2018 Fall
CTP431: Music and Audio Computing

Introduction

Graduate School of Culture Technology, KAIST
Juhan Nam

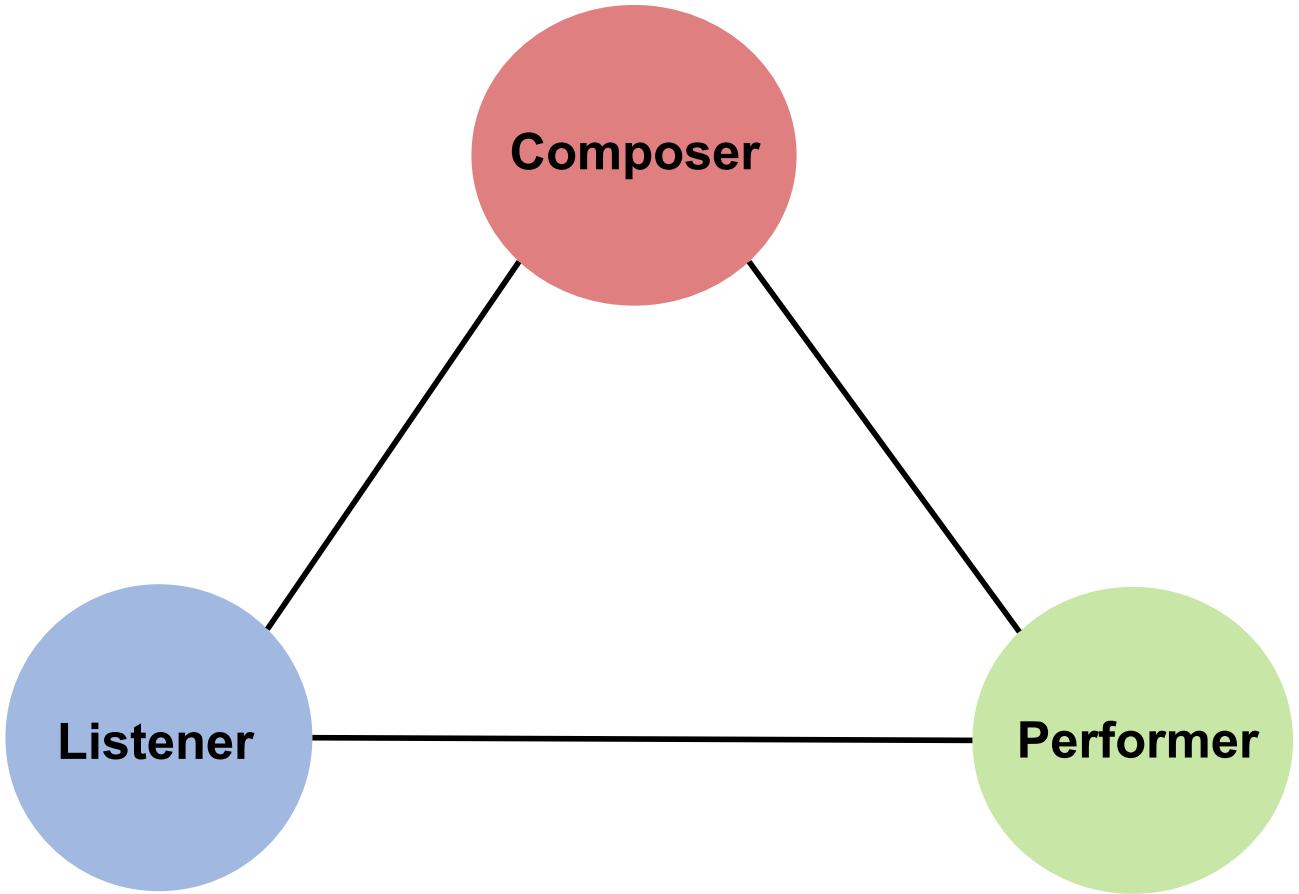
Who We Are

- Instructor
  - Juhan Nam (남주한)
  - Assistant Professor in GSCT, KAIST
  - Music and Audio Computing Lab: http://mac.kaist.ac.kr

