

# CAMPIMETRE

Jeffrey Wilson

Dominic Eccher

Ethan Galer

Client: Dr. Betsy Meinz, Department of Psychology,  
SIUE

April 12th, 2013

# MAJOR PROJECT REQUIREMENTS

- Add MIDI information to eye tracking data
- Record performance as a MIDI file
- Design and conduct studies
- Analyze raw eye tracking and eye fixation data
- Interfaces for workflow
  - Design
  - Run
  - Analyze



# EYE TRACKING LAB



# DESIGN

Study name:  Load Study...

Preview time for all scores:  
 seconds

Scores:

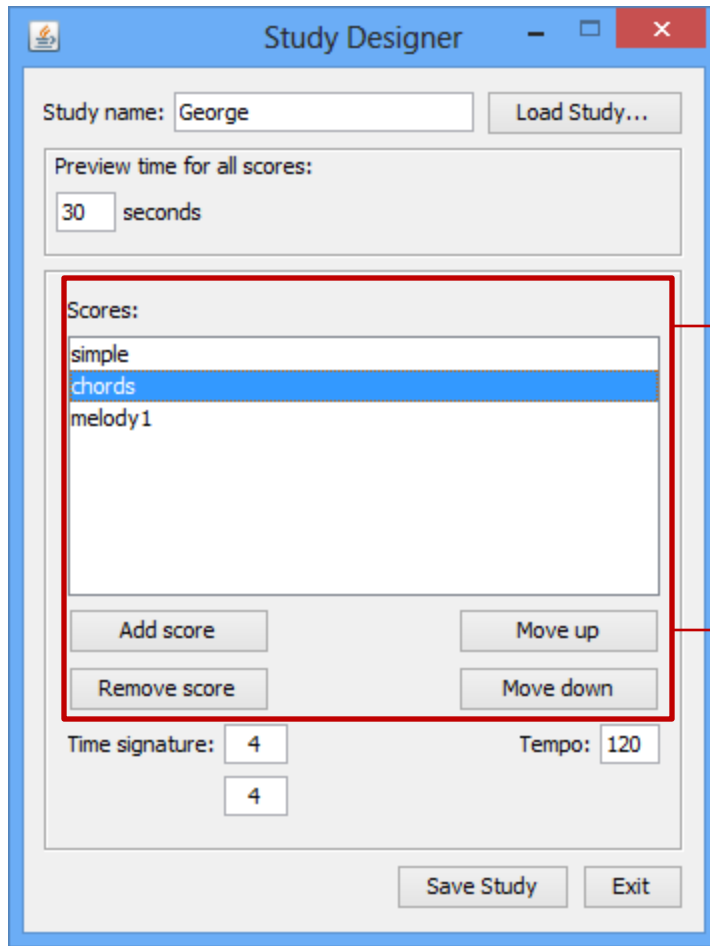
Time signature:  Tempo:

Each study has a name; client can load an existing study.

Scores are shown to the user for a specified amount of time.



# DESIGN



Score images are added to the study in a specific order.

Images can be reordered, or removed.



# DESIGN

Study name:

Preview time for all scores:  
 seconds

Scores:  
simple  
chords  
melody1

Time signature:   Tempo:

Scores have different time signatures and tempos. This is used to play a click track when running a study.



# CONDUCTING

An existing study is loaded into the runner.

Each participant is given an identifier.

The screenshot shows a software window with four main sections:

