

**ME and COMP SC**  
**(Music, Engineering, and Computer Science)**

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**Abstract**

Indications are that more scientists, mathematicians, and engineers will be needed to compete in the world markets<sup>1,2</sup>. However, the majority of young people entering the workforce will be women and minorities, who traditionally have not pursued careers in these fields<sup>3</sup>. More recently, a Senate bill passed that provides 600,000 new visas for foreign workers sought by the burgeoning high-tech industry<sup>4</sup>. Clearly we need to nurture the technical interest and achievements of all students. Devising strategies to increase their participation and enjoyment in the use of computers is the impetus for Me and Comp Sc.

College students like music and MP3's. They also like technology...cell phones, beepers, computer games, email, and surfing the web. This love of technology cuts across all educational disciplines. A combination demo/hands-on exercise for the MIDI (Musical Instrument Digital Interface) is under development for inclusion in an introductory computer science course. The purpose of the exercise is to expose students to more than the traditional word processing and spreadsheet exercises and to make them aware of the relationships between computers and music. This project is called Me and Comp Sc.

**Background**

An introductory 3-credit computer science course called CmpSc 100 is offered through Penn State. Although it is not required as part of any curriculum, it does offer students the opportunity to improve their computer skills, or expand their knowledge base. The course introduces students to computers and computer applications such as word processing, spreadsheets, database management, business graphics, and communications<sup>5</sup>. The prerequisite is two entrance units in mathematics. Students who take this course are, generally, from non-technical disciplines such as Criminal Justice, Liberal Arts, and Education.

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As the sole faculty member from Penn State Abington College teaching this course and as a faculty member whose discipline is engineering, the course has taken a new direction. The course now includes topics such as computer-aided design (CAD), personal homepages, and group and personal projects.

For the personal homepage assignment, students are given a set of criteria used for development, design, and grading of their homepages. One requirement is the use of the hypertext markup language (HTML) and not a software package such as Microsoft's FrontPage. Another is the creation and loading of a sound file onto their personal web page.

Given the criteria and knowing students may attempt to secure sound files from web sites such as Napster and knowing the University's strong commitment to discourage this practice, it was decided to launch Me & CompSc in the introductory CmpSc 100 class this spring. A more formal MIDI component is under development and will be added to the course in the fall of 2001.

It is expected that this MIDI component will not only expand the experiential basis of the student, it may be the first in a series of collaborative efforts to develop an interdisciplinary prototype module for inclusion in music, engineering, and computer science. It may also serve as the basis for the development of additional modules and possibly the development of a future Freshmen Seminar course involving Computers and the Arts.

### **Format**

The Me & CompSc (pronounced "me and comp sc") experience will be launched via an introductory combination lecture/MIDI demo. During this lecture/demo, a colleague from Music & Integrative Arts will discuss the role of computers in today's music. He will stress that, although most college students like music, they often have very little knowledge about how computers are used to create the sounds they hear. Prior to the lecture/demo, the Engineering professor will tell the CmpSc 100 students the rationale behind the session, which is to create a MIDI file that they will load onto their personal homepage at Penn State.

The one-hour, in-class, lecture/demo will be followed by a one-hour hands-on homework assignment under the guidance of a student assistant. This session will take place approximately one week after the lecture/demo. In the interim, a sign-up sheet will be passed through the class. Students will be asked to partner with one other person in the class. This will mean that two students will jointly attend the one-hour hands-on session.

It is expected that through this exercise students will experience, firsthand, the interdisciplinary nature of today's music. They will be required to save their MIDI files to a disk and, upon designing their website, incorporate their MIDI files into their personal homepage. A final (optional) one-hour session will allow students to finalize, or change, their MIDI output.

### **Melody and Rhythm**

The MIDI exercise is broken into two segments: the melody and the rhythm. The melody is the Penn State Alma Mater and will be the same for all students. Each student will, however, select an instrumental timbre. The rhythm, likewise, will vary from student to student. Each student will be asked to select a rhythmic pattern from a collection of 260 drum patterns by Rene-Pierre Bardet<sup>6</sup>.

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## Part I -The Melody

The following is for inputting MIDI data to the melody of the Penn State Alma Mater.

Procedure:

1. Open the “Prof” folder on the desktop and double click “Alma Mater.” The MusicShop program will open. The “Prof” folder contains the accompaniment to the Alma Mater. Students will then complete the Alma Mater by adding the melody.
2. Check the “Multi” button on the piano keyboard to be sure it lights up. If not, press the button until it lights.
3. Check Track 1 on the left-hand side of the screen to be sure it is selected and appears light blue. If not, take the mouse and click on it until it appears light blue.
4. Click and hold the picture of the Trumpet above Track 1. Then, select the instrument you wish to use to play the Alma Mater.
5. At the top right hand side of the screen above the word “Quantize,” the word “Edit” should appear in a box. If it does not, click and hold the mouse button until “Edit” appears.
6. When in MusicShop, click on the “Step” button and check to be sure the first note is the same as the first note in the Alma Mater.
7. With Figure 1 of the piano keyboard handy, press the corresponding keys (notes) of the Alma Mater using the corresponding letters on the keyboard. Do this for every note.