- TA:
  - Taegyun Kwon (권태균), Ph.D. Student in GSCT, KAIST

Music and Human

- We are engaged in music as composers, performers and listeners



Music and Technology

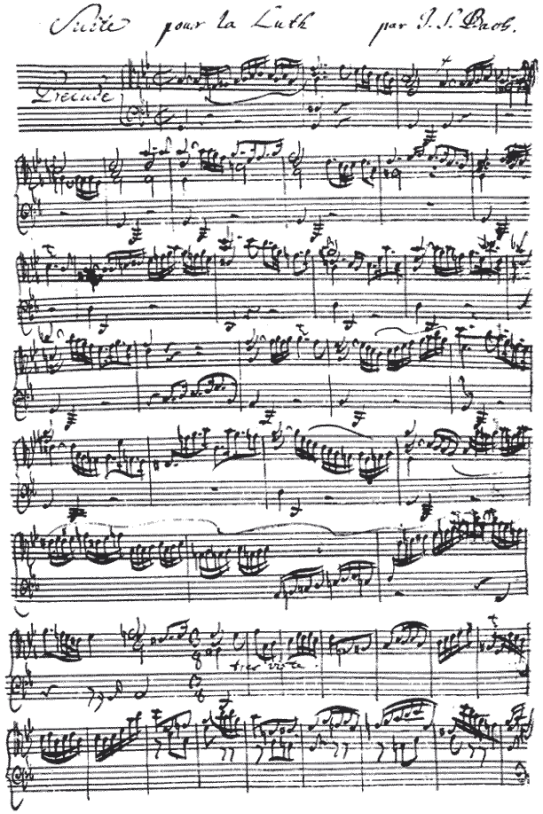
- Creating “better” sounds
  - Musical instruments: tone, expressivity, playability
  - (Composition: melody, arrangement)

- Storing the sounds “efficiently”
  - Musical notation: symbols on paper
  - Sound recording: physical media
  - (Distribution)

- Historically, these fundamental issues have challenged the technologies available at the time

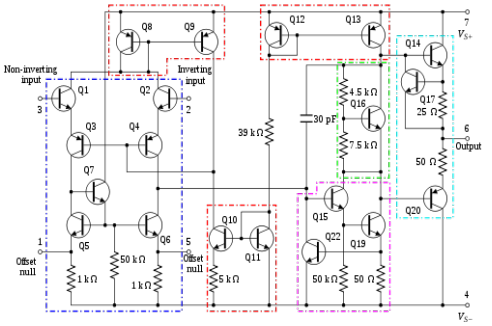
History of Music Technology

- Material/Mechanical technology
  - Crafting wood and processing metal
  - New musical instruments: e.g. piano, saxophone
  - Sheet music



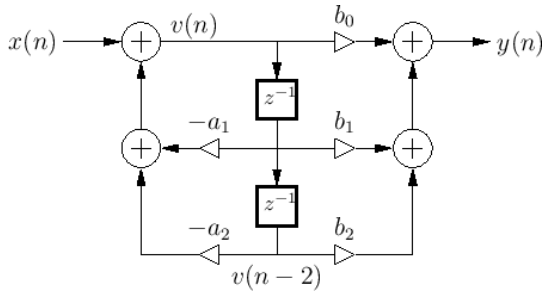
History of Music Technology

- Electro-Magnetic Technology
  - Microphone and speakers: sound as “electrical signals”
  - Electronic circuits
  - Amplifier and effects: loudness and timbre control
  - New musical instruments: electric guitars, synthesizers
  - Recorder/Player : paradigm shift in music creation and distribution