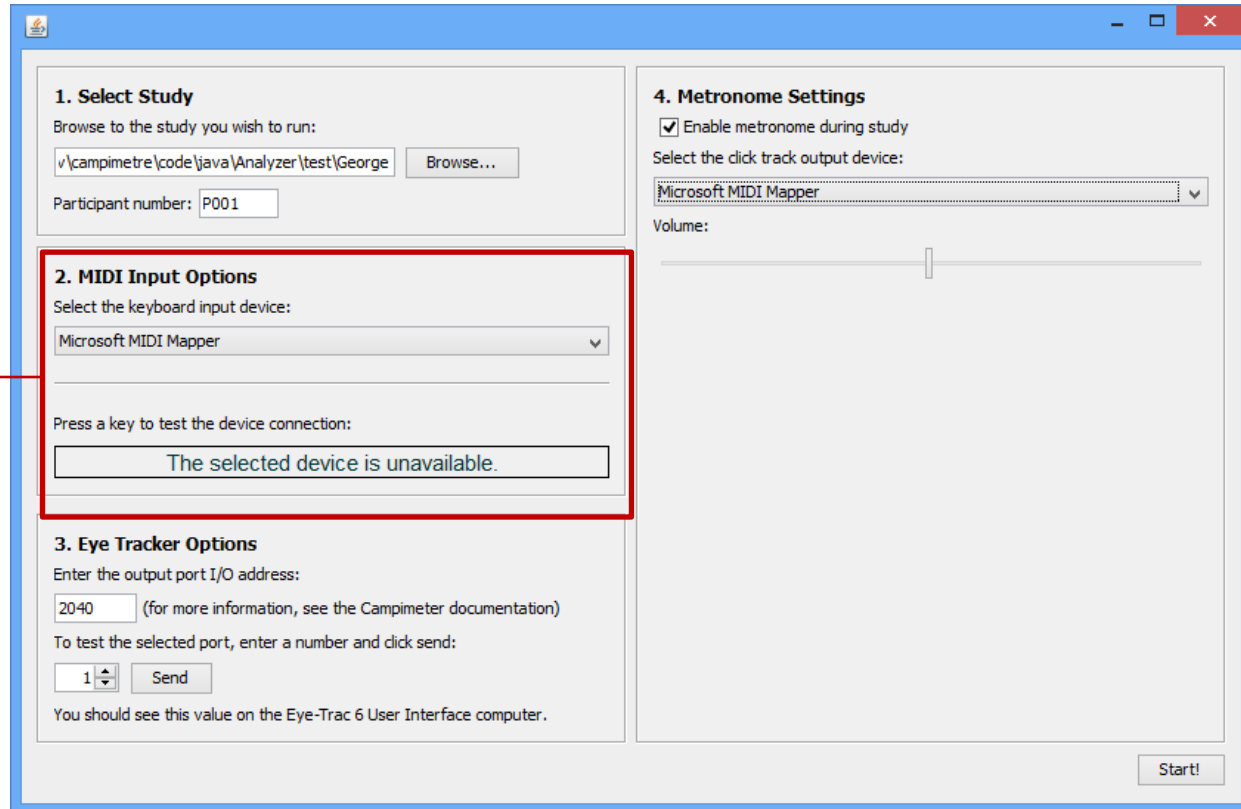
- 1. Select Study**: A red box highlights this section. It contains a text field with the path `v\campimetre\code\java\Analyzer\test\George`, a "Browse..." button, and a "Participant number" field containing "P001".
- 2. MIDI Input Options**: Contains a dropdown menu for "Select the keyboard input device:" set to "Microsoft MIDI Mapper". Below it is a button labeled "The selected device is unavailable."
- 3. Eye Tracker Options**: Contains a text field for "Enter the output port I/O address:" with "2040" entered. Below it is a dropdown menu for "To test the selected port, enter a number and click send:" set to "1", and a "Send" button.
- 4. Metronome Settings**: Contains a checked checkbox "Enable metronome during study", a dropdown menu for "Select the click track output device:" set to "Microsoft MIDI Mapper", and a volume slider.

A "Start!" button is located at the bottom right of the window.



# CONDUCTING

Client can select and test a MIDI input device, such as a keyboard.



The screenshot shows a software window with four main sections:

- 1. Select Study**: Includes a text field with the path `v\campimetre\code\java\Analyzer\test\George`, a `Browse...` button, and a `Participant number: P001` field.
- 2. MIDI Input Options**: This section is highlighted with a red box. It contains a dropdown menu for `Select the keyboard input device:` with `Microsoft MIDI Mapper` selected. Below it is a text box for `Press a key to test the device connection:` containing the message `The selected device is unavailable.`
- 3. Eye Tracker Options**: Includes a text field for `Enter the output port I/O address:` with `2040` entered, a `Send` button, and a dropdown menu for testing the port.
- 4. Metronome Settings**: Includes a checked checkbox for `Enable metronome during study`, a dropdown for `Select the click track output device:` with `Microsoft MIDI Mapper` selected, and a volume slider.

A `Start!` button is located at the bottom right of the window.





