CS 1124 Media Computation

October 13, 2008

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TODAY

- MIDI
- different ways of combining sounds
- fast talking
- Assignment 6
  - time warp to Chapter 10

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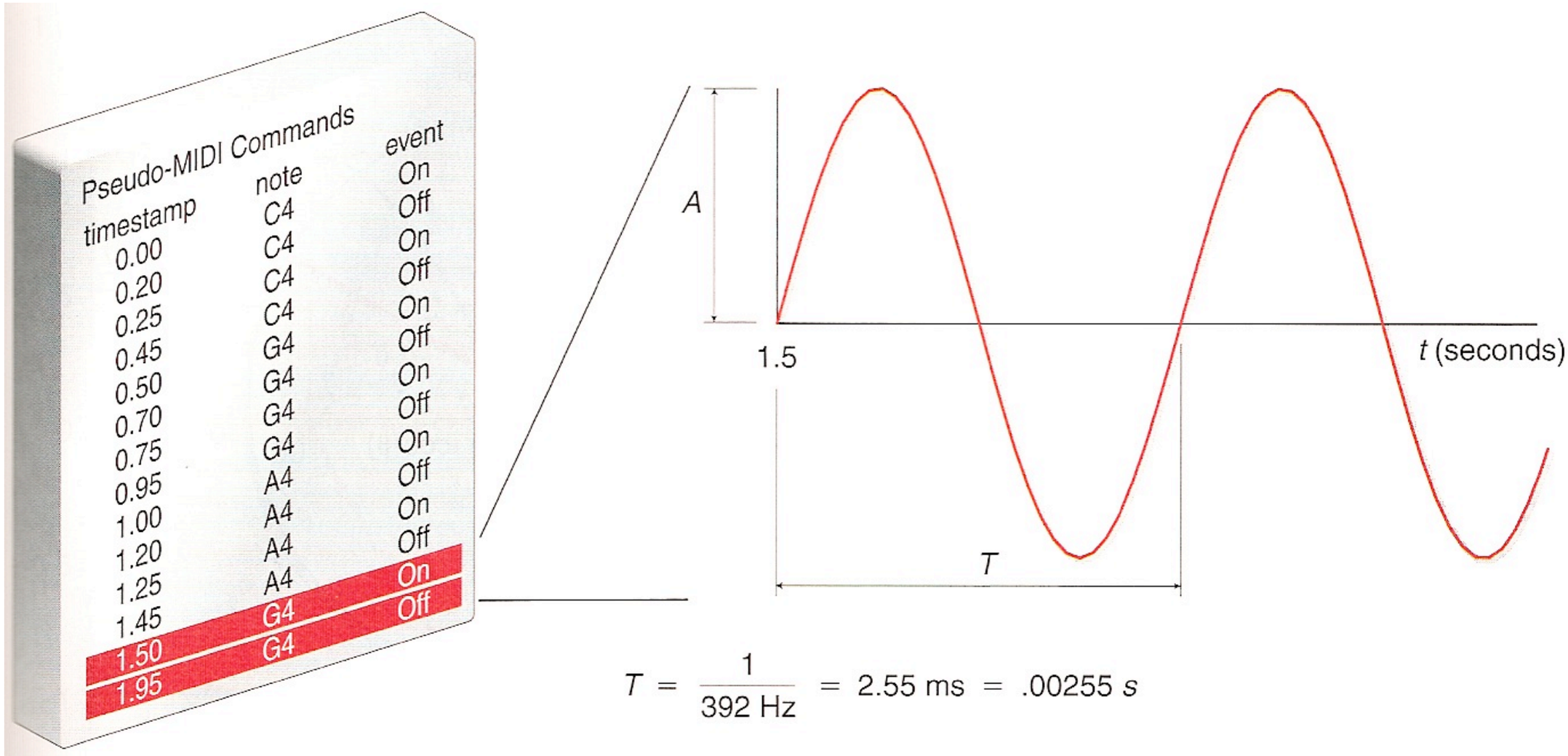


Figure 2.22 MIDI file producing a sinusoidal signal for the note G4 with a frequency of 392 Hz. The amplitude A and period T of the signal are shown.

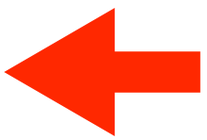
MIDI

- represent the sound waves
  - **.wav**
  - **our Jython sound functions**
- OR represent the "instruments"
- MIDI: *Musical Instrument Digital Interface*
  - **used to connect audio (and some video) devices**
    - instruments: keyboards, synthesizers, drum machines
    - synchronize events
  - **more compact representation - like vector graphics!**
- Jython's MIDI
  - **just plays the notes (alas)**
  - **sounds like a piano**

Playing MIDI notes

- recipe 74

```
def song() :
  playNote( 60, 200, 127 )
playNote( 60, 500, 127 )
playNote( 60, 800, 127 )
playNote( 60, 600, 127 )
for i in range( 1, 2 ) :
   playNote( 64, 120, 127 )
   playNote( 65, 120, 127 )
   playNote( 67, 60, 127 )
```



Can anyone explain this?

