found it difficult to develop activities that all of the students could participate in because of the extremely broad range of physical, cognitive, and social deficits that the students possessed. For this reason my initial goal for the program was that of a music educator: to facilitate active participation in musical activities as a means of developing aesthetic sensitivity, social development, and a sense of self-accomplishment. After researching the subject of music and special needs, through books on music therapy and discussions with teachers and therapists, I began to see the program as a flexible tool that could be used to accomplish a wide variety of goals. Juliette Alvin, a music therapist, has written

. . . physical, intellectual, emotional, and social developments are so closely interwoven that a handicap affecting only a specific area of the child's development is bound to hamper his harmonious growth. It is thought that the most valuable means of maturation are those which can integrate the different parts of the child's development and appeal to his whole being. This applies particularly well to music since it can offer the handicapped child a vast number of sensory, emotional, intellectual, and social experiences, some of which he may not be able to get by any other means. Moreover, it is flexible enough to be adapted not only to the specific disability of the child but also to each of the stages of his maturation.¹

SwitchEnsemble was written in assembly language for the Apple IIGS and makes full use of its graphical user interface. The IIGS was the perfect computer for this project; not only is it already prevalent in schools and homes with disabled children, but its exceptionally good quality sound allows the program to be used without the expense of additional music synthesizers. SwitchEnsemble uses the sound chip built into the computer (Ensoniq digital sound integrated circuit) and Apple Computer's latest sound tool (MIDI Synth) to create a high-quality digital sampling synthesizer that can play up to seven voices at a time. The SwitchEnsemble package includes

dozens of instrument sounds, including flute, electric piano, bass guitar, violin, and drums.

Another advantage to using the IIGS is the wide variety of input devices that are available for it. SwitchEnsemble supports the use of keyboards (the standard computer keyboard and adapted keyboards such as the Unicorn Board), game port devices (joystick, paddle, TouchWindow), and switches. A switch is a simple on/off control that may be purchased in a variety of styles (foot, head, lever, eye gaze, puff/sip, etc.) so that virtually any body movement can be used to control the computer (Fig. 1). By supporting these existing devices, SwitchEnsemble allows students to build on the skills that they may have already developed in order to control their wheelchairs, communication systems, or computers.

TONE BELLS

SwitchEnsemble's most basic construct is the "electronic tone bell." Traditionally, a tone bell is a single-pitched bell that is played by striking it with a small mallet. Music teachers use these tone bells along with



Figure 1. Frank improvises a melody using a TouchWindow and a head pointer. Wheelchair control switches imbedded in his head rest may be used to produce other tones (Massachusetts Hospital School).

other percussion instruments as a means for students to explore various musical concepts. SwitchEnsemble has eight analogous tone bells; when one of these tone bells is activated, either from the keyboard or through a switch, a sound is produced. The two most obvious advantages to having electronic tone bells are as follows: (1) through the use of switches, practically any body movement can be used to activate the tone bell; and (2) a large variety of sounds (flute, drum, voice, bell, etc.), pitches, or combination of sounds and pitches can be produced by a single electronic tone bell.

Recently, I had the opportunity to use SwitchEnsemble to enable a group of five disabled students to participate in the annual spring concert at the Massachusetts Hospital School in Canton, Massachusetts (Department of Education; Bureau of Institutional Schools). We attached head switches to each of the student's wheelchairs and then assigned the notes of a different chord to each switch. By triggering their switches at the proper times, these students provided violin, flute, and percussion accompaniment for their classmates in the chorus. For example, if switches 1, 2, and 3 were assigned the chords A major, E7, and D major, respectively, the last line of "America the Beautiful" could be played:

Switch: 3 1 3
Chorus: "and crown thy good with brotherhood from sea

Switch: 2 1
Chorus: to shining sea."

SwitchEnsemble has a simple music editor that may be used to compose and play back musical sequences. It is usually used to provide musical accompaniment for the players. The editor also allows you to insert into the accompaniment instructions to automatically reassign the sounds and pitches of any switch as the music is playing. For example, the computer might be set to play a jazz accompaniment (acoustic bass and drums) while a student's switch is set to play a chord (piano). As the harmony of the accompaniment changes, the pitches of the chord that the switch produces can change automatically so that the sound is always appropriate. In this way, triggering the switch at even seemingly random intervals will result in satisfying musical results.

