Events-First Programming in App Inventor

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Talk Overview

- Event-Based Programming in App Inventor 2

- Surprises in the App Inventor Event Model
- Event-Based Thinking with App Inventor 2

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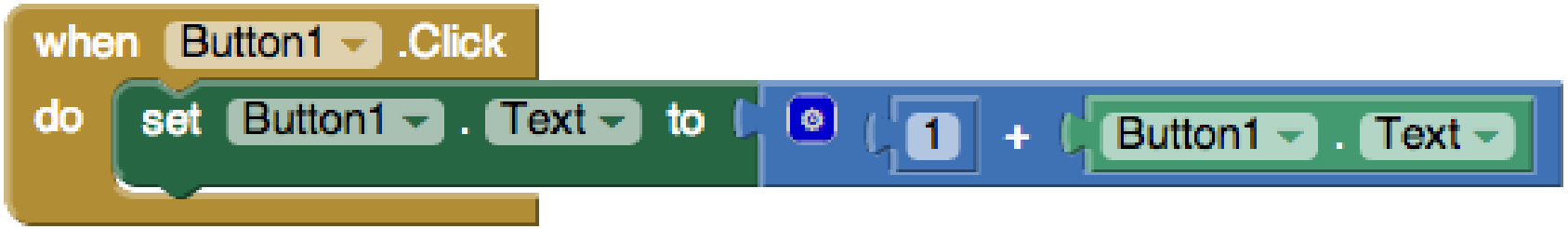
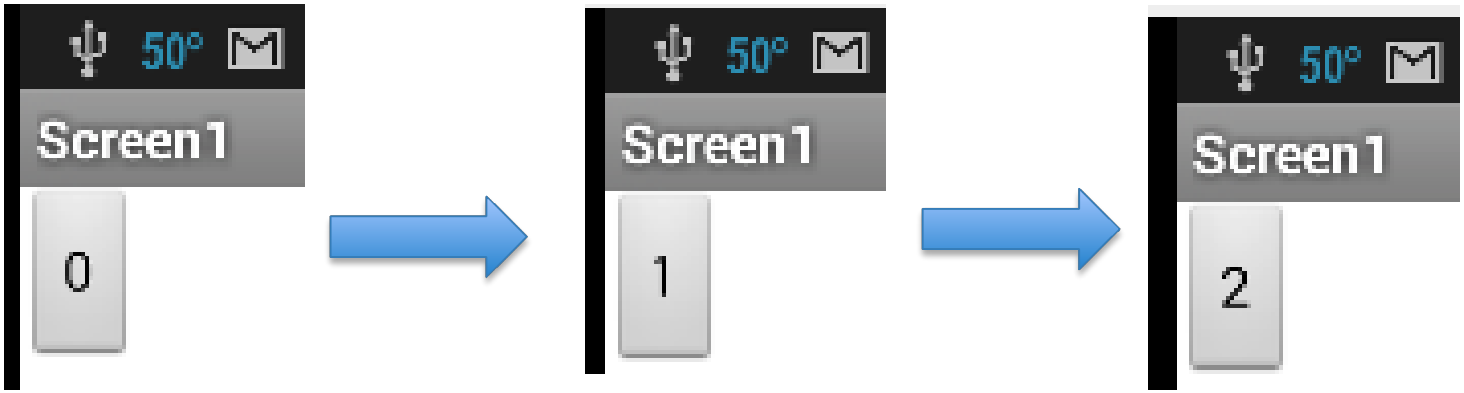
Simple Events: CountButton