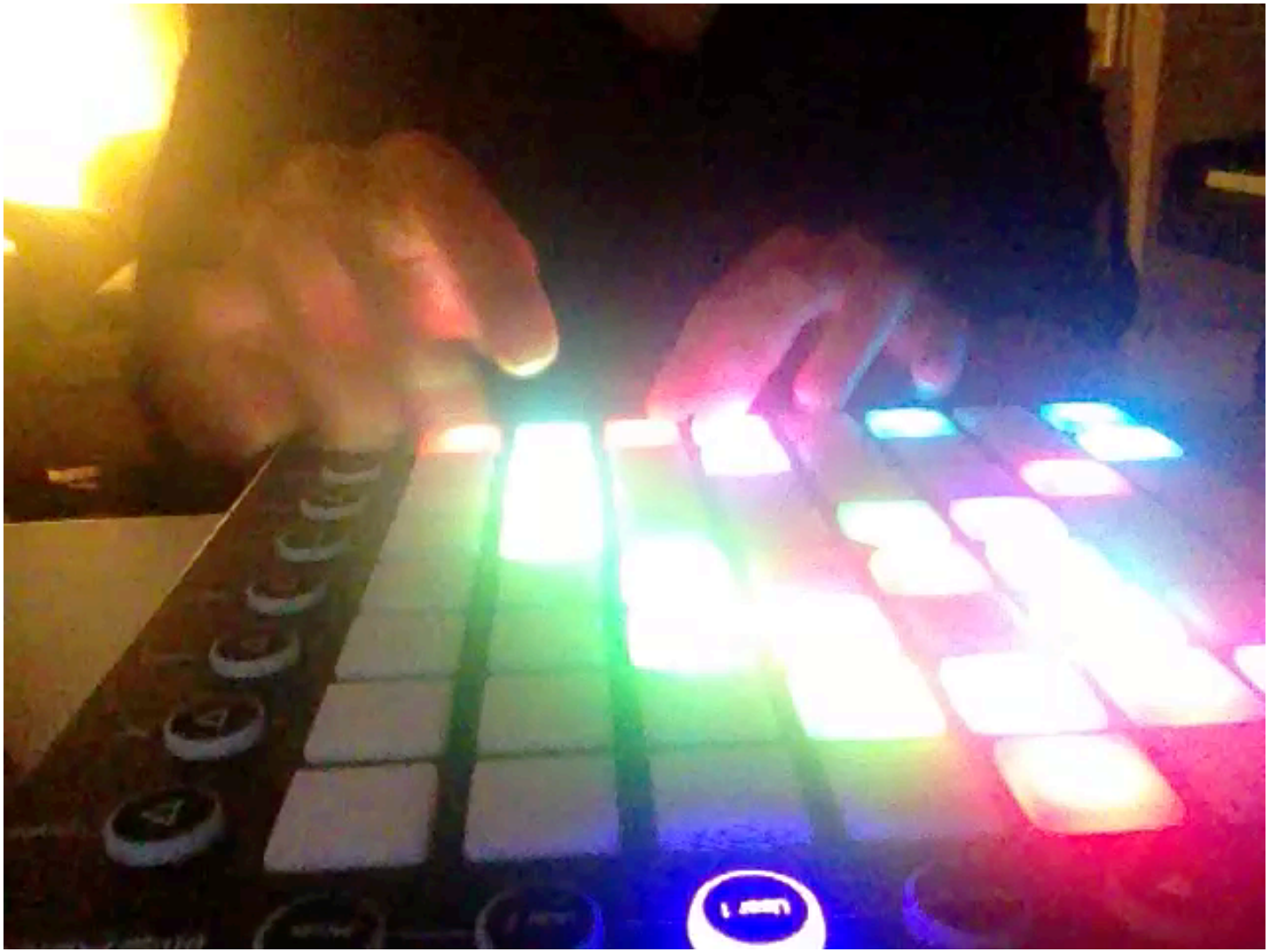


History of Music Technology

- Digital Technology
  - A/D, D/A converters: sound as “discrete numbers”
  - Digital signal processing
  - Virtual analog: synthesizer, digital audio effects
  - Sample-based Instruments
  - Digital audio workstation (DAW): music recording, editing and production
  - MP3 players

