

Software-assisted Composition Instruction for Non-music Students

by V.J. Manzo

The Interactive Music Technology Curriculum Project (IMTCP) was a research endeavor that sought to use interactive software to teach composition and performance to middle-school students including those with little or no musical experience. The software used in this study allows individuals to use the number keys on a computer keyboard to play diatonic scale degrees and chords in a specified key.

In 2010, IMTCP was conducted at Rowan University with a group of middle-school and early high school students in a one-week music camp setting during the summer. Early activities involved brief explanations of music terminology like pitch, harmony, and timbre. A collection of free open-source software apps (eamir.org/imtcp) was used exclusively to demonstrate these musical concepts. These apps were used as the instruments by which students composed and performed throughout the week.

Instructional Activities

After a brief crash course in harmony, students were asked to go to YouTube® and copy the links to 10 songs that they liked. The instructors listened to these songs and created a single sheet of paper containing the form and chord progressions containing just the numeric diatonic chord functions. Each student then had a folder containing a Word document for each song they identified. Each document displayed the artist's name, tempo, key, and the chord progression (typically a 4 bar phrase) used for each section of the song's form.

The software used in this project all hinged around one central idea: scales consist of seven unique notes and chords are built up from each scale degree. If we map these seven scale degrees or chords to simple control interface, like the numbers 1-7 on a standard ASCII computer keyboard, we would enable the students to control diatonic harmony with an accessible control interface that they are already familiar with. With a list of chord functions of their favorite music and the ability to play such chords just by pressing a number key on the computer keyboard, students played through their favorite songs and composed original compositions. The chords generated by the software could utilize internal software timbres or could be routed to a third party DAW like GarageBand® where the timbres could be changed and the data could be recorded and layered.

As the week progressed and the students' understanding of triggering diatonic notes and chords became clearer, a MIDI keyboard was introduced by which a seven-note major scale would be used to trigger the diatonic scale degrees instead of the number keys on a computer keyboard. When the student played a single note of the scale, the software added the remaining chord tones to complete the diatonic chord for that scale degree. If a student played the note D, scale degree 2 in

Artist: Train	Song: Hey, Soul Sister	Key: E	Tempo: 98 bpm
Intro:			
1	5	6	4
Verse: 2x			
1	5	6	4
1	5	6	4 5
Chorus:			
4	5 1 5	4	5 1 5
4	5 1 5	4	5

Excerpt of sheet music made for student playback showing diatonic chord functions

the key of C major, the software would add the third and fifth (F and A) to complete the chord. The MIDI keyboard would in essence be functioning as a trigger just like the computer keyboard was being used earlier. Electric guitars or acoustic instruments could be harmonized in the same way since the software can detect pitch from a microphone. Eventually, the software was removed completely and students played chords on their MIDI keyboard.

Each day, students were asked to identify progressions that they liked, either from the popular music they were playing or other genre, devise a form as pictured above with progressions allocated to each section. Students would then perform and record their original compositions (and the works of others in the class) using the IMTCP software to perform and GarageBand® to record. Students were permitted to use drum loops if desired, but all other harmonic or melodic content had to be original. Instructors were able to make comments about their compositions

In addition to composing and performing diatonic chord functions, students soon became comfortable with identifying progressions and chord functions by ear. A number of pop songs were played in which the students were able to successfully identify the chord progression by ear using the IMTCP software as an aid. This opened the door to allow the students to perform other music that they liked without the need for the instructors to create sheet music for them.

The Software

There were 6 IMTCP software titles used in the 2010 version of this study, labeled E000 - E005, each with a specific purpose. Each program was introduced to the students with an explanation of the musical concept it highlighted before they were invited to use it to help them compose.

E000

E000 is a basic demonstration app for showing the numerical relationships between scale degrees and how chords can be built in tertian harmony. It uses the numerical keys from a computer keyboard to trigger diatonic scale degrees or chord functions.