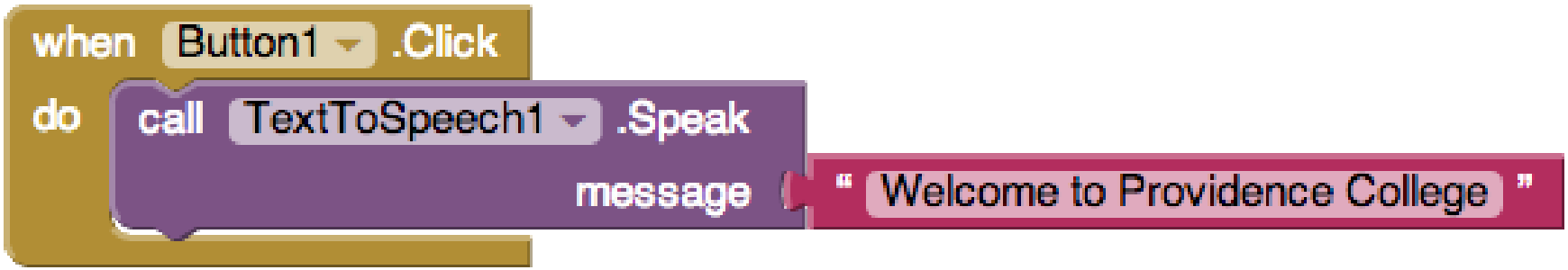




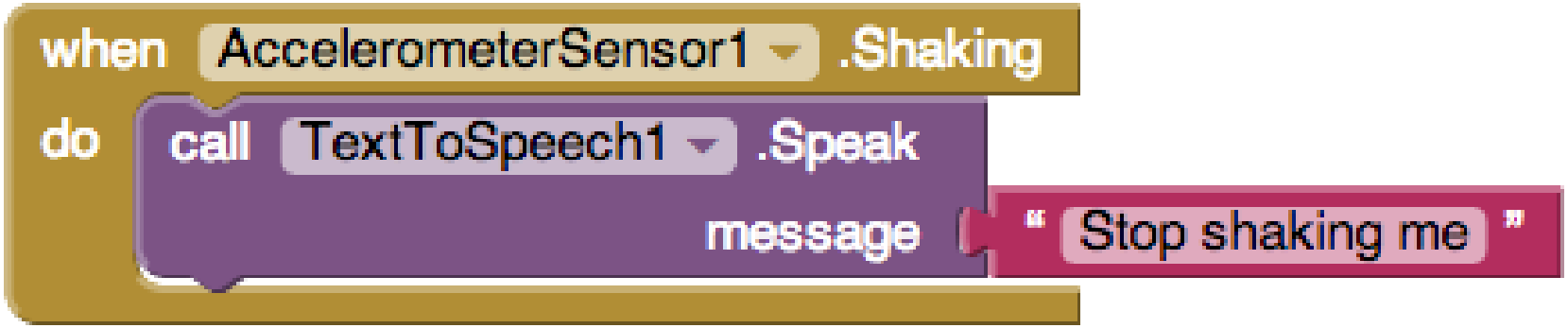
CountButton Example in Java

```
// Assume counter, counterLabel, and incrementButton
// are instance variables
counter = 0;
countButton = new JButton("Increment"); countButton.addActionListener(
  new ActionListener(){
    public void actionPerformed(ActionEvent e) {
      counter++;
      countButton.setText(Integer.toString(counter));
    }
  }
);
```

