Input methods for music

MUSIC 253/CS 275A
STANFORD UNIVERSITY
Translating (musical) sounds to symbols

From the “calculating machine” perspective

Babbage difference engine

Analytical Engine--CHM reconstruction (2008)
https://www.youtube.com/watch?v=KBuJqUfO4-w
CHM (2008)
Babbage Analytical Engine (1837)

**Aim:** to process data

**Needs:**

- Data
- Instructions

Two types of **punched cards** used to program the machine. Foreground: 'operational cards', for inputting **instructions**; background: 'variable cards', for inputting **data**.
Possible sources of musical input

Symbolic data entry

Sound

Graphics construction sets

Optical recognition

Hybrid systems
Punched cards (1837-1964)

**Aim:** to process data

**Needs:**
- Instructions
- Data

IBM Hollerith card, 1964
Sound capture

How can we make sound tangible?

Carl Seashore

Sonogram (c1930)
Samson box (for “audio computation,” c1975-80)

Gareth Loy’s full article (2013) at:
http://www.mitpressjournals.org/doi/pdf/10.1162/COMJ_a_00193

Alex Di Nunzio, “Samson Box,”
http://www.musicainformatica.org/topics/samson-box.php
Symbolic codes for music

1965-1985: hand encoding (type keyboard)
  - DARMS (Digital Alternate Rep. of Music Scores)
  - MUSTRAN, IML-MIR et al.

- Designed for mainframes, card-readers
- Few printing possibilities
- Important for
  - the thinking that went into the task
  - documentation
  - Implementation (school music, esoteric repertories)
DARMS Pioneers (1966--)

1. First system for encoding music notation

Stefan **Bauer-Mengelberg** (1927-1996)
- IBM mathematician; developer
- Assistant *conductor* (to Leonard Bernstein) of NYSO
- Implemented system for making a computer transcribe a composition (by Stefan Volpe)
- Edited papers of the mathematician Gödel
- IP lawyer

Jef **Raskin** (1942-2005)
- Apple #4
- co-dev (with Brian Howard, Apple #32) of Apple G&S (forerunner of *QuickTime*)
- Developed original *Mac interface*
- Composer
- First person to implement DARMS (1966)
Graphics assembly kits for scores

Lisa 1 (1984)

Apple Graphics & Sound: Brian Howard, Jef Raskin
Hand-encoding pioneers (1970s, 1980s)

Raymond Erickson (DARMS)
Queens Univ., NY (open)

Tom Hall (DARMS)
A-R Editions, WI (proprietary)

Michael Kassler (IML/MIR)
Princeton, 1970s

Don Byrd (2000s-Nightingale)
Princeton, 1980s
Indiana U., 1990s-2010

Don Byrd’s music typesetting

Doug Hofstadter’s text (1979)

Ray Erickson
Computer music-typesetting pioneers (mainframes, 1955-1975)

**East Coast**

**Leuning, Ussachefsky et al.**
Columbia-Princeton tape-music collaboration (from 1954)

**West Coast**

**Leland Smith** (SCORE, 1974-2013)
Prof. of composition

Stanford AI lab

J. McCarthy

L. Smith
2. MIDI-assisted/personal computer era (1985-2005)

**Machine and hand input**
- Point-and-click palettes (graphic assembly with mouse)
- Many problems with MIDI timing resolution
- Cross-hatched systems (part MIDI, part by hand)

**Printing options kept changing**
- 1970s: **plotters** (SCORE)
- 1980s: **dot-matrix** printers (MuseData)
- 1990s: **laser** printers, PostScript
- 1985-2005: high-end **phototypesetting** shops
3. Sound/phonographic input

Thomas Edison (from 1889, but not initially musical)
Transcription tools (graphics)
Recording horns (sound, 1910)
Video capture (no synch with sound)
Sound/video synchronization (after 1940)
Edison recording studio (1905)

http://www.tinfoil.com/record.htm

West Orange, NJ

Setup for band recording
Sound/video synchronization

Edison’s Black Maria (1892-1910)


Turntable for altering light/shadow

Films were “narrated” by live music (piano, organ) until c. 1930

Film and audio were not synchronized until c. 1946.
Reproducing music:
Early recording technology

Edison Amberol c. 1908