

**Title of Session:** Math and Technology - Music Algorithms

**Moderator:** David Weksler

**Guest Speaker:** Jonathan Middleton

**Title of File:** 20051115mathtechmusic

**Date:** November 15, 2005

Room: Math and Technology Group

**DavidWe:** We'll start this discussion shortly, but we begin most presentations in Tapped In with introductions. So a bit about who/where you are and what you do, if you don't mind

**BJB2:** I'm an art teacher in Pennsylvania

**DavidWe:** I'm David Weksler and I'm the host/owner of the MathTechEd Group in Tapped In. I help math teachers (and others) learn more about educational technology and I'm in New Jersey, near New York City

**JonathanNM:** I'm Jonathan Middleton Asst. professor of Music Composition at Eastern Washington University

**DavidWe** nods

**DavidWe** . o O ( next? )

**MarkGst7:** Hey, V. I'm a post-bach Music Composition major, with an interest in multimedia.

**VaraiaP:** I am 21 / EWU student extraordinaire finishing B.A. Theatre, B.A. Physics, minor in Mathematics by Fall 06

**DavidWe** is impressed with Jonathan's students

**MarkGst7:** is getting used to the lingo.

**JonathanNM:** thanks, they are terrific

**DavidWe** smiles

**DavidWe:** Kelli?

**KelliAW:** I am a first grade teacher at a private school in Brentwood, Ca. I graduated from USC undergrad (Go Trojans!) and am currently doing my masters in education at Pepperdine. I am here to learn about any new ways of incorporating technology into my

classroom. Since I work at a private school, budgets really aren't a problem, so anything you all can offer would be great

**JeffC:** I'm an Ed TEch Consultant, and on Helpdesk here at Tapped In.

**DavidWe** thanks everyone for the introductions

**DavidWe:** I met Jonathan a few weeks ago and was intrigued with his program/web site for Musical Algorithms

**DavidWe:** We arranged to have him do a Tapped In presentation and please give him your attention

**DavidWe:** All yours, Jonathan

**JonathanNM:** This is the site to go to <http://musicalgorithms.ewu.edu>

**JonathanNM:** Please click on the link in blue

**JonathanNM:** and arrange your browser windows

**DavidWe:** If any of you have windows and your browser has a pop-up blocker, you may need to hold the Control key and click the link

**JonathanNM:** so that you can see both Tappedin and musicalgorithms

**JonathanNM:** The software is designed to create an interdisciplinary learning environment

**VaraiaP:** there are also blogs set up mine has good stuff  
<http://www.lifeofbrain.blogspot.com> and this is the main one  
<http://www.musicalgorithmsewu.blogspot.com> hope those show up

