An Investigation of Digital Mixing and Panning Algorithms

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Recording Music

- Song typically made up of multiple tracks
- Analogue summed vs digitally summed
  - Sound engineers hear difference
  - Farmelo: "undeniable depth, width, punch and realism" [1]
- Analogue summing boxes
  - Crane Song Egret

Image from: http://www.soundonsound.com/sos/jun12/articles/spotlight-0612.htm

[1]Farmelo, Allen. 2011. Analog vs. Digital Summing. Self-published.

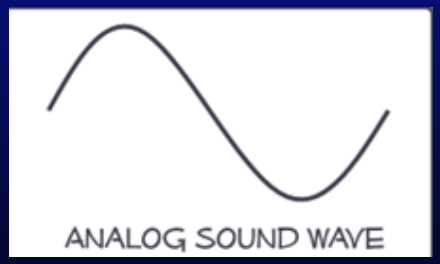
Terminology

- Terminology: “mixing” and “summing”
- “Analogue” sample
  - Even if played digitally/through computer

Analogue To Digital

Analogue

- Mic -> Voltage
- Recorded onto magnetized tape



Digital

- Samples every second
  - Industry standard: 44.1kHz
- Computer (DAW)
  - Digital Audio Workstation

Images from http://www.centerpointaudio.com/Analog-VS-Digital.aspx

Objectives

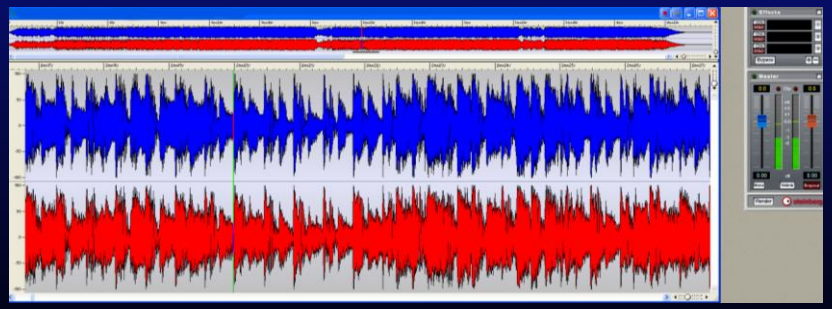
1. Prove if a visual or audible difference exists between analogue and digital samples
2. Can digital mixing algorithm be created
   - Emulate summing in analogue console
3. User interface to easily test samples

Previous Testing

- "Objective and Subjective Evaluations of DAW Summing" by Brett Leonard in 2012
  - Tested summing of five DAWs
  - Results: When panning exluded – minimal differences
- Which of the two DAWs best matches the quality of the Analogue System? By Woszczyk in 2007
  - Two different sample rates
  - Result: Higher sample rate sounded most similar

My Approach (1)

- Record digital and analogue audio samples
  - Corinne Cooper
- Perform first round of listening tests
  - Expert panel
- Visual testing
  - Wavelab

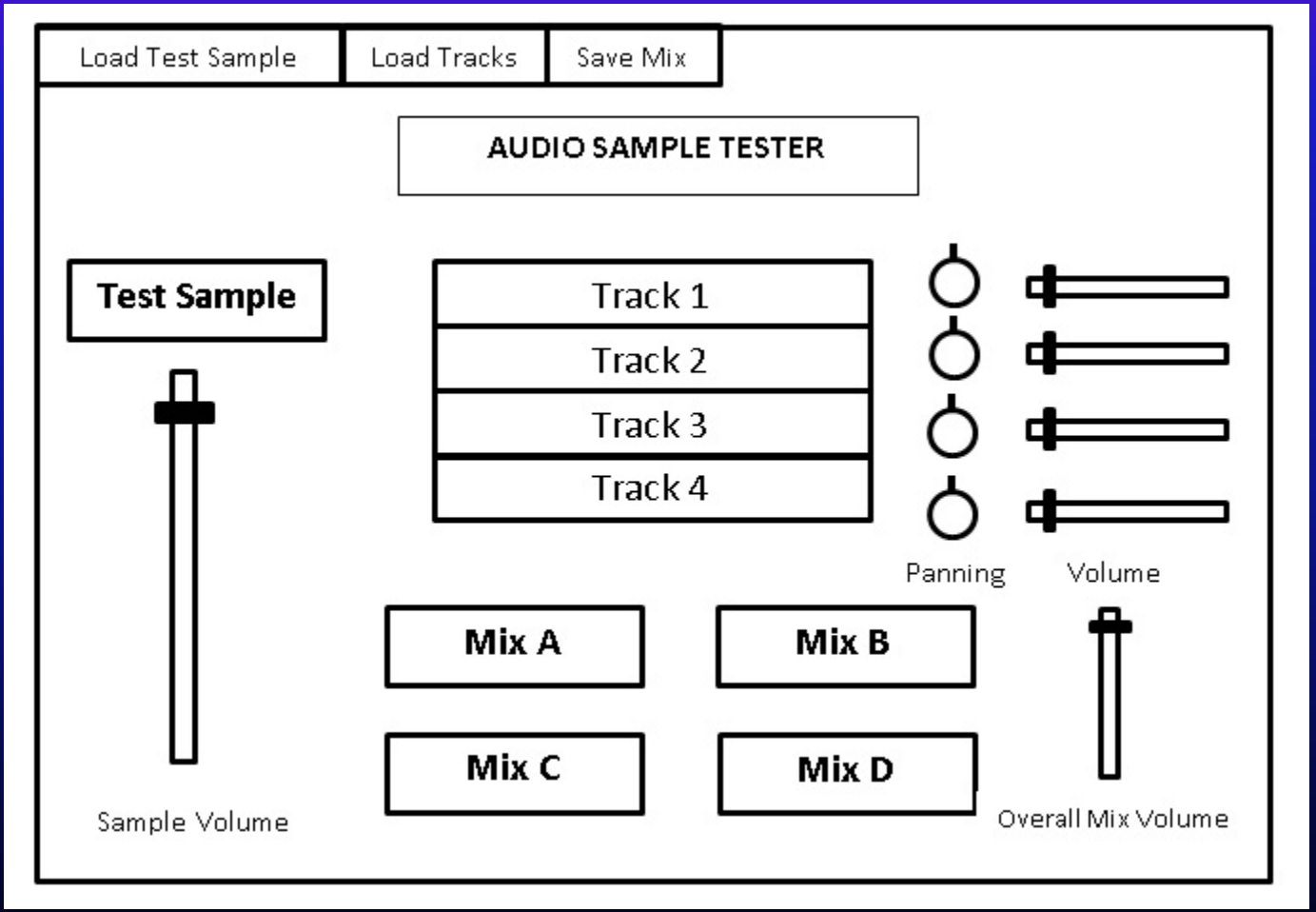


http://en.wikipedia.org/wiki/WaveLab

My Approach (2)

- Create program to mix tracks statically
  - Code one WAV file to play
  - Play multiple tracks by implementing known mixing algorithms
    - Paul Vögler and Viktor T. Toth
  - Create new mixing algorithms
  - Experiment with panning laws
- Design and implement testing interface
- Second set of listening tests
  - Include new algorithm/s

Testing Interface Mock-Up



Possible Extensions

- Mix tracks in real-time
- Mixing algorithm plug-in
  - User can import own algorithm into interface

Questions?