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The tonic and mode can be determined by selecting from the two pull-down menus. Chord tones can be added or taken away by checking the chord tones boxes. The chord voicings and octave doublings can be adjusted from the chord voicing menu.

The software has the option to enable auto sustain in which notes will sustain until a new note is received or the space bar is pressed. This allows notes to sustain while the user is preparing to play the next note. With manual sustain enabled, notes will sustain only as long as the number key is held down allowing rhythmic patterns to be performed with greater accuracy than in auto sustain mode. A mode using an automatic playback style can also be turned on and set in beats per minute in which sustained chords will instead be played back with a specified rhythmic pattern.

E001

E001 is similar to E000 in almost every functional aspect. It does, however have added functionality for recording MIDI data as a performance. It also has the option to route the MIDI data from the software to another audio program like GarageBand® or Mixcraft®. From within those programs, the performance can be recorded in real-time. This also allows the user to change the timbre to something other than the default internal timbres of the E001 software.

E002

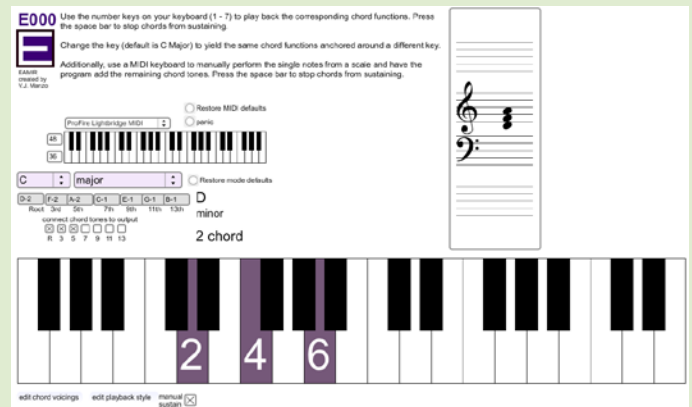
E002 incorporates the same functionality and concept as the aforementioned software: provide a bunch of numbers using the onscreen buttons, and then manipulate those numbers to create music. The numbers can be played back in a user-controlled rhythm and tempo, while their timbre, chord voicing, and dynamics can be changed. The tonic, mode and overall chordal harmony can also be changed. Students can use up to 4 number-based patterns simultaneously which can be linked to the same tempo if desired. Like E001, this software can also be recorded internally or routed out to another audio program for recording and timbre changes.

E003

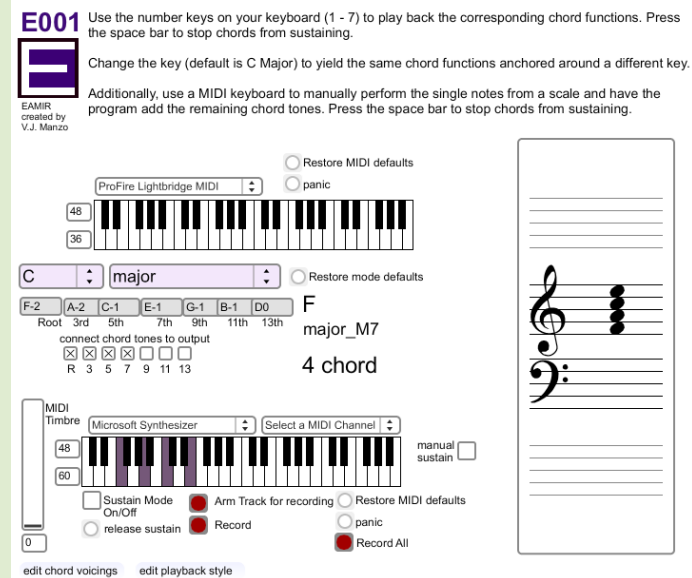
E003 allows a user to organize a collection of progressions into a form. The software will then perform through each chord in the progression as the user dictates the overall form by selecting from the different progressions. Like E001 and other software, the user can control the playback style, tempo, timbre, key and more. The data can be recorded internally or routed to another audio program.