**JonathanNM:** that is user-friendly

**DavidWe** nods

**JonathanNM:** The purpose is to engage students

**JonathanNM:** from a variety of backgrounds

**DavidWe:** Are you using this with your EWU students?

**JonathanNM:** both scientific or artistic

**JonathanNM:** of course

**DavidWe** smiles

**JonathanNM:** I use it for composition lessons

**VaraiaP:** and homework

**JonathanNM:** to teach students how to be super creative

**JonathanNM:** ahh yes homework

**JonathanNM:** the nicest kind

**KelliAW:** That sounds great! inspiring creativity in students can sometimes be a challenge

**JonathanNM:** Kelli and others may need to do a sound check - like most musicians

**VaraiaP:** one of the great things is that I couldn't escape it because it was online. I had no excuse.

**DavidWe** . o O ( no hiding, huh, Varaia? )

**JonathanNM:** Please click on the "compose" button

**VaraiaP:** yes forced creativity sooo cruel

**JonathanNM:** She did great on her homework

**DavidWe** smiles

**JonathanNM:** Does everyone see the compose button

**DavidWe:** yes

**KelliAW:** yes, I'm there

**JonathanNM:** Click on Fibonacci

**JonathanNM:** Does everyone see the Fibonacci Sequence?

**DavidWe** hopes he will be back

**KelliAW:** yes

**DavidWe** does

**VaraiaP:** ditto

**JonathanNM:** Click on it and type in a number - "10" in the top box

**DavidWe:** ok

**KelliAW:** ok

**JonathanNM:** Then click "Get algorithm output"

**JonathanNM:** You should see 10 Fibonacci numbers 1,1 ...

**DavidWe:** Hey, it's the Fibonacci sequence

**BJB2** nods

**KelliAW:** Gosh, I have this vague memory of learning this when I was in like 3rd grade

**JonathanNM:** Then go to the next orange area and click on "scale values"

**KelliAW:** something about a pineapple...

**VaraiaP:** wait till you come back to it in Calc II

**JonathanNM:** pineapple orange?

**DavidWe** . o O ( British mathematician who worked with the Math Forum, Ron Knott has a great page about this sequence:  
<http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fib.html> )

**DavidWe** apologizes for the aside

**JonathanNM:** oh no Fibonacci pineapple

**DavidWe** smiles

**KelliAW:** yeah something about that

**JonathanNM:** nice site

**DavidWe** clicked on scale values

**JonathanNM:** So...click on "scale values"

**BJB2** did that also

**KelliAW:** yep

**JonathanNM:** 0,2,2,5,7,12,20 should appear

**DavidWe** nods

**JonathanNM:** scroll down to the bottom and click "play"

**KelliAW:** yep

**SharonSta** joined the room.

**DavidWe:** Hi, Sharon. Welcome

**SharonSta:** thanks, I am a little late. Perhaps I'll just listen

**JonathanNM:** listen yes!

**DavidWe:** I can try to catch you up to where we are, Sharon. Hang on for a sec.

**DavidWe** . o O ( rather ominous )

**DavidWe:** Sharon, go to <http://musicalgorithms.ewu.edu>

**VaraiaP:** memories, light the corner of my mind. this brings it back, hear that beautiful tune.

**JonathanNM:** Kelli - do you see a window pop up called MIDI player?

**DavidWe** really likes this interface

**DavidWe:** The way the notes are indicated along with the numbers - very good

**JonathanNM:** Does Sharon need help?

**KelliAW:** I don't see the MIDI player

**SharonSta:** No, just listening

**DavidWe:** It should show up in a new window, Kelli - it's a JAVA applet

**JonathanNM:** Do you see a window that is blank?

**VaraiaP:** Did we go over browser specifications?

**JonathanNM:** not yet

**DavidWe:** Good thought, Varaia

**KelliAW:** I don't see one, but I have JAVA so it should work

**DavidWe** agrees with Kelli

**KelliAW:** Is there another button I need to push, the last thing I did was hit scale values?

**JonathanNM:** Do you have a blank window greyed out?

**DavidWe:** Which web browser are you using, Kelli?

**KelliAW:** internet explorer

**DavidWe:** Did you go to Section 4 COMPOSE?

**JonathanNM:** Push play at the bottom of the entire window

**JonathanNM:** Yes section 4!

**KelliAW:** Yep, I have the gray window now

**DavidWe** smiles

**DavidWe:** Click the "Play" button below the image of the keyboard, Kelli

**JonathanNM:** You should see a piano

**JonathanNM:** Mark- can you see the text ok?

**KelliAW:** I pushed play but it is just a gray box that says MIDI player at the top, no piano

**DavidWe:** oh

**DavidWe** . o O ( not what I have )

**JonathanNM:** was there a coffee "java" cup or anything else?

**KelliAW:** nope

**VaraiaP:** Her browser may be old? Safari or Explorer?

**DavidWe** . o O ( IE )

**JonathanNM:** Kelli, do you have more than one browser?

**KelliAW:** I have netscape

**JonathanNM:** Firefox, Explorer, or other?

**BJB2:** I'm using Explorer and got everything fine

**DavidWe** smiles

**KelliAW:** Nope just internet explorer and netscape

**DavidWe:** Are you using Windows, Kelli?

**DavidWe** . o O ( not Mac? )

**KelliAW:** yep

**JonathanNM:** Can you open another browser window?

**JonathanNM:** and copy the URL address into the top

**DavidWe** . o O ( <http://musicalgorithms.ewu.edu> )

**DavidWe:** Still with us, Kelli?

**VaraiaP:** for the rest of you... we found that in testing the tempo control was affected by how fast your browser was so it was not completely accurate but it was close.