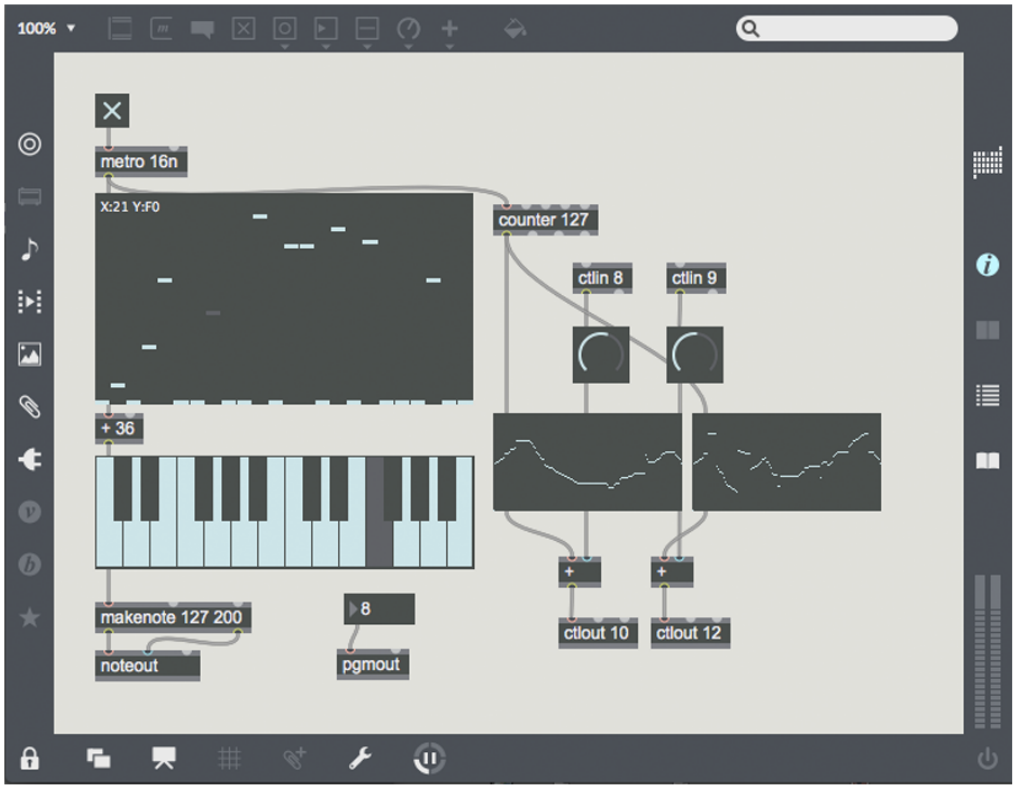


Recent Examples

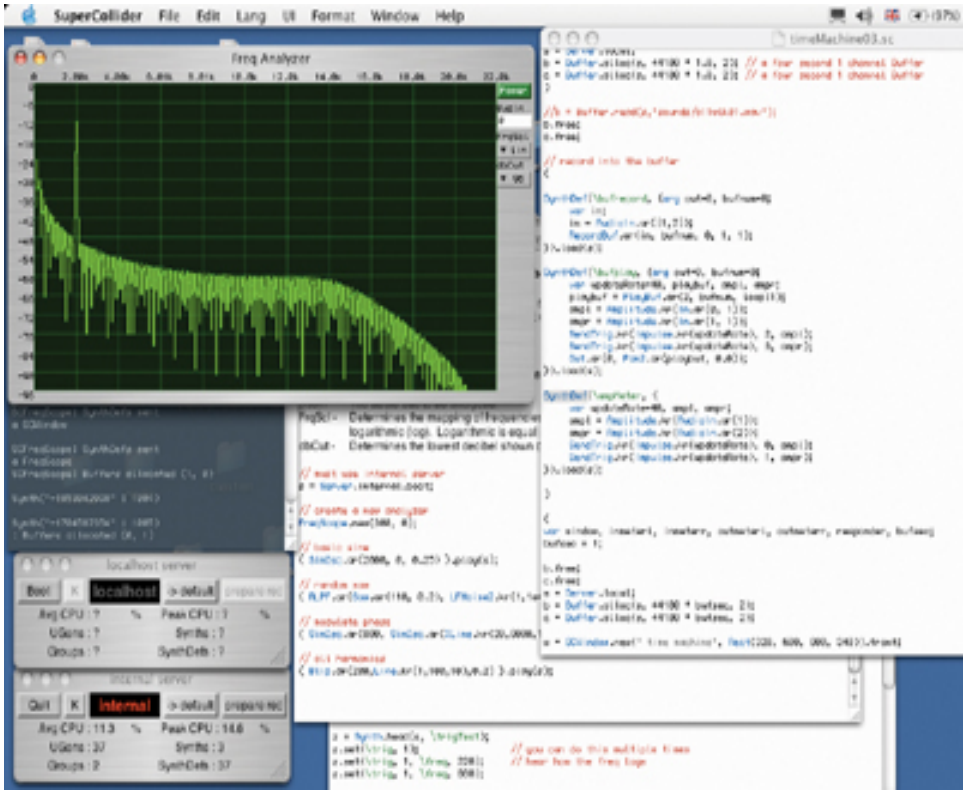


Abletone Live + Launchpad

Recent Examples

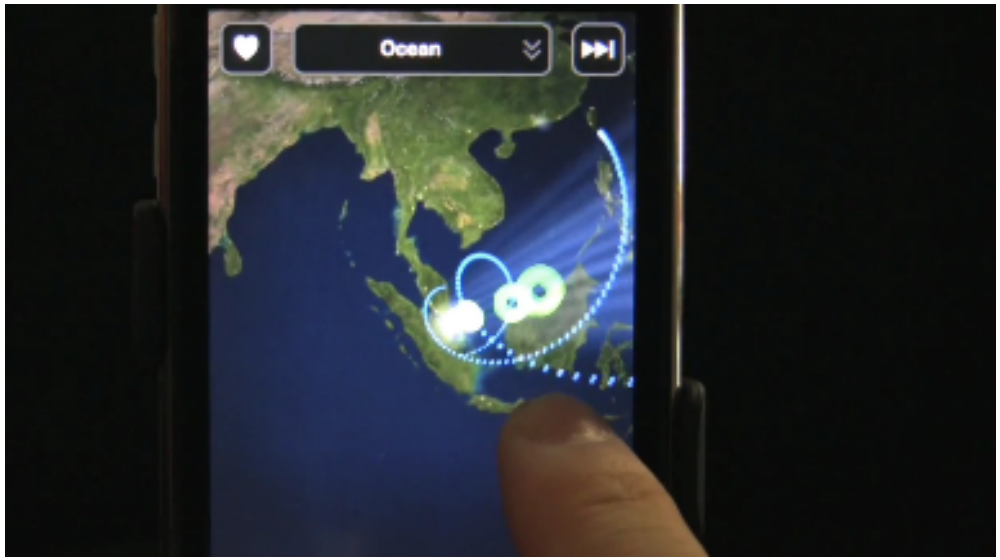