E004

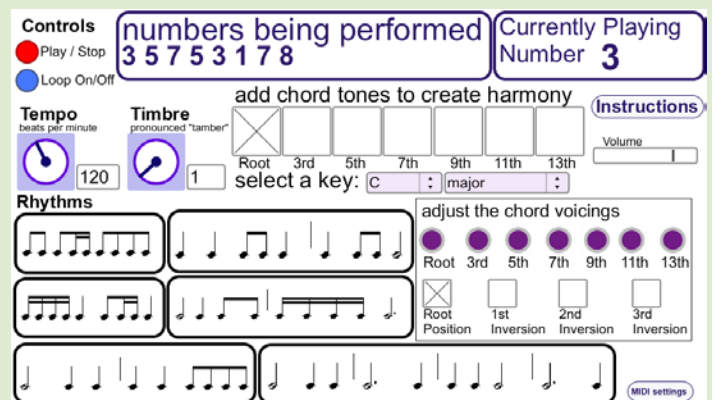
E004 is a modified version of the existing EAMIR Smart IWB software created for use on a large interactive white board such as a Smart Board®. This software shows suggestions for composing chord progressions based on the ways that chords tend to resolve in western music which includes popular music. If a user clicks on the 5 chord, they will hear the chord played back in either a sustained mode or in one



Screenshot of chords played to demonstrate tertian harmony



Screenshot of chords played using the numbers 1 - 7 on a computer keyboard



Screenshot of selected numbers being synthesized according to a tonic and mode

of the playback styles as seen in other IMTCP software. Additionally, the 6 chord and the 1 chord will begin blinking
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E005 Use the number keys on your keyboard (1 - 7) to play back the corresponding chord functions. Press the space bar to stop chords from sustaining.

Change the key (default is C Major) to yield the same chord functions anchored around a different key.

Additionally, use a MIDI keyboard to manually perform the single notes from a scale and have the program add the remaining chord tones. Press the space bar to stop chords from sustaining. You may also open the audio input panel (below) to track the pitch of an acoustic instrument using a mic.

Screenshot of a chord triggered by playing the single note G on a MIDI keyboard

E003 Enter a number of chord progressions in the list below.

To do so, click on a space in the rectangle below, then enter chord numbers followed by the return key. Next, click on another space and repeat the above steps.

From the list of progressions, click a progression and then click the "Start/Stop Playback" toggle to begin playing back chords: the chords in that progression.

Screenshot of computer playback from one of two progressions within the user's form

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showing the user that these chords tend to follow the one they just played. Of course, the user is not forced to play one of these chords, but the suggestions are still there when the user triggers diatonic chords or any of the secondary dominant or leading-tone chords, augmented sixth chords, or other tonicizing chords available in the other rows of the program or through the pull down menu.

The blinking chord suggestions are stored in a simple text document and can be modified to allow instructors to create customized chord suggestions for a given chord.

E005

E005 is almost identical to E001 with a few added features. The main difference is the addition for MIDI input support that will take a single note from a scale played on a MIDI keyboard and add the remaining chord tones to complete the triad or taller chord. A user can then play through chords in progressions using the MIDI keyboard to trigger scale degrees 1 through 7. There is also a mode so that when the key is changed in the software, the user can still play the diatonic scale degrees in C major in order to trigger the diatonic chords of another key, like F# Major. This allows the user to play through a wide range of repertoire even if they only know one scale.

An added feature of E005 is the option to use a microphone to record an acoustic instrument or a line-level instrument such as an electric guitar to perform in a similar way. A user could play a single note on their guitar and have the software harmonize the single diatonic notes just as it did with the MIDI keyboard.