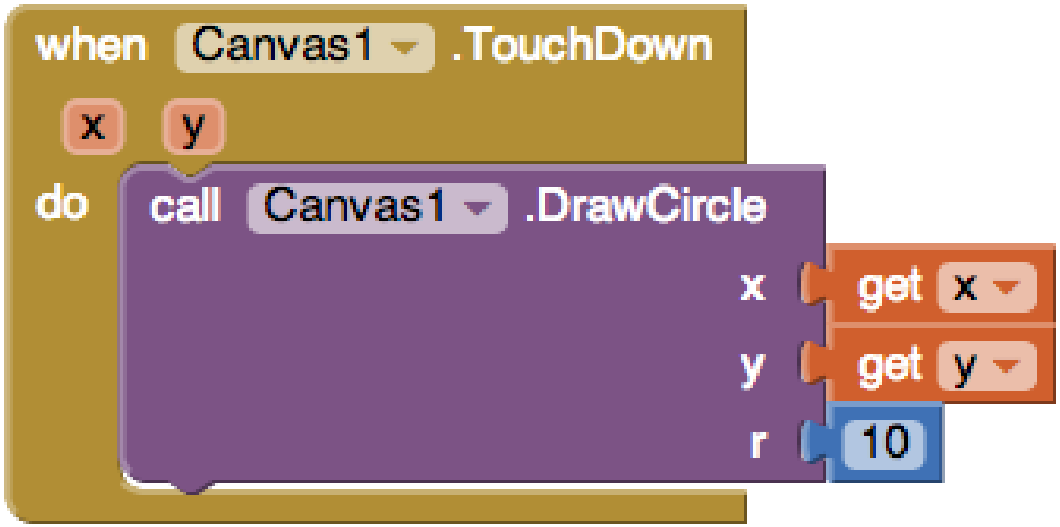
Simple Events: Talk To Me

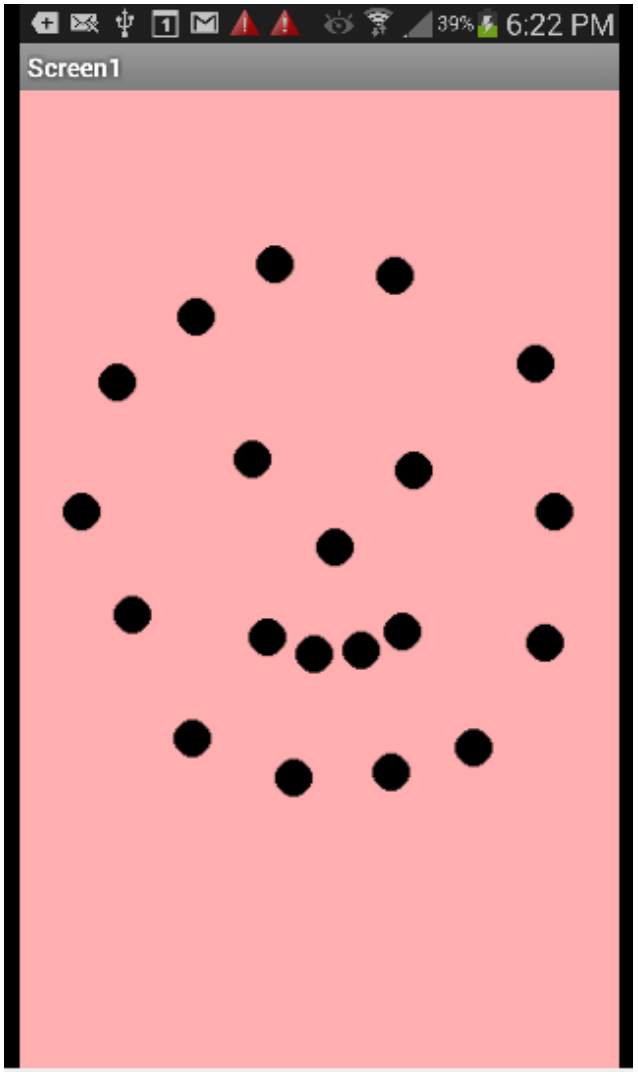