# CONDUCTING

**1. Select Study**  
Browse to the study you wish to run:  
   
Participant number:

**2. MIDI Input Options**  
Select the keyboard input device:  
  
Press a key to test the device connection:

**3. Eye Tracker Options**  
Enter the output port I/O address:  
 (for more information, see the Campimeter documentation)  
To test the selected port, enter a number and click send:  
   
You should see this value on the Eye-Trac 6 User Interface computer.

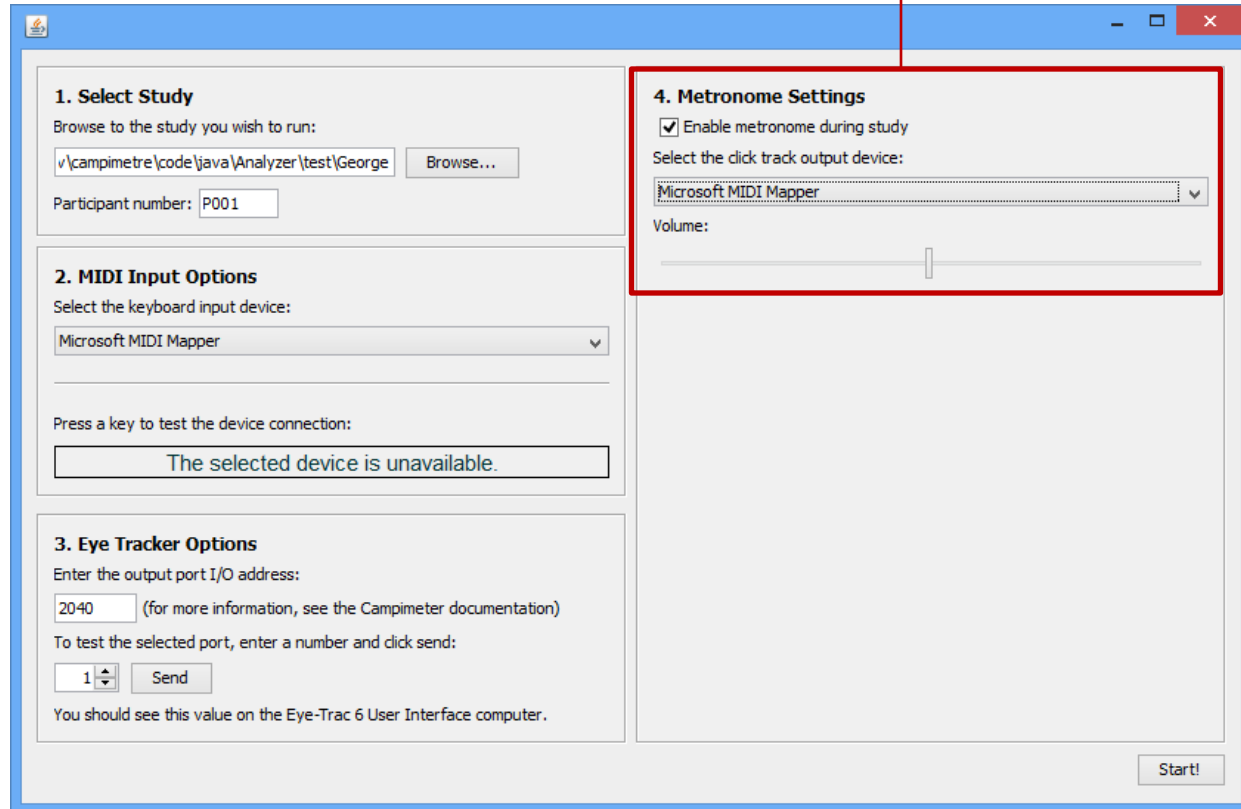
**4. Metronome Settings**  
 Enable metronome during study  
Select the click track output device:  
  
Volume:

Eye tracker  
output can be  
configured  
and tested as  
well.



# CONDUCTING

While playing the score, participants may be allowed to use a metronome.



**1. Select Study**  
Browse to the study you wish to run:  
   
Participant number:

**2. MIDI Input Options**  
Select the keyboard input device:  
  
Press a key to test the device connection:

**3. Eye Tracker Options**  
Enter the output port I/O address:  
 (for more information, see the Campimeter documentation)  
To test the selected port, enter a number and click send:  
   
You should see this value on the Eye-Trac 6 User Interface computer.