**DavidWe:** Thanks, Varaia

**KelliAW:** Okay so I tried it in netscape and the grey box popped up with a coffee cup and then went to an X so I obviously don't have something that I should, but I will listen to the discussion anyways

**DavidWe:** Which browser worked most consistently?

**JonathanNM:** The response varies

**DavidWe** nods to Kelli

**DavidWe:** I can trouble-shoot browsers with you later, Kelli, if you like

**VaraiaP:** there are 128 voices that you can choose from on the (grey) instrument bar from space sounds to piano

**KelliAW:** Thanks, I'll just listen and take in what I can

**JonathanNM:** There is a learn more button in step 4 that can help users install plugins

**DavidWe:** I've been using the harpsichord

**JonathanNM:** That is, JAVA plugins

**DavidWe:** . o O ( ooh, bag pipe )

**SusanR** joined the room.

**DavidWe** waves to Susan

**DavidWe:** Welcome back, Jeff. Hi, Susan

**DavidWe:** We're at the following page:

**SusanR:** Thanks

**DavidWe:** <http://musicalgorithms.ewu.edu/algorithms/Fibonacci.html>

**JonathanNM:** I thought we might listen to Phi

**DavidWe:** Sounds good to me, Jonathan

**JonathanNM:** which is related to the Fibonacci series

**JonathanNM:** go to the compose button again

**JonathanNM:** which is blue at the top

**DavidWe** nods

**VaraiaP:** taking you back to the main page

**JonathanNM:** click on "Constants"

**DavidWe** is on the Constants page

**JonathanNM:** You should see a selection of Pi, Phi, and e

**BJB2** nods

**JonathanNM:** . o O ( good )



**KelliAW:** yep

**SusanR:** yep

**JonathanNM:** click on the circle for phi

**DavidWe:** ok

**JonathanNM:** and in section B ask for 30 digits

**SusanR** nods

**JonathanNM:** 1.618033988749894....

**DavidWe** . o O ( click Algorithm output, right? )

**JonathanNM:** We will create a decimal expansion

**BJB2** . o O ( Jonathan has that number memorized? )

**JonathanNM:** so that commas are inserted between each number

**DavidWe** nods

**JonathanNM:** click on "Get algorithm output"

**KelliAW:** okay

**JonathanNM:** now click on the word "keyboard" in blue Step 2 far right

**JonathanNM:** oops "keyboard" is in grey

**DavidWe** . o O ( far left? )

**JonathanNM:** It is under the "Pitch" text in orange - yessss left

**DavidWe** smiles

**KelliAW:** okay

**JonathanNM:** at least I know some things

**DavidWe** smiles

**BJB2** chuckles

**JonathanNM:** The keyboard has numbers !!!

**JonathanNM:** the numbers from phi will map onto the numbers in the keyboard range

**JonathanNM:** It would be nice to "place" the phi numbers

**DavidWe** nods

**JonathanNM:** in a mid-keyboard range

**JonathanNM:** no, rather

**JonathanNM:** a mid to high keyboard range

**DavidWe:** okay

**JonathanNM:** under Scaling in step 2

**BJB2** wonders how to do that?

**JonathanNM:** insert 40 to place of zero - leave the 88 as is

**JonathanNM:** zero is on the LEFT and 88 on the RIGHT

**BJB2** winks...got it.

**DavidWe** has it

**KelliAW:** I'm with ya!

**JonathanNM:** Now click "scale values"

**DavidWe** smiles

**DavidWe:** okay

**KelliAW:** yep

**JonathanNM:** 45,72,45,82,40,56..... should appear

**BJB2:** stay at division operation?

**JonathanNM:** yes

**JonathanNM:** This is a proportionate operation

**DavidWe:** meaning?

**JonathanNM:** among the digits of phi

**JonathanNM:** there are only numbers 0-9

**JonathanNM:** high numbers become high pitches

**DavidWe** understands

**JonathanNM:** and low numbers become low pitches

**JonathanNM:** so...