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Adding

- recipe 71 (part 2)

```
def addSounds( sound1, sound2) :
  for index in range( 1, getLength(sound1) + 1 ) :
    s1Sample = getSampleValueAt( sound1, index )
    s2Sample = getSampleValueAt( sound2, index )
    setSampleValueAt( sound2, index, s1Sample + s2Sample )
  return sound2
```

- NOTE: could also use average of s1Sample and s2Sample

Adding (50% of each)

- recipe 71 (part 2)

```
def addSounds( sound1, sound2) :
  for index in range( 1, getLength(sound1) + 1 ) :
    s1Sample = getSampleValueAt( sound1, index ) * 0.5
    s2Sample = getSampleValueAt( sound2, index ) * 0.5
    setSampleValueAt( sound2, index, int( s1Sample + s2Sample ) )
  return sound2
```

Adding

- A more general addSounds()

```
def addSounds2( sound1, sound2) :
  len1 = getLength( sound1 )
  len2 = getLength( sound2 )
  if len1 > len2 :
    longer = sound1
    shorter = sound2
    soundLen = len2
  else :
    longer = sound2
    shorter = sound1
    soundLen = len1

for shorterIndex in range( 1, soundLen ) :
        setSampleValueAt( longer, shorterIndex, getSampleValueAt( longer, shorterIndex ) + getSampleValueAt( shorter, shorterIndex ) )

  return longer
```

Adding without side effect changes

- The more general addSounds() --> return sound

```
def addSounds2( sound1, sound2) :
  len1 = getLength( sound1 )
  len2 = getLength( sound2 )
  if len1 > len2 :
    longer = sound1
    shorter = sound2
    soundLen = len2
    remainderLen = len1
  else :
    longer = sound2
    shorter = sound1
    soundLen = len1
    remainderLen = len2

target = makeEmptySound( (soundLen), getSampleRate( longer ) )

for shorterIndex in range( 1, soundLen ) :
        setSampleValueAt( target, shorterIndex, getSampleValueAt( longer, shorterIndex ) + getSampleValueAt( shorter, shorterIndex ) )

for remainder in range( soundLen, remainderLen ) :
        setSampleValueAt( target, remainder, getSampleValueAt( longer, remainder )  )

return target
```

Combining (alternating samples)

- not in book

```
def combine( sound1, sound2 ) :
  len1 = getLength( sound1 )
  len2 = getLength( sound2 )
  if len1 > len2 :
    longer = sound1
    shorter = sound2
    soundLen = len2
  else :
    longer = sound2
    shorter = sound1
    soundLen = len1

  for shorterIndex in range( 1, soundLen, 2 ) :

     setSampleValueAt( longer, shorterIndex, getSampleValueAt( shorter, shorterIndex ) )

  return longer
```

Lets see how these combining ideas work with pictures

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Fast talking

- not in book

```
def fastTalk( sound, thresholdAmplitude,
thresholdDuration ) :
  # this skips pauses between words
  sampleRate = getSamplingRate( sound )
  soundLen = getLength( sound )
  target = makeEmptySound( 1 + int(soundLen /
sampleRate) )
  thresholdCount = int( sampleRate *
thresholdDuration )
  targetIndex = 1
  count = 0
  targetJumpBackTo = 1

  for sourceIndex in range( 1, soundLen + 1 ) :
    sampleValue = getSampleValueAt( sound,
sourceIndex )

    if abs(sampleValue ) < thresholdAmplitude :
       count = count + 1
    else :
     if count > thresholdCount :
       targetIndex = targetJumpBackTo
     count = 0
     targetJumpBackTo = targetIndex

    setSampleValueAt( target, targetIndex,
sampleValue )
    targetIndex = targetIndex + 1

  return target
```

- Suggestion: normalize spoken sound, use a threshold = 800, duration = 0.01

Faster talking

- not in book

```
def fasterTalk( sound, thresholdAmplitude, thresholdDuration ) :
  # this skips pauses between words, overlaps words
  sampleRate = getSamplingRate( sound )
  soundLen = getLength( sound )
  target = makeEmptySound( 1 + int( soundLen / sampleRate) )
  thresholdCount = int( sampleRate * thresholdDuration )
  targetIndex = 1
  count = 0
  targetJumpBackTo = 1

  for sourceIndex in range( 1, soundLen + 1 ) :
    sampleValue = getSampleValueAt( sound, sourceIndex )

    if abs(sampleValue ) < thresholdAmplitude :
        count = count + 1
        sampleValue = 0        # different than fT,
    else :
        if count > thresholdCount :
            targetIndex = max ( 1, targetJumpBackTo - thresholdCount )      # different than fT, overlap
        count = 0
        targetJumpBackTo = targetIndex

    setSampleValueAt( target, targetIndex, sampleValue + getSampleValueAt( target, targetIndex ) ) # different than fT, add rather than replace

    targetIndex = targetIndex + 1

  return target
```

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ASSIGNMENT 6

- Speaking a phone number
- readPhoneNumber(phoneNumber, path)
  - phoneNumber is a string of characters (0 - 9)
  - path is path to the directory of 10 sound files
- Challenge
  - handle other characters like “(“ , “-” and “ “

Assignment 6

- How to read a string of characters?
- Chapter 10!
- Strings

```
>>> hello = “hello”
>>> for character in hello :
...         print character
...
h
e
l
l
o
```

Assignment 6, more

- Strings are also arrays

```
>>> hello = “hello”
>>> print hello[2]
l
>>> print hello[0]
h
```

- Yup -- strings start at 0
- So we have a couple of ways to read individual characters from a string
- And file names are strings... (“1.wav”, “2.wav” ...)
- + *concatenates* strings

Questions?

COMING ATTRACTIONS

- Wednesday
  - HW Project 5 due 10:00 am
  - Extra credit reports in class on sound abstraction
- Friday:
  - come to class with Group Project 2 ideas
  - leave with specification for project

COMING ATTRACTIONS

- Next Monday
  - read quiz 8 due 10:00 AM
- Next Wednesday
  - HW 6 due 10:00 AM
- Friday:
  - Group Project 2 due 2:00 PM
  - Bring to Lab