MIDI Input into LilyPond

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Beginning May 30, 2016, for 10 Weeks

Project Proposal

Description

The goal of this project is to create a more user friendly input mechanism to a free, open source, music scorewriter, LilyPond, thereby making it more accessible to the community.

LilyPond is a music engraving (typesetting) program. It works very much like the TeX typesetting program, but is designed to create music scores. The input to LilyPond is a text document containing source syntax that describes a music score. This input text document is compiled by LilyPond to produce a graphical representation of the music score in an output PDF file.

LilyPond's graphical output is excellent. Finale and Sibelius are other programs that perform the same function as LilyPond. These programs cost around $600 per year. The graphical representation of music by these programs is sometimes not as good as LilyPond's. However, these programs have the advantage of being able to take input directly from instruments as they are played, relieving the user from creating the input text file that LilyPond requires. Another disadvantage of LilyPond is that the syntax of its input file is difficult to learn and tedious to write by musicians.

The Musical Instrument Digital Interface (MIDI) is the standard language computers use to represent computer input and output to and from electronic musical instruments. This project will capture the MIDI signals generated by a playing instrument and use these signals to generate the input file for LilyPond. By doing this, LilyPond becomes a program on par with scorewriters such as Finale or Sibelius, but not with the $600 per year cost those both require. Providing LilyPond with a MIDI input interface allows LilyPond to be more usable to the entire musical community.

Roles and Responsibilities

Edward has impressed me with his motivation to learn and command of the disciplines he studies. He is a self-starter and able to work independently. He is capable of completing this project with limited help from others. It is expected that Edward will take the lead role in completing this project. It is expected he will contact me promptly if he has problems. My

role will be to provide Edward with the resources and support he needs to understand how to accomplish the technical aspects of the project. I will also meet regularly with Edward to help him with any difficulties that he may encounter. I will also help in the preparation of any profession papers or posters that we may wish to present in various forums.

Project Timeline

- Week 1: Access MIDI input from Python

- Weeks 2-4: Create MIDI single-note interpreter

- Weeks 5-7: Build LilyPond single-note syntax from MIDI input signals

- Week 8: Create MIDI multi-note interpreter

- Weeks 9-10: Build LilyPond multi-note syntax from MIDI input signals

Student Engagement

Through this project, Edward would be gaining experience with software development, language translation, manipulation of hardware from high-level programming languages, interpretation and manipulation of pre-written code, and methods of learning unique interfaces, such as the Musical Instrument Digital Interface (MIDI) and programming to an interface. This project also improves Edward's skills with software design patterns, as well as, management and implementation of a large scale software project.

Contribution to the Discipline and the Community

Throughout the years, many different techniques have been used to typeset music, and each one has been difficult. Before the use of computers became common, composers used paper and ink, taking an extraordinary amount of time to create just one page of one piece of music. If multiple copies were requested, each one would need to be scribed again. It is very easy to see how this may be difficult for composers.

Luckily, technology evolved as time moves on. What was once just writing music became actual typesetting with a typesetter. Paper would get stamped with whatever notes were inserted on the print press. Of course this too took a long time, but now music was not sloppy and did not look hand-written. It now became beautiful.

When personal computer became mainstream, music typesetting programs were created. These programs, usually called scorewriters, were the best things available to composers, orchestrators, and musicians in general. The two programs that dominated the market by the turn of the century were Finale, mostly dominating the United States market, and Sibelius, dominating the market everywhere else.

Of course, both of these programs had downsides. Firstly, each has a very hefty cost associated with it. At current pricing, each program is $600 a year to keep up with current updates. Most composers use both programs as each one has its benefits. Secondly, the graphical output can be subpar. When printing out scores on both Finale and Sibelius, it cannot even be assumed what one sees on the screen is what will be printed out. Although these programs make it very easy to create music scores, their output is not always what one desires.

There is another music typesetting program that many people are fond of called Lily-Pond. It is a free, open source, program. LilyPond inputs a score encoded in a text document, which it then translate to a PDF file presenting beautiful music scores. LilyPond's scores are accurate and look like they were typeset by a machine. In fact, the font LilyPond uses is based on those used by old typeset scoring machines. The output from LilyPond is superior and is almost always done accurately.