Simple Events: Stop Shaking Me

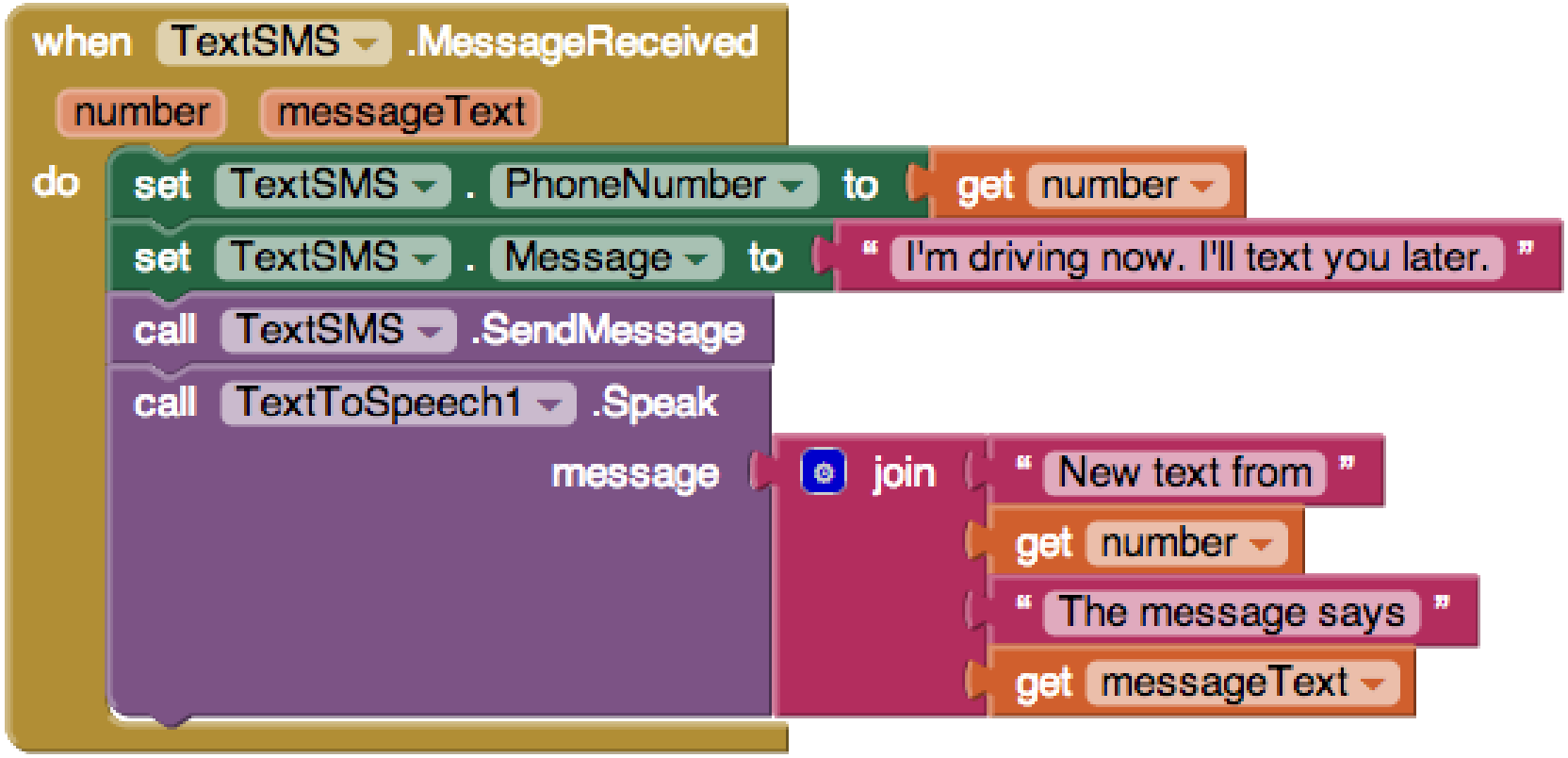


Event Parameters: Dots on Canvas