Recording Notes:

- To delete a note incorrectly entered, press the delete key.
  - Every time a different note appears in the Alma Mater, change to the corresponding note in the step window.
8. When done, go to “File” and click on “Save As.” Save the melody with the previously recorded accompaniment to your floppy disk as <YOUR LAST NAME\_Alma Mater>.
  9. If you wish to listen to your rendition of the Alma Mater, close the step window altogether, and at the top left of the screen, click the “Play” button.

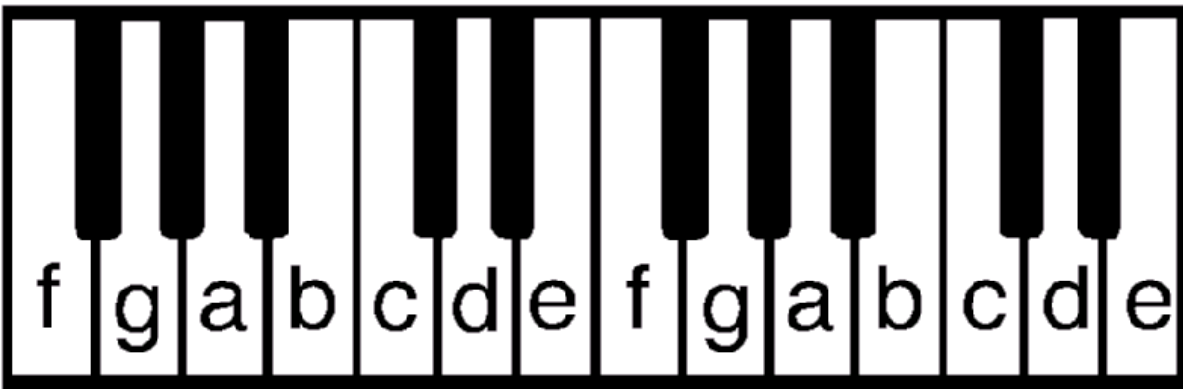


Figure 1. Keyboard.

## **Part II -The Rhythm**

The following is for step-by-step input of the rhythm for the Penn State Alma Mater using a drum pattern.

Procedure:

A. To start,

1. Turn computer, monitor, and speakers ON.
2. Turn Korg X5D Keyboard ON; button is at right rear.
3. Open MusicShop using desktop icon.

B. In a new file,

1. Select Track 1 from the vertical list at the far left. (Track 1 should be light blue in color when selected.)
2. Press the “Multi” button on the X5D Keyboard. It should turn red.
3. In MusicShop, click and hold the small “Trumpet” icon above the track list. Choose “0 GM Kit.”
4. Test keyboard sounds. -If everything is configured properly and the speakers are turned on, you should hear percussion sounds, with the drum kit mostly on the left side of the keyboard. See Figure 2.
5. Click the icon with word “Step.” A menu should pop up on the right side. Within this menu a small icon of a musical note should appear. A 16<sup>th</sup> note should appear. If not, click and hold to change the selection to a 16<sup>th</sup> note. At this point, any notes played on the X5D Keyboard will be recorded sequentially as you play them. The recording will be made, not in real time, but note-by-note, i.e., step-time. Leaving the “Step” window open, proceed to Part C.

C. Choosing a drum machine pattern from the book (when starting, a good pattern to choose is “Disco 10” on page 25),

1. Enter the notes as they correspond to the various keys of the keyboard.
  - a. At the left side of the pattern grid are abbreviated terms for various types of drums (BD= Bass Drum, OH=Open Hi-Hat, etc.). A complete listing of abbreviated terms can be found in *260 Drum Machine Patterns* by Rene-Pierre Bardet<sup>6</sup>.
  - b. Given these terms, use Figure 2 of the keyboard diagram to determine the keys to be played.
  - c. If there is a shaded box in the pattern grid, a note is to be played at that time. If there are multiple notes in one column, they are to be played simultaneously. If there are no notes in a column, then there is a rest and you should press the Space Bar so as to advance the cursor.
2. Working from left to right, play the notes from the pattern on the keyboard at whatever pace is comfortable for you. The rhythm is not important, only the sequence of the notes played. If you make a mistake, use the Delete key to erase your previously entered note. A series of light-blue blocks will appear as you enter the notes. The pattern should resemble the respective pattern in the aforementioned book by Rene-Pierre Bardet.