As described above, LilyPond's input is a text document containing a description of the score to print. Music scores are described in this input file using a very strict syntax that is difficult for many to learn. For software programmers, such as the principal investigators, it is easy to understand this syntax after a bit of effort. For musicians, it is much more difficult to learn and understand the input file syntax. The syntax is not intuitive for musicians. The difficulty in learning the input file syntax for LilyPond turns people away from using this great program.

This project seeks to combine the ease of input featured by other scorewriters with the beautiful output produced by LilyPond. This will be accomplished by creating a program that will read MIDI input directly from a playing instrument and automatically creating the input file for LilyPond. The creation of this program will make LilyPond more usable and therefore more accessible to the general public. Not only does this help the LilyPond get more users, but LilyPond users will spend much less time creating the score and more time being a musician. Since LilyPond's graphical output of the music score is superior to other programs, it will make reading the score easier for more people. The easily readable output of LilyPond will help the performer understand the music, meaning more time can be spent teaching and performing, rather than guessing at what is supposed to be taught or performed. Lastly, LilyPond is typically used in musicological documents as it can be input into word processors. Easing the use of the program helps more people start research in these areas, helping to promote understanding of music.

Expenditures

Edward owns all the musical instruments and computers necessary for the completion of this project. The only expenditures requested are the stipend and housing.

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Dr. Gregory Schaper,
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On-Campus Housing is Requested

Student Statement of Purpose

I have been a musician since I was 2 years of age. I started off on the piano playing simple melodies. Now, at the age of 20, I am a composer, orchestrator, and performer, which means I have a lot of music that I need to get typeset.

When Dr. Schaper approached the Computer Science Department with a proposal to work with someone on a music-based SOAR project, I was very happy. I contacted him expressing my interest in doing such a project with him. This project will benefit the musician in me and the computer scientist that I want to be.

This idea of creating a MIDI interface for LilyPond has been with me for years. I have been trying to use scorewriting even through my pre-college career, including writing simple pep tunes for my high school's marching band. I was able to get the scores done very easily without a problem, but whenever I would print out the parts, the first thing that I was tasked on doing is making the parts more readable since the output was so terrible. The software I used then is nonexistent anymore, so I am glad no one can see the horrible output it makes.

Presently, there are three major music scoring program competitors. Finale and Sibelius pretty much own the market but have an annual cost of $600. I have always used LilyPond because it is a free, open source, music scoring program. As an unemployed student I am forced to use the cheapest solution I can find.

Strangely, LilyPond requires different input than the other two program. Finale and Sibelius both directly input MIDI signals from instruments as they are played. This makes life much easier for the users of these programs. LilyPond, however, uses a text document containing a lot of confusing syntax for input. I can understand LilyPond's syntax now with ease after using it so much. However, for anyone who is not a programmer, this is a troublesome issue. Because LilyPond is difficult to use, I am always hesitant about recommending LilyPond to others. I know it will confuse them to no end.

This project should change that. Not only will it make my life easier if I can use MIDI inputs with LilyPond, but it will make everyone else enjoy the program more since it will not be as difficult to use. For a savings of $600 a year, it seems obvious to me that LilyPond should be the choice for many. Completion of this project will not only benefit me, but it will benefit everyone to be able to more easily use LilyPond.

Building a MIDI input for LilyPond is only one of the benefits I will receive from this project. I will also be able to put into practice many of the concepts and theories I am learning in my computer science courses. Many software design and engineering concepts are not easy to appreciate until one works on a large scale project like this. I will be able to put into practice:

- the use of Software Engineering techniques, such as, design patterns

- accessing computer hardware components from high-level programming languages

- use of code sharing websites that facilitate working with teams on programming projects

- comprehending and using Application Programmer Interfaces

- using and modifying existing code bases

- implementing a translator

- management of a large software project

These experiences will help me prepare for a career in software engineering and give me a small taste of what jobs are like in the real world. This experience will also help me gain experience and confidence in performing independent research, and also research in conjunction with my professors. This project is the type of academic experience I wanted to have when I decided to attend Moravian. I know it will be a big help to me in preparing myself for any and all opportunities that present themselves after I am finished at Moravian.