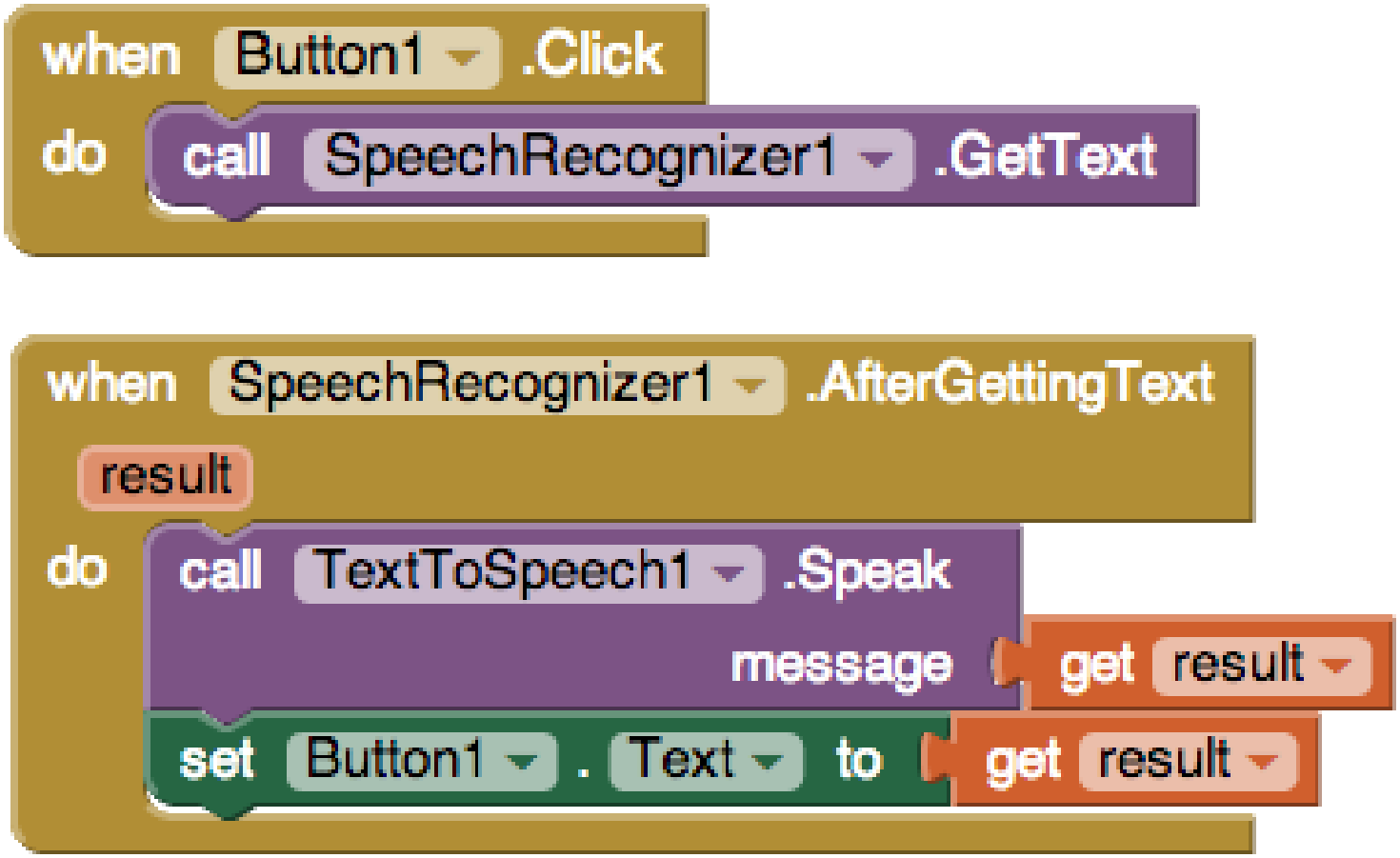




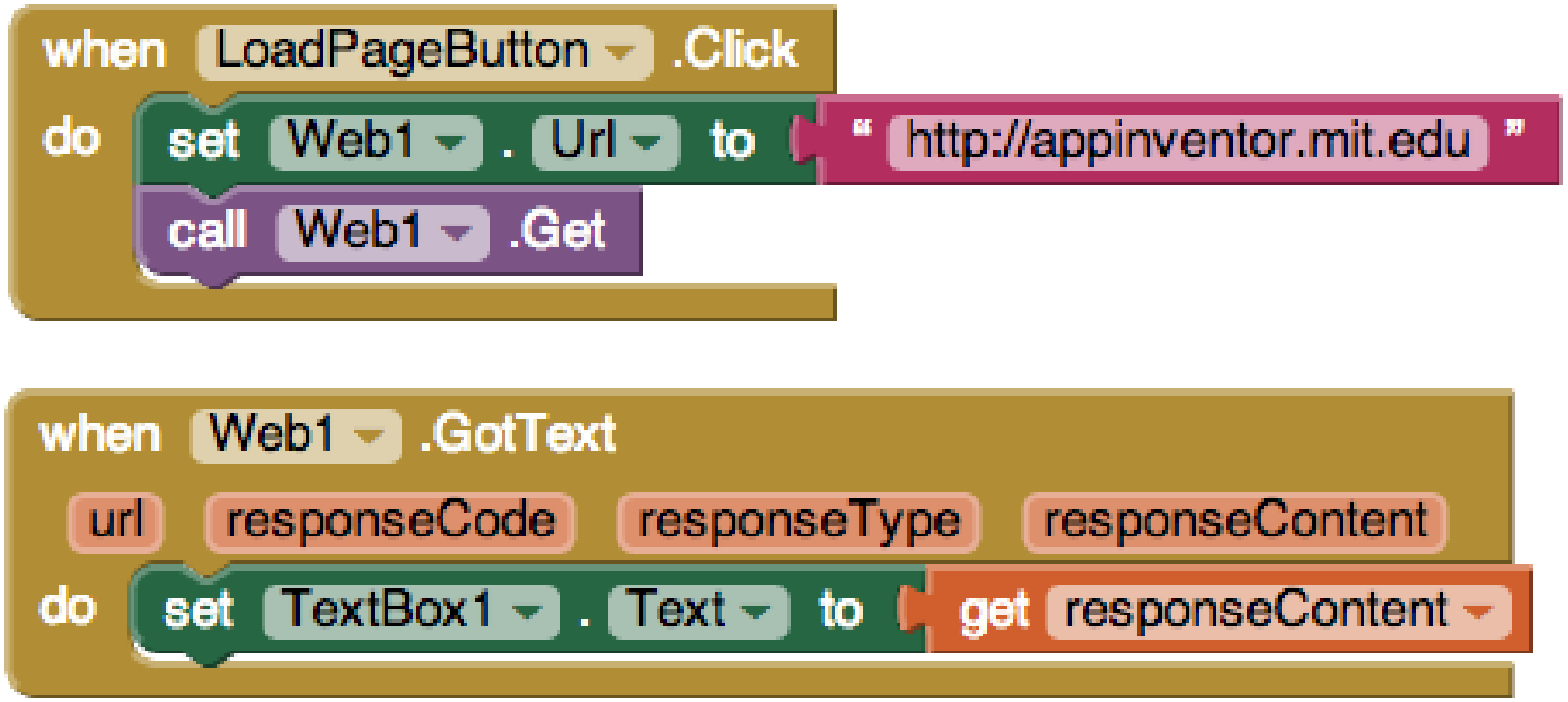
Event Parameters: No Texting While Driving