MAX



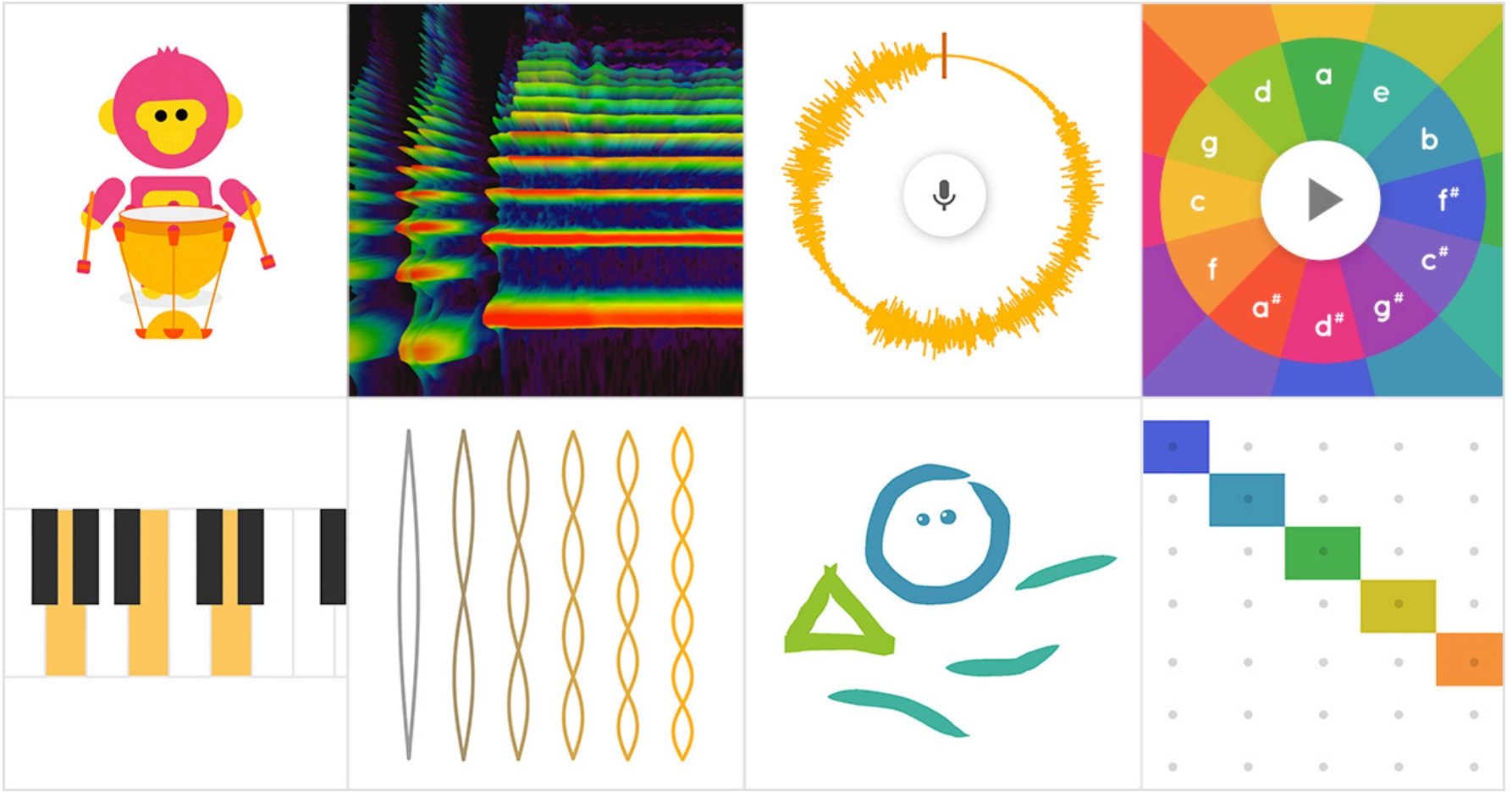
SuperCollider

Recent Examples



Smule Ocarina

Recent Examples



Chrome Music Lab

https://musiclab.chromeexperiments.com/Experiments

Characteristics of Recent Music Technology

- Interactive
- Audio-visual
- Flexible (programmable)
- Social
- Easy and accessible
- Intelligent and autonomous

What Is This Course About?