**JonathanNM:** 9 becomes 88

**JonathanNM:** 0 becomes 40 on the keyboard

**DavidWe** nods

**JonathanNM:** here we see 1 in phi is pitch "45"

**JonathanNM:** 6 is "72"

**SusanR** nods

**JonathanNM:** The interesting thing for me is

**BJB2:** yes

**KelliAW:** I see...

**JonathanNM:** I really have no clue what these pitches are

**JonathanNM:** So there is always a surprise

**DavidWe** . o O ( high and low pitches )

**JonathanNM:** The melody could be pleasant

**DavidWe** smiles

**JonathanNM:** or dissonant

**JonathanNM:** but at least it is related to phi

**JonathanNM:** There is also a convert button to

**KelliAW:** is there any way to figure out how it would sound?

**JonathanNM:** physically change things that "I don't like"

**DavidWe:** Well, I hope we will play it soon, Kelli

**JonathanNM:** Sorry - got carried away

**JonathanNM:** Kelli we will have to trouble shoot for you at some point

**KelliAW:** okay

**JonathanNM:** I'd like to make this melody rhythmic

**JonathanNM:** go down to step 3

**JonathanNM:** under scaling

**JonathanNM:** in bold

**DavidWe** nods

**JonathanNM:** click on "perform modulo operation"

**JonathanNM:** oops - you may need to undo the check next to Use a 2

**DavidWe** thanks Jonathan for that tidbit

**JonathanNM:** This undoes the default setting

**DavidWe** nods

**BJB2:** done

**JonathanNM:** is everyone there?

**GailH** joined the room.

**MarkGst7:** yep

**DavidWe:** Hi, Gail. Welcome

**KelliAW:** yep

**DavidWe:** <http://musicalgorithms.ewu.edu/algorithms/constants.html>

**BJB2** hugs Gail

**JonathanNM:** enter values 1 and 3 in place of 0 and 5

**DavidWe** . o O ( that's where we are, Gail )

**GailH** was trying to sneak in (just got home!)

**DavidWe** . o O ( okay, 1 3 )

**JonathanNM:** 2,1,2,3,1,1,1,1,3,3,2,2,1,3,1,2,3, should appear

**JonathanNM:** if you click on "scale values"

**DavidWe** . o O ( Click on "Scale values" )

**BJB2** nods

**KelliAW:** okay

**DavidWe:** This changes the length of the "notes", right?

**JonathanNM:** yes

**DavidWe** . o O ( quarter note, half-note, etc. )

**JonathanNM:** low numbers are short

**JonathanNM:** high numbers are long

**JonathanNM:** 1,6,1,8,0,

**JonathanNM:** is now

**JonathanNM:** 2,1,2,3,1

**DavidWe** nods

**KelliAW:** yep

**JonathanNM:** mod is more whacky than division

**DavidWe** . o O ( Modulo arithmetic is kind of cool, though )

**JonathanNM:** I love mod

**JonathanNM:** I can never predict the outcome

**DavidWe** smiles

**JonathanNM:** click play in step 4

**JonathanNM:** If you can read music

**JonathanNM:** you can also click "Notate"

**DavidWe:** Way cool!

**DavidWe:** I like that

**DavidWe** reminds everyone that we are close to the end of the hour

**JonathanNM:** Can anyone hear a melody

**GailH** made sounds that sound like I am three (which is probably about what I know).

**DavidWe** hopes Jonathan might be able to answer some questions, if there are any

**SusanR:** yes

**JonathanNM:** There is a tempo slider to make it play faster

**DavidWe** nods

**JonathanNM:** With more time, I would suggest doing the same settings with e or pi

**VaraiaP** . o O ( for extra credit change your scaling values from 50-88 to 41 to 53 instead, choose perform division operation, click Scale values button, modification set to convert 42 to a 48, click convert values, scroll down click play. This is much less dissonant. )