**4. Metronome Settings**  
 Enable metronome during study  
Select the click track output device:  
  
Volume:



# CONDUCTING

Moderately slow

2

*mf-p*

*mf-p*

2

The original score image specified in the designer.

27

The score is previewed for 30 seconds here



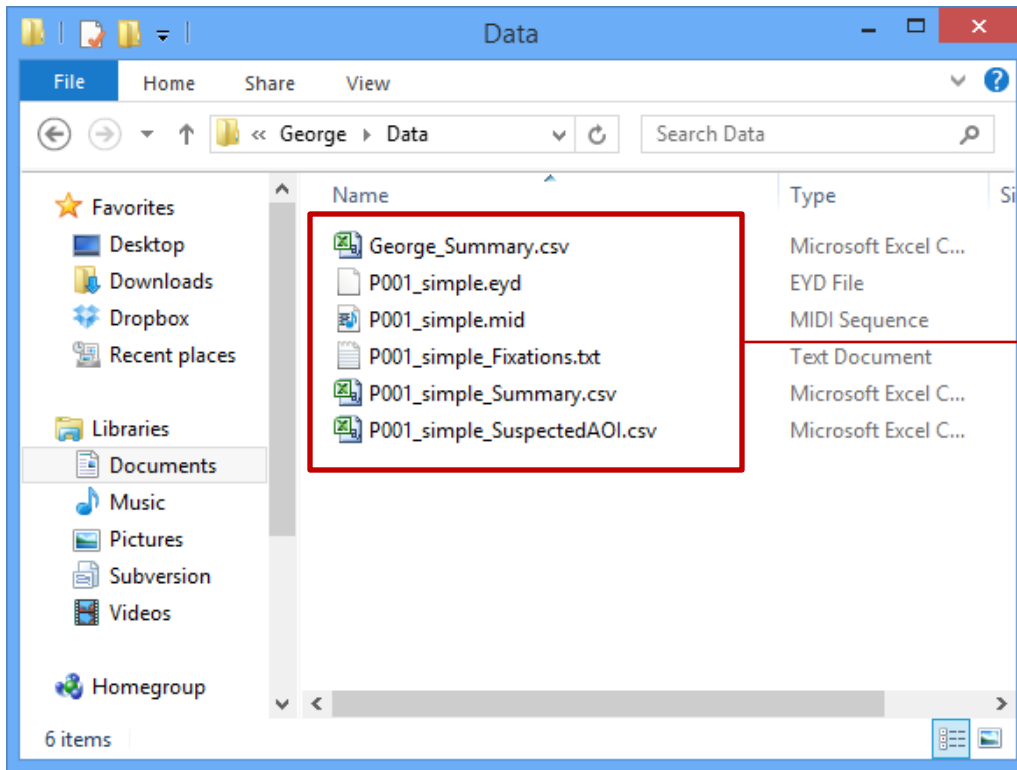
# ANALYSIS: AREAS OF INTEREST

The screenshot shows a music analysis application window titled "Study: |ava\Analyzer\test\ToddStudy". The interface includes a "Score:" panel on the left with "Score1" selected. The main area displays a musical score in 3/4 time, marked "Moderately slow" and "mf-p". A red bounding box highlights a sequence of notes on the treble clef staff, with labels "m1b2t", "m1b2t", "m1b3t", "m2b1t", "m2b2t", "m2b3t", and "m3t" positioned above them. A red bracket on the right side of the image points to these labels and the notes they describe. At the bottom of the window, there are buttons for "Suspected AOIs", "Generate Reports", and "Exit".

Areas of Interest, or bounding boxes, can be drawn on the screen by the client.



# ANALYSIS: MANAGING DATA



Files are named consistently with participant number and score name to make file management easier.

- Files come from two sources: the participant computer and the eye tracking computer.
  - MIDI data from participant computer
  - EYD and fixations data from eye tracking computer.



# ANALYSIS: SUSPECTED AREAS OF INTEREST

Time (ms)	Field Number	Note	Suspected AOI (box)
0	0	<N/A>	m1b1
12648	744	D4	m1b1
18700	1100	E4	m1b2
23409	1377	F4	m1b3
28390	1670	G4	m2b1
33456	1968	F4	m2b2
39236	2308	E4	m2b3
44472	2616	D4	m4
52496	3088	<up>	m4
54740	3220	F3	m5b1
55692	3276	G3	m5b2
56474	3322	F3	m5b3
57341	3373	E3	m6b1
58157	3421	F3	m6b2
59041	3473	E3	m6b3
59755	3515	D3	m7
65348	3844	<up>	m7

Where were they most likely playing in the piece? A bounding box name is used to pinpoint a location in the score image.

