# Block-Based Programming with Scratch and App Inventor for Android


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# My Background

**Work**

Software Engineer, Sys Admin (6 yrs)
Teacher
- AT&T (3 yrs)
- Swarthmore College (1 yr)
- Penn (ugrads:10 yrs; HS students: 8 yrs)

Educational Researcher, Developer
- NSF Broadening Participation (3 yrs)
- BotWorld, Debug'ems, Deconstruction Kits

University/K-12 Liason
- Penn Netter Center (1 yr)

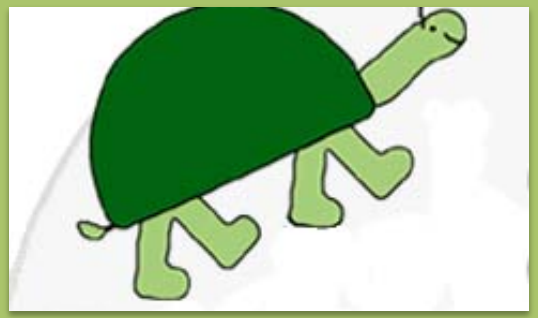
**Education**

BA Computer Science, Mills College
MSE Computer Science, Penn
Graduate School of Education student, Penn

**Programing Languages**

APL
Assembly Language
Pascal
Logo
Unix Shell
C
C++
Visual Basic
Maya MEL
Java, C#
O'Caml, Scheme, lisp
HTML, CSS
Python
Scratch
BYOB
App Inventor for Android

# *abbreviated* HISTORY



**1960's: Logo**

Seymour Papert (with W. Feurzeig)

"Constructionism"

StarLogo, NetLogo, Lego Mindstorms


**2006: Scratch**

Mitch Resnick (MIT)

**2008: BYOB**

Jens Monig with Brian Harvey, UCB


**2010: App Inventor for Android**

Hal Abelson and colleagues

Developed at Google

Adopted by MIT


**2012: Blockly**

Neil Fraser

Developed at Google

# Scratch

- Animations, simulations, stories
- Free
- Mac, linux, Windows
- Designed for middle school age; used by all ages
- “Scratch” images like DJs “scratch” sounds
- “Remixing” culture, website encourages sharing
- “Media-rich”: images, sounds, paintbox

# How I Teach Scratch

In Any Order:

- Show Demos
- Explain basics (Sprites, moves, operators, etc.)
- Remixing, “Creative Chaos”
- Explore’ems
- Debug’ems
- Tutorials: Pong

Later:

- Design your own story/game/animation
- Complete’ems

# Resources

**Scratch**

http://scratch.mit.edu
http://scratched.media.mit.edu/ (for educators)

Maloney, J., Resnick, M., Rusk, N., Silverman, B., Eastman, E., "The Scratch Programming Language," *Transactions on Computing Education*, Vol. 10, No 4., 2010, pp. 16-30.

Malan, D., Leitner, H., "Scratch for Budding Computer Scientists," SIGCSE Bulletin, Vol. 39, No. 1, 2007, pp 223-227.

**Debug'ems, Explore'ems, Complete'ems**

https://sites.google.com/site/scratchdebugems/debugems-to-share

Griffin, J., Kaplan, E., Burke, Q., "Debug'ems and Other Deconstruction Kits for STEM Learning", *Proceedings of 2nd IEEE Integrated STEM Education Conference (ISEC)*, Ewing, NJ, March, 2012.

# BYOB (snap!)
# Build Your Own Block


Very similar to Scratch

Re-written with modifications:

- More abstraction (procedures, objects)
- User creates a procedure by “building a block”
- Cloud version available
- Higher order functions, list comprehensions
- Objects