**JonathanNM:** and comparing melodies

**DavidWe:** Thanks for the extra credit challenge, Varaia

**JonathanNM:** Some are clearly advanced users

**JonathanNM:** of whom I am proud

**DavidWe** smiles

**JonathanNM**: less dissonant is a good thing too

**KelliAW**: wow, that is very interesting, but it does sound kind of like a little kid just hitting random numbers.

**DavidWe**: Varaia, did you have much of a musical background before you encountered this in your music course?

**KelliAW**: p.s. I got the keyboard to come up! Yeah!

**DavidWe**: Way to go, Kelli!

**JonathanNM**: Kelli - there are other settings that could make it sound better

**VaraiaP**: yes I was actually majoring in music when I arrived at EWU, Tuba for 6 years

**DavidWe** smiles

**JonathanNM**: This example is a bit abstract

**DavidWe**: Tuba, really?

**DavidWe** is really impressed with Varaia

**JonathanNM**: Kelli- Varaia made music from star charts that sounds like Mozart

**KelliAW**: well, I really don't know much about much so I wouldn't really know, but like you said more dissonant would be better

**VaraiaP**: they are on my blog so all you have to do it put them in the program and follow the instructions

**JonathanNM**: More ?

**KelliAW**: Varaia sounds very talented

**DavidWe** agrees with Kelli

**JonathanNM**: absolutely

**JonathanNM**: Mark is talented too

**JonathanNM**: He is just more low key

**DavidWe:** Jonathan, are there any suggestions for using the software with younger children?

**MarkGst7:** Thanks

**DavidWe** smiles

**VaraiaP:** yes Mark has an excellent vocal ability

**JonathanNM:** You can hear their music

**DavidWe:** Where?

**KelliAW:** yes, that is a great question!

**DavidWe:** Check out: <http://musicalgorithms.ewu.edu/>

**JonathanNM:** we are creating music from numbers

**JonathanNM:** you don' need musical training

**VaraiaP:** teaching across the curriculum math, science and music combined

**JonathanNM:** it is interdisciplinary

**KelliAW:** so they can see the correlations between the numbers and the scales, like fractions right?

**JonathanNM:** and hopefully...

**JonathanNM:** user-friendly

**DavidWe:** If anyone here wanted to contact you about some more ideas, Jonathan, what would be the best way to do that?

**JonathanNM:** my email is in "contact us"

**DavidWe** reminds everyone that a transcript of this discussion will be available in the Tapped in archives in about a week

**DavidWe:** In addition, members should get an email with the transcript soon after they logout of Tapped In

**JonathanNM:** musical examples are in "About Site"

**JonathanNM:** These are headings at the top of the web page



**KelliAW:** great thank you so much for sharing your knowledge

**DavidWe:** Anyone else have comments or questions?

**MarkGst7:** Varaia, what's the blog site again?

**JonathanNM:** you are welcome

**DavidWe** really appreciates Jonathan and the EWU students for participating tonight

**DavidWe:** Great stuff, you guys

**DavidWe** would like to do this presentation again, at some point

**GailH:** Is Varaia an undergrad student (in math and physics)?

**JonathanNM:** yes

**BJB2** applauds appreciatively

**DavidWe:** She's a multi-variable student, Gail

**JonathanNM** bows

**JeffC:** Math Resources K-20 on the first Tuesday of December from 4-5 Pacific will be on FIRST... a Robotics program.

**SusanR** listens to the some of the examples..sounds surrealistic

**GailH** can tell that!

**VaraiaP:** <http://www.lifeofbrain.blogspot.com> and haha David

**DavidWe** applauds for the EWU team

**GailH** joins in applause.

**DavidWe** was a chemistry major - physics was too hard

**JonathanNM:** I thought you were a math teacher

**GailH** looks forward to the transcript being posted.

**MarkGst7:** got it

**VaraiaP:** I'm a glutton for punishment

**DavidWe:** Everyone is welcome to hang out, but feel free to leave, also

**DavidWe** smiles

**JonathanNM:** I'm afraid I must return home

**MarkGst7:** I miss the summer class.

**JonathanNM:** My wife is completing her MS thesis

**VaraiaP:** I can stay for a bit and answer questions

**BJB2** waves bye and goes to get ready for the Nuts About Nature discussion

**DavidWe:** Thank you, again, Jonathan. I think that went really well

**JonathanNM:** Thanks Varaia and Mark

**DavidWe** thanks Varaia

**JonathanNM:** Thanks everyone

**GailH** thanks all of you (including David who made it happen).

**VaraiaP:** Thanks Dr. Middleton we should do this again

**MarkGst7:** Sure

**DavidWe** agrees with Varaia

**SusanR:** Thank you..