- Understanding theoretical backgrounds in current music technology
  - Basic acoustics
  - Digital audio
  - Spectral analysis
  - Sound synthesis
  - Digital audio effect
  - Musical interface
  - Algorithmic composition

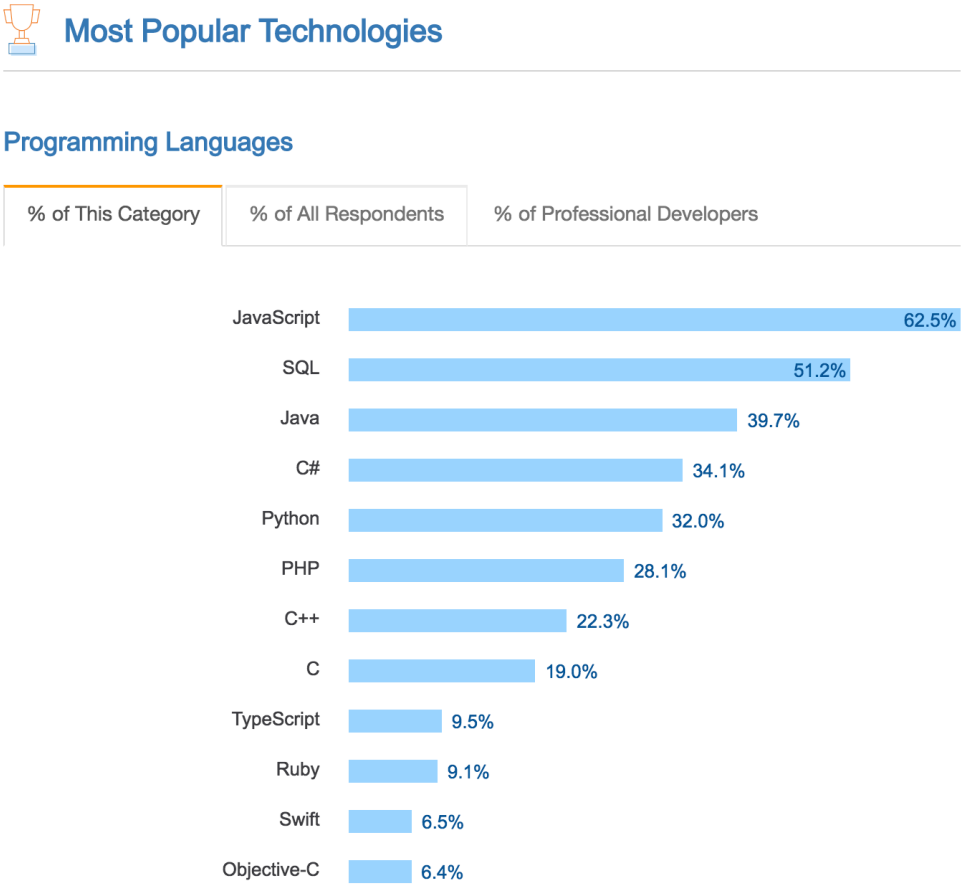
What Is This Course About?

- Having hand-on experiences with JavaScript-based audiovisual programming
  - Audio control, sound synthesis and audio effect
  - Visualization, graphics and interaction
  - Music generation