3. Once the pattern is entered, you may listen to the computer play it back with the correct rhythm.
  - a. First, close the “Step” window.
  - b. Secondly, rewind the cursor using the icons on the top left.
  - c. And finally, press play. You should hear a drum-kit playing a pattern vaguely in the style of the description in the book.
4. After the drum pattern is correctly entered, you can set the computer to play it back continuously as a loop.
  - a. To do this, go to the “Setups” menu and check off “Loop Play/Record.”
  - b. Then, in the bar underneath the icon of a pencil, click the infinity symbol until it changes to the number 2.
  - c. At this point, playback will result in the pattern being repeated infinitely...as if it is being played continuously.

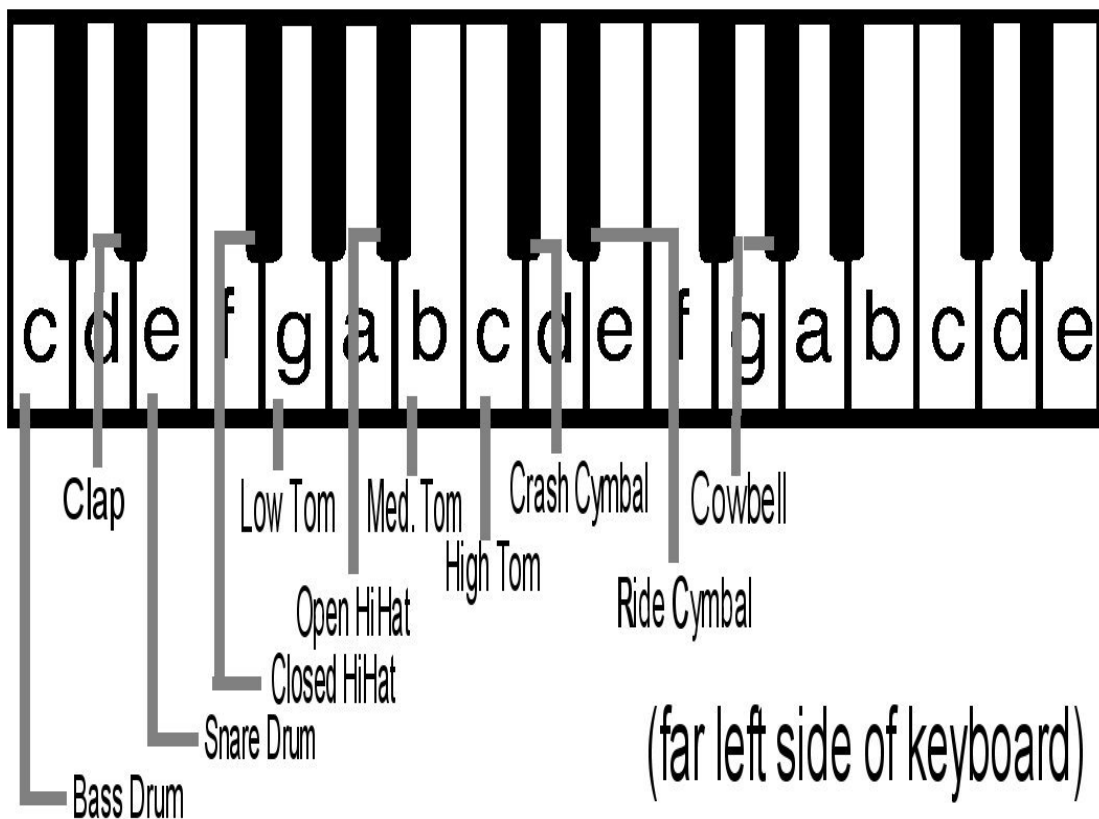


Figure 2. Keyboard with Percussion.

### Where Do We Go From Here?

The MIDI component for the introductory CmpSc 100 class, named Me & CompSc, is still in the preliminary stages of development. The melody and rhythm segments are being

revised as more students participate in the exercise and as more questions arise. There is also the issue of staffing and scheduling of physical lab space in future semesters

As Me & CompSc becomes part of the existing CmpSc 100 curriculum, several questions will remain to be answered. Will Me & CmpSc expand the experiential basis of the CmpSc 100 student? Will it make students aware of the relationship between computers and music? Will the MIDI exercise be the first in a series of collaborative efforts to develop interdisciplinary prototype modules for inclusion in music, engineering, and computer science at Penn State Abington? Will it serve as the basis for the development of additional modules and possibly the development of a future Freshmen Seminar course involving Computers and the Arts?

Much has yet to be done. Stay tuned for future developments.

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