U.C. Berkeley course for non-CS majors

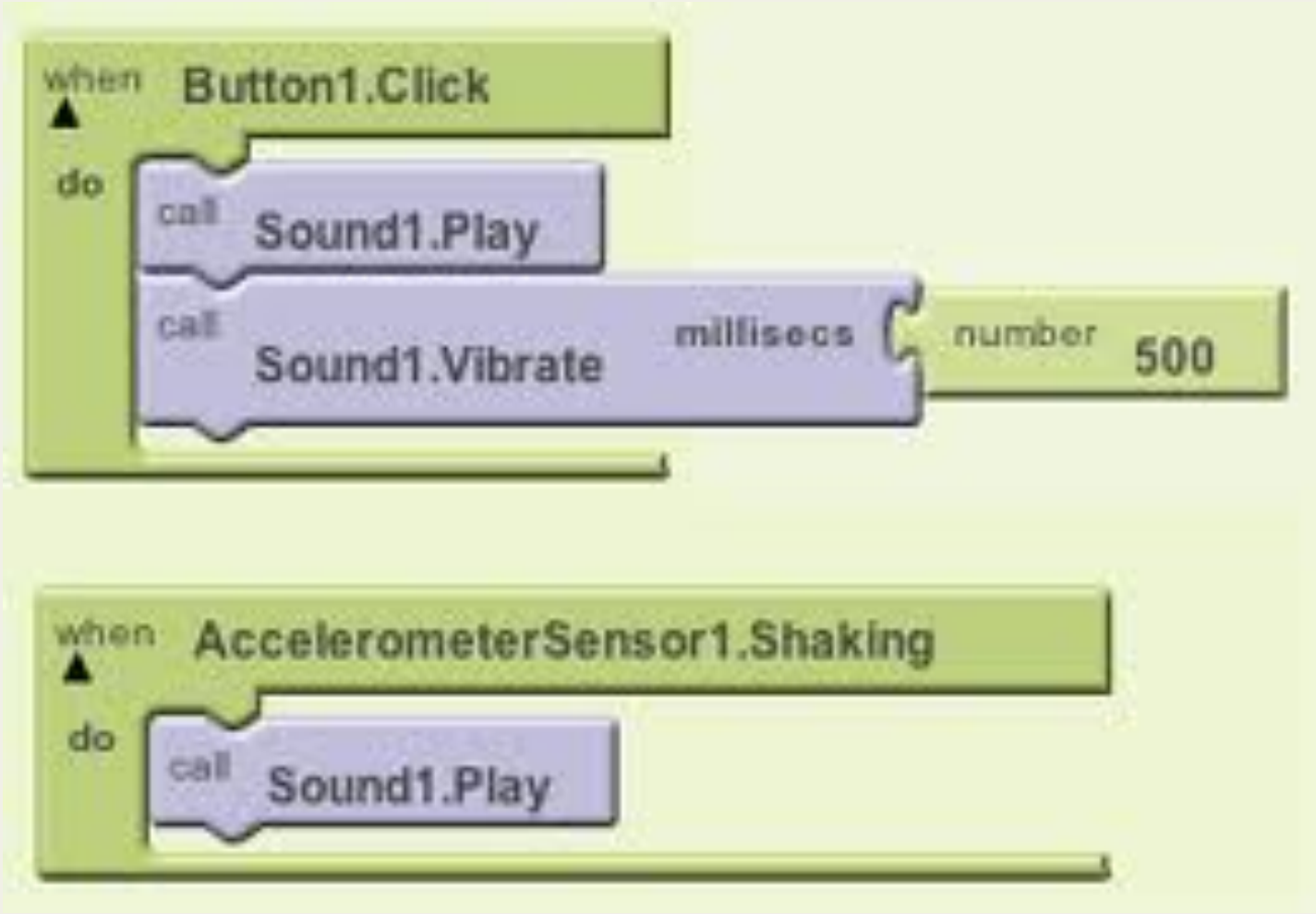
- “The Beauty and Joy of Computing”
- Professors Brian Harvey, Dan Garcia
- Encourages recursion early and often
- YouTube videos available

# App Inventor for Android


Uses block-based programming to create Android apps for phone, tablets, and other mobile devices

# App Inventor for Android
# 1. Designer

# App Inventor for Android
# 2. Blocks Editor

# App Inventor for Android
# 3. Emulator or Device



# App Inventor for Android
# Hosting, Logistics


**Hosting**

2010-2011: Google

Spring 2012: MIT

**What you need:**

Currently:

- Google account
- Java compiler on local machine
- Blocks editor app on local machine
- (Designer available on cloud)

Spring/Summer 2013:

- Google account
- (Designer, Blocks editor on cloud)

# App Inventor for Android


- Inspired by Scratch
- Produces mobile apps
- Color scheme “more mature”
- Built-in procedures; user may create procedures
- No objects
- GPS, accelerometer, texting, phone, touch sensing!!!
- User creates in two modes:
    1. Designer (for user interface)
    2. Blocks editor (for code, logic)

# App Inventor for Android Resources


- http://appinventor.mit.edu/
- Book, online tutorials by Wolber, et al.

# Some Other Block-Based Languages

ModKit (MIT)

- Inspired by Scratch
- Electronic textiles, Arduine Lilypad microcontroller

Blockly (Google)

- Inspired by App Inventor
- App Inventor will incorporate its blocks
- Cloud computing
- Exports to Javascript, Python, …

# Summary

| Language | Product | Execution | Notable Characteristics | Free, for all ages, and multiplatfom |
|---|---|---|---|---|
| **Scratch** | Animations, Games, Simulations | Local<br><br>Future: Cloud | Next release will have procedures with inputs (not output) | Yes |
| **BYOB (snap!)** | " " | Local or Cloud | Has procedures with input/output and higher order functions. Recursion-friendly | Yes |
| **App Inventor for Android** | Android apps for phones, tablets | Local & Cloud<br><br>Future: Cloud | GPS, text, phone, accelerometer, camera | Yes |
| **Blockly** | Screen output; Code (Python, Javascript, …) | Cloud | Can export to text-based languages | Yes |

# Conclusion

Thank you for inviting me to speak!

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Questions? Comments?