- The client must specify this data manually, as participants could make mistakes and backtrack
  - More complex algorithms could be used to solve this problem.



# ANALYSIS: PER-SCORE REPORTS

- Each performance is recorded on a note-by-note basis in a file named “Participant#\_ScoreName\_Summary”
- Collected from suspected AOI, eye tracking and MIDI data
- Spanning information is computed
  - How far ahead the participant looked at first when playing the note.
  - The farthest ahead (or behind) the participant looked during this note
  - And many more. . .



# ANALYSIS: PER-STUDY REPORTS

- Overall study is summarized in a file named “StudyName\_Summary”
- Averages data for each score that participants played
  - Each participant is a row
  - Columns are averages for columns from former data file



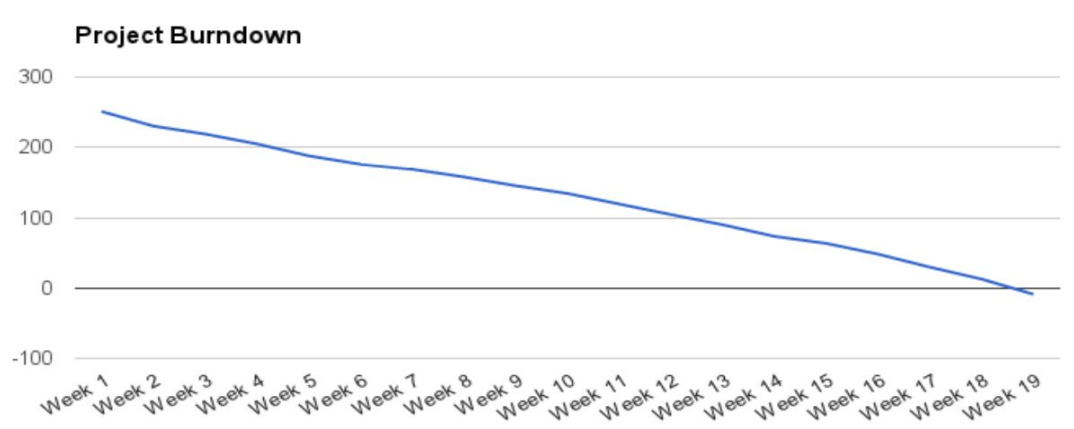


# TESTING AND QUALITY ASSURANCE

- Client testing
  - New components always demonstrated to client
  - Client was given two releases and tested it with her students
  - Reports generated by Campimetre have been tested and reviewed by the client
- Unit testing (JUnit)
  - Reading of eye tracking data files
  - Comma-Separated Value files
  - MIDI recorder
- Integration testing
  - Still in progress
  - Ensuring that all components play well together



# BURNDOWN



- Drawbacks during the project
  - Did not analyze eye tracking data in realtime
    - EYD files were an acceptable substitute
  - Score images are not rendered in Campimetre
    - Third party libraries not adequate
    - Score images are imported from other sources
    - Requires manual drawing of bounding boxes (in Analyzer)
- Other changes
  - Interface refactored into three components discussed previously



# UNMET REQUIREMENTS

- Remainder of Sprint VII
  - Rigorous testing of user interface
  - Completion of user manual
  - Completion of developer documentation
  - Client training
- Future tasks
  - Implement the “look down” and “saccade” fields in reports
  - Provide a more convenient way to import the EYD and fixations files in the Analyzer.
  - Develop more complex algorithm to determine where a player is in a particular score (Sequence Alignment algorithms?)



# POST-MORTEM

- Meetings with client were regular and productive
  - Could improve on meeting minutes
- Task distribution improved
  - During last three sprints, task definitions were more precise
  - Less confusion and overlap
- Recognition of problems
  - Spent too much time attempting to render scores in Campimetre
  - Underestimated complexity of realtime data analysis
- Adapted well to changes in requirements
  - Good utilization of remaining development time



THANK YOU



# Q & A