Callback Events: Speech to Text



Callback Events: Load Web Page



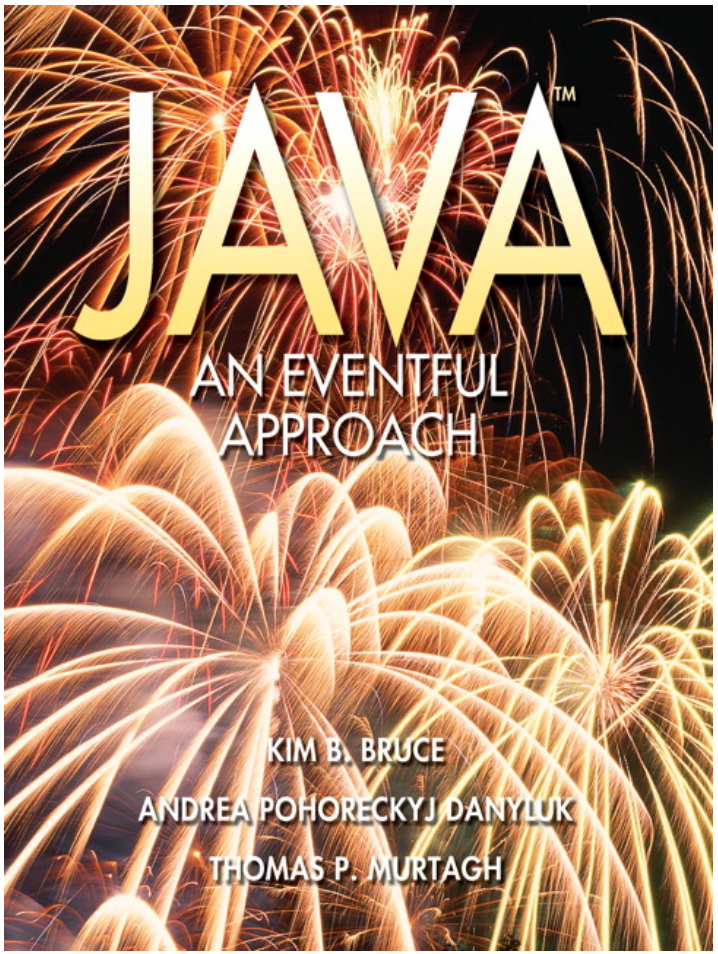
Web Example in JQuery JavaScript

```
$.get("http://appinventor.mit.edu",
    function (page) { alert(page); }
    );
```

Events First!

- Interactions with mobile apps are inherently event based.
- Want an event-based programming model that matches the event-based user model.
- Accessible to novices.
- Powerful paradigm for professionals.
- App Inventor programs are just a collection of event handlers.

Java: An Eventful Approach



- "We feel it is clearly more appropriate to adopt programming tools that reflect natural human models of the task undertaken than to adjust the thinking patterns of our student to fit the limitations of the programming techniques we present."
- Java objectdraw library allowed event-based programming from week 1.
- Including event-based techniques enhanced (and did not displace) other topics.
- Students thrilled by real-world interactivity of EBP.

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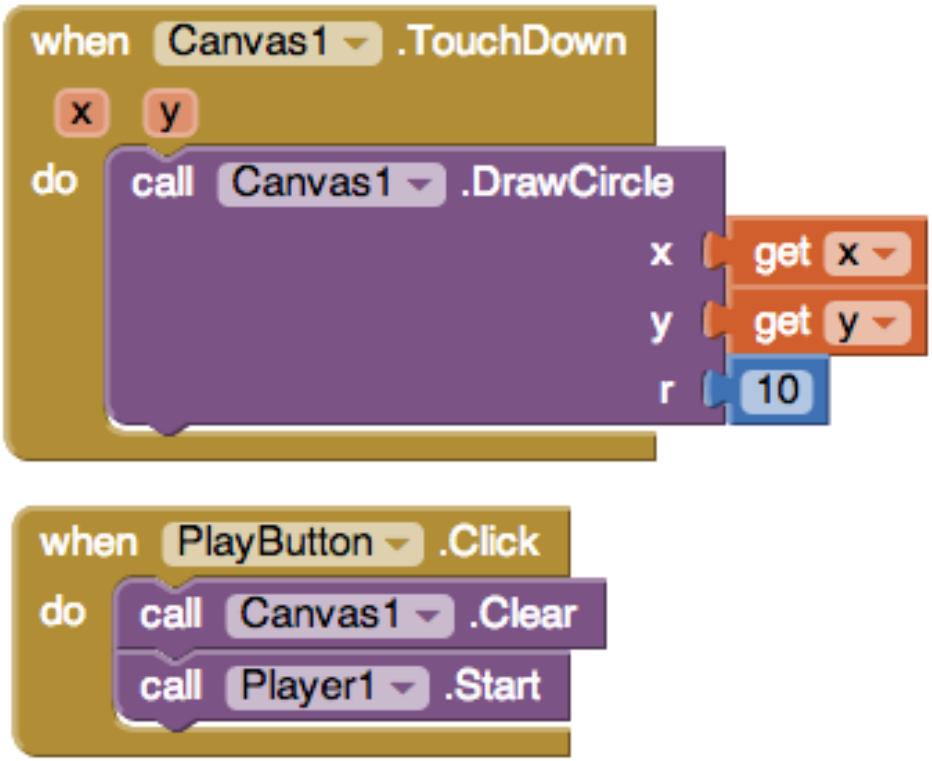
Events in the App Inventor Notional Machine