CONDUCTING

SwitchEnsemble provides several modes that allow a student to use his or her switch to "conduct" a musical sequence that has been entered into the editor. Probably the most effective of these is the *Tap* mode; the student plays by tapping out the "melodic rhythm" of the music (i.e., hitting the switch once for each syllable in the song lyrics). For example, if the song is "Happy Birthday," the student would tap the switch as follows:

Switch: • • • • • •
Melody: Happy birthday to you, etc.

Each time the student presses the switch, the program responds with the appropriate musical passage. Students who have difficulty hitting a switch in tempo can conduct the songs with a slow, rubato feeling (Fig. 2).

IMPROVISATION

Probably the most popular of SwitchEnsemble's activities is improvisation. It allows a student to explore a range of notes (musical scale) while an appropriate accompaniment is played in the background. For example, if a blues accompaniment is loaded into the editor, a blues scale might be assigned to the TouchWindow. As the accompaniment plays, a student can improvise a solo by running his or her hand (or head pointer or mouth stick) across the screen. Because any note of the blues scale will sound appropriate along with the blues accompaniment, the student cannot play any "wrong" notes. For more complicated accompaniment patterns, the editor can be set to reassign appropriate scales automatically to the TouchWindow as the harmony of the accompaniment changes, so that the student is guaranteed a successful musical experience. Other input devices that can be used for improvisation include a joystick or paddle, a keyboard, or two switches.

ENSEMBLE PLAY

The activities just presented can be combined within a given tune to allow groups of students with mixed abilities to play together in a cooperative setting. For example, if the students are playing a rock song, one student might cause a basic drum sequence to play by holding down a switch. Another might add a snare drum part by triggering a switch on the second and fourth beats of each measure. Similarly, other switch users could provide bass, guitar, piano, and organ parts. On top of this, yet another student might use a TouchWindow to improvise a melody. Although the skills required for the



Figure 2. Francesco (pictured with the author) taps out a melody using a light-touch switch (Massachusetts Hospital School).

various parts may vary dramatically, from basic cause/effect to tapping out complex rhythmic patterns, each student is making a vital contribution to the overall performance.

SONG DISK

For teachers or therapists who lack the time or musical expertise required to develop their own custom activities, the SwitchEnsemble package includes a song disk containing over seventy-five tunes in a variety of musical styles. To use the program, the teacher simply chooses the desired activity (for example, Cause and Effect, Conducting, Improvisation, Ensemble Play, etc.) and then loads a song from the disk. The program also comes with a manual that describes all of the activities on the song disk, suggests different ways to use the activities, and, for the advanced user, gives detailed explanations on how to develop new activities.

CONCLUSIONS

SwitchEnsemble has been commercially available since early 1992. The majority of the programs sold have been to schools and are being run by special education teachers with little previous musical experience.

Many teachers have reported great success in using the program to teach basic cause-and-effect relationships to severely disabled students. The two most frequent explanations given for this success are that the music is highly motivating and that the program does not require the students to focus their attention on the computer monitor. Several therapists have reported similar success in using the program with the elderly (stroke and Alzheimer's patients). Another teacher is using SwitchEnsemble's MIDI (musical instrument digital interface) capabilities to link it to a professional music-sequencing program running on a second computer. This setup enables his students to write, record, and edit their own compositions. Finally, several sites have already used SwitchEnsemble

to provide students with the opportunity to perform in public recitals, and a number of young musicians have won awards for their performances.

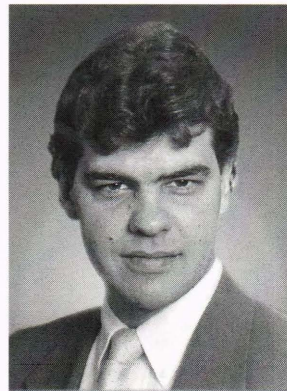
In talking to the teachers, therapists, and students who are using SwitchEnsemble, I frequently receive requests for specific songs and activities that were not included on the original song disk. I am presently compiling a second disk that contains many of these requests along with songs and activities that reflect the expanding variety of applications that users are finding for SwitchEnsemble.

REFERENCES

¹Alvin, J., *Music for the Handicapped Child*, Oxford University Press, p. 25 (1965).

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