Screenshot of harmonic resolution suggestions being given by the software for the selected chord

Implications

The software applications used in this study were simple programs created for a specific intended purpose tied to our teaching objectives. In the context of a typical music classroom situation that meets regularly throughout the year, a teacher could easily incorporate these lessons and methods to discuss

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Association for Technology in Music Instruction (ATMI)

By Jane M. Kuehne, ATMI Secretary, Assistant Professor of Music Education at Auburn University, Alabama

ATMI's Mission is to improve music teaching and learning through the integration of current and emerging technologies into the music-learning environment. It does this by providing a forum for the scholarly presentation of pedagogical and technical information for music teachers in higher education. ATMI seeks to engage both specialists and non-specialists in music technology, in an atmosphere that effectively disseminates information, encourages participation, cultivates collegial relationships, and engages practice (ATMI, 2010).

Each year ATMI holds a national conference in conjunction with the College Music Society. Musicians and Music Educators gather together to present four days of sessions on music technology and its many sub areas. The past conference was held this past September in Minneapolis, Minnesota. There were many wonderful sessions, panel discussions, and workshops.

Some of the highlights from the conference included panel discussions by various members on using technology and where it is headed. In A panel discussion, Dan Hosken, Scott Lipscomb, and Gena Greher discussed Music Literacy and Music Technology and asked questions about where music technology fits in the spectrum of music literacy, whether it helps or hinders, whether literacy is become less necessary, and whether music technology will ultimately make us less dependent on music literacy as a prerequisite for making music. Peter Webster and David Williams presented a session on using technology as a possible replacement for print resources. In another interesting session, Eric Brisson discussed using Moodle and Flash for Undergraduate Music Theory instruction. Brisson created several assessments for

his music theory classes and integrated them into the Moodle course management system for his university.

Another highlight from the 2010 conference was the lecture by ATMI keynote speaker, Elaine Chew, from the University of Southern California. Her lecture, *De-mystifying Music and Its Performance through Science and Technology*, discussed her work in music, mathematical and computational modeling of tonality, and her other work. Dr. Chew is the founder and head of the Music Computation and Cognition Laboratory at USC where the research goal is to "...systematically study, computationally model, and scientifically explain human abilities in music perception and cognition, and music making, such as music performance, improvisation, and composition" (MuCocCo, 2010).

The ATMI Business Meeting this year presented new opportunities for members to interact including both a Facebook (<http://www.facebook.com/ATMI>) and Twitter presence (<http://twitter.com/ATMIonline>) and discussed ways to increase opportunities for professional peer-reviewed presentations and activities. Following the business meeting was the ATMI President's Dinner which was once again a wonderful experience with a large number of attending for good food and excellent conversation.

If you are a member of ATMI and/or a member of the ATMI listserv, then you received the call for conference participation in your email inbox in November. The deadline for submissions is December 2, 2010. More information on how to participate can be found on the ATMI website, <http://atmionline.org>. The 2011 conference chair is Susan Piagentini and it will be held with CMS in Richmond, VA, October 20 – 23, 2011. We look forward to seeing you there! ●

References

- ATMI (2010). *About ATMI*. Retrieved November 15, 2010, from <http://atmionline.org/index.php/about-atmi.html>
- MuCocCo (2010). *Introduction*. Retrieved November 15, 2010, from <http://www-bcf.usc.edu/~mucoaco/>

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composition and musical concepts in classes where little or no formal musical training is evident.

One of the main thrusts of this project was to get the students performing music that was culturally familiar to them with timbres that they liked. By using a simple control interface for playing back diatonic chords, students were able to play along with these songs and compose original music. This allowed the students to function in a more self-directed learning paradigm while the instructors functioned as facilitators for the musical discovery. This freed instructors to discuss the harmonic implications in Green Day, draw comparisons to extant music, and apply the concepts to the students' work.

At the end of the week of IMTCP, students were given a CD of all of the software as well as a CD of all of the MP3's they

made of their compositions. The benefits for students having a CD of their work go without saying, but, as an educator, it is helpful to be able to see the advancement in compositional sophistication as time goes by.

IMTCP was conducted by V.J. Manzo and Rick Dammers in August 2010. For more information about IMTCP and to download the software, visit www.imtcp.org or www.eamir.org/imtcp. ●

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