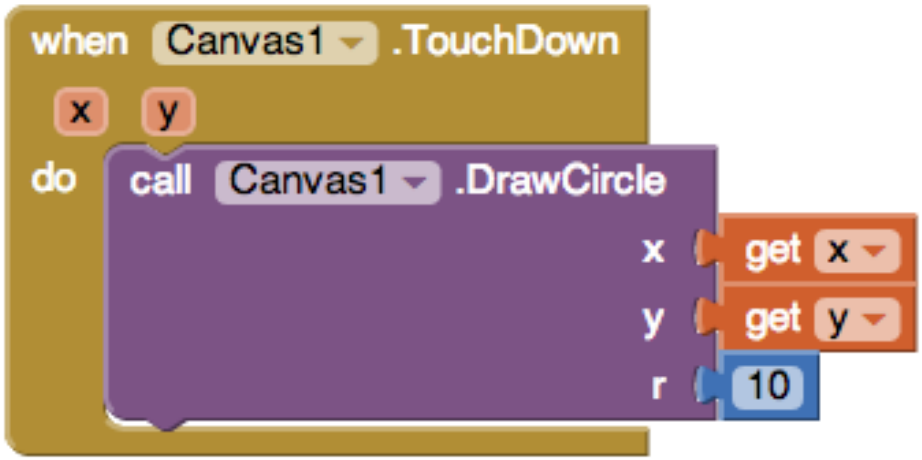
- Only one event handler can be executing at any given time.
- Other events that occur while an event handler is executing are queued and handled later, in order.
- Any GUI changes during an event handler are not displayed until the event has completed.
- Certain system actions (playing a sound file, initiating a web request, etc.) are executed in a thread separate from the current event handler.
- Playing a sound on a Player component first terminates any sound currently playing *except* when the source file has not been reset, in which case the new play request is ignored if the sound is already playing.

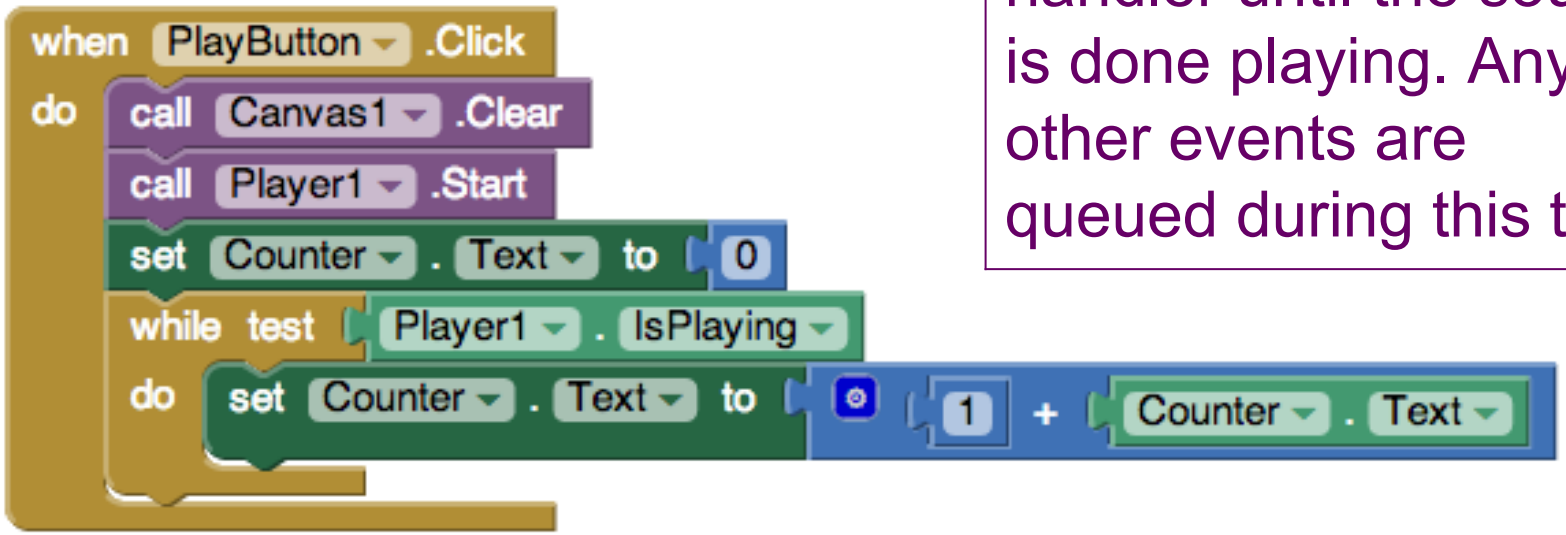
Can dots be drawn while the sound plays?