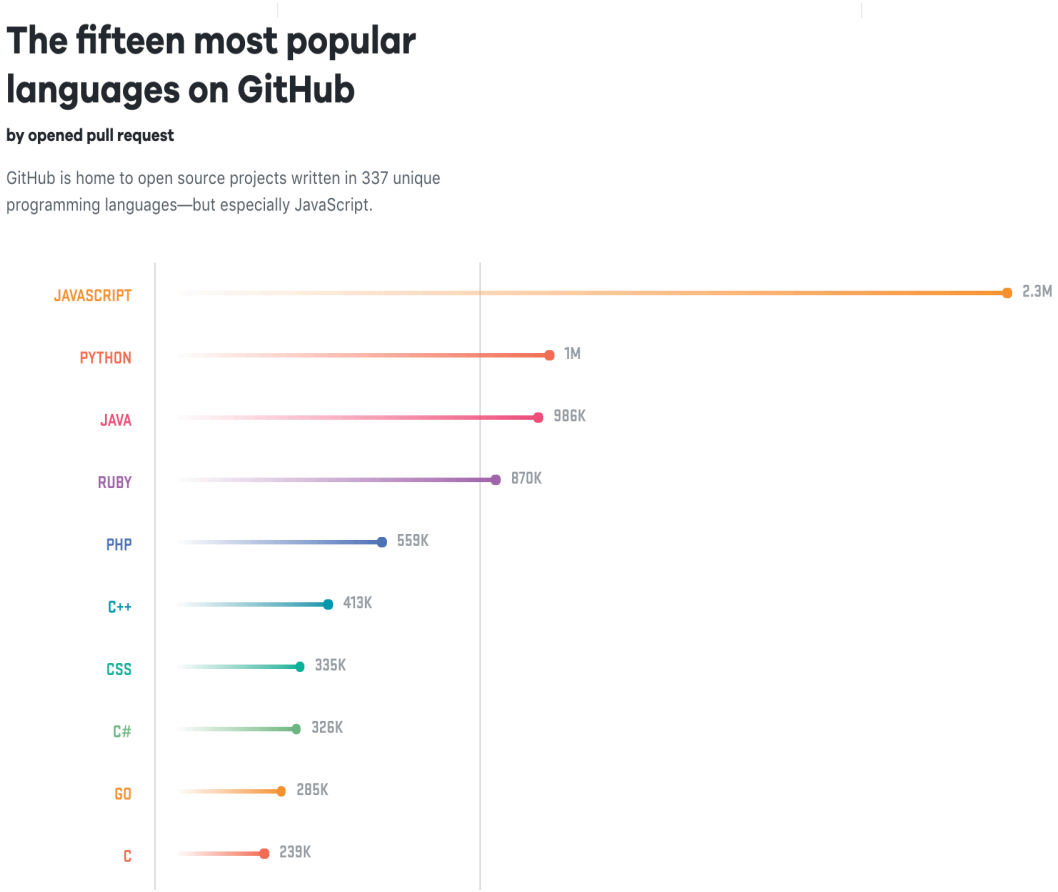
- Music-oriented interactive web applications

Why JavaScript?

- More popular language in StackOverflow and GitHub



https://insights.stackoverflow.com/survey/2017#technology



https://octoverse.github.com/

Why JavaScript?

- Free and no installation
- Platform-independent (but browser-dependent)
- Great APIs
  - Tone.js: https://tonejs.github.io
  - p5.js: https://p5js.org/
  - Magenta.js: https://magenta.tensorflow.org/js
- We can realized all the characteristics of recent music technology!

Related Areas

- Acoustics
- Digital signal processing
- Computer graphics
- Human-computer interaction
- Machine learning

Pre-requisites

- Basic engineering literacy
  - Programming language: variable, control, loop, function, class
  - Signal processing: meaning of x, y, t and f, Fourier transform (hopefully…)
- Music: strong interest!
- HTML/CSS/JavaScript: desired but not required

Grading

- Attendance: 10%
  - Attendance, participation in discussion, and so on
- Assignments: 50%
  - JavaScript programming using web audio
- Final Project: 40%
  - Proposal / Presentation / Submission (using Github)

Course Information

- Course webpage: http://mac.kaist.ac.kr/~juhan/ctp431/
  - Basic course info, schedule and resources
  - Announcement

- KLMS: https://klms.kaist.ac.kr/
  - Homework submission
  - Grading

- Classum: https://classum.org/
  - Announcement
  - Q&A: discussion board