Answer: **YES**.
The sound plays in a different thread, so the PlayButton.Click event completes quickly, allowing Canvas events to run.

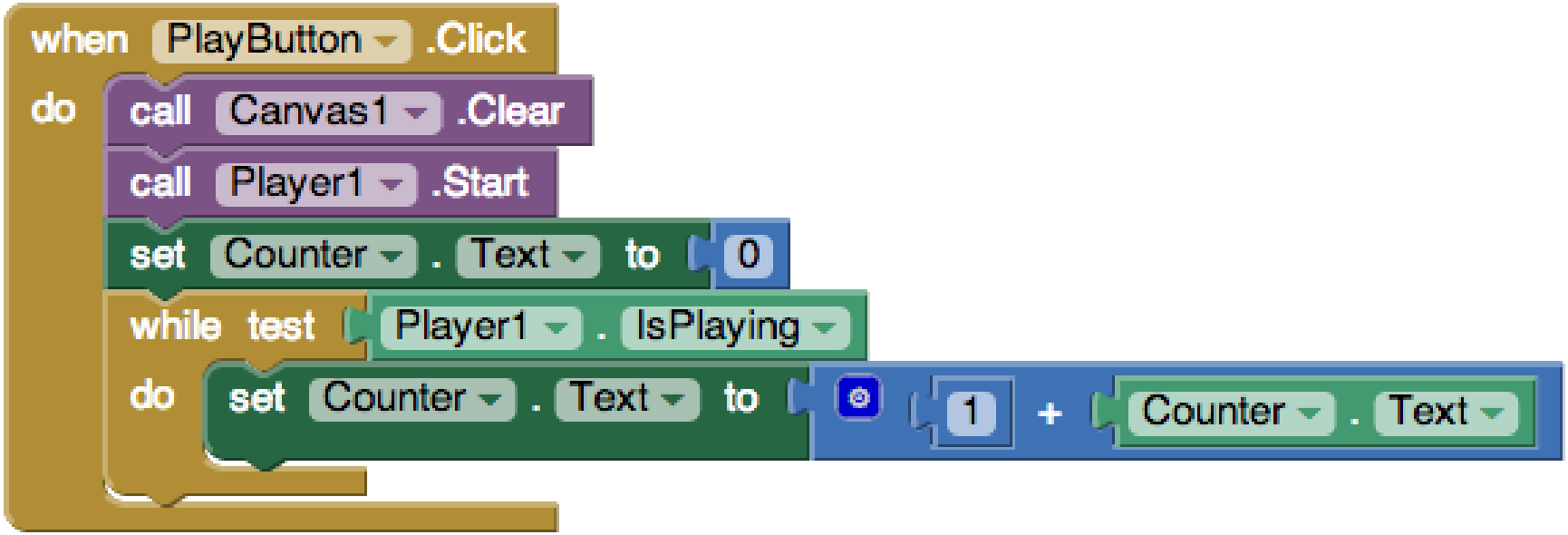
Can dots be drawn while the sound plays?





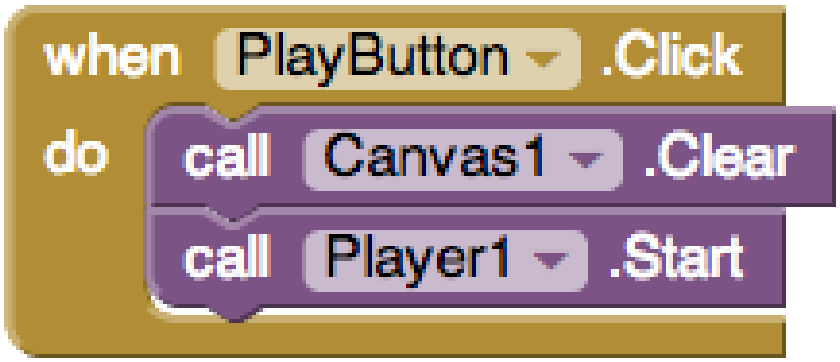
Answer: **NO**.
Although the sound plays in a different thread, the while loop holds control in the PlayButton.Click handler until the sound is done playing. Any other events are queued during this time.

Can we see the counter increment while the sound plays?



Answer: **NO**. The GUI is not updated until the event handler finishes executing, when the counter reaches its final value.

Suppose PlayButton is clicked to play a sound. What happens if it's clicked again while the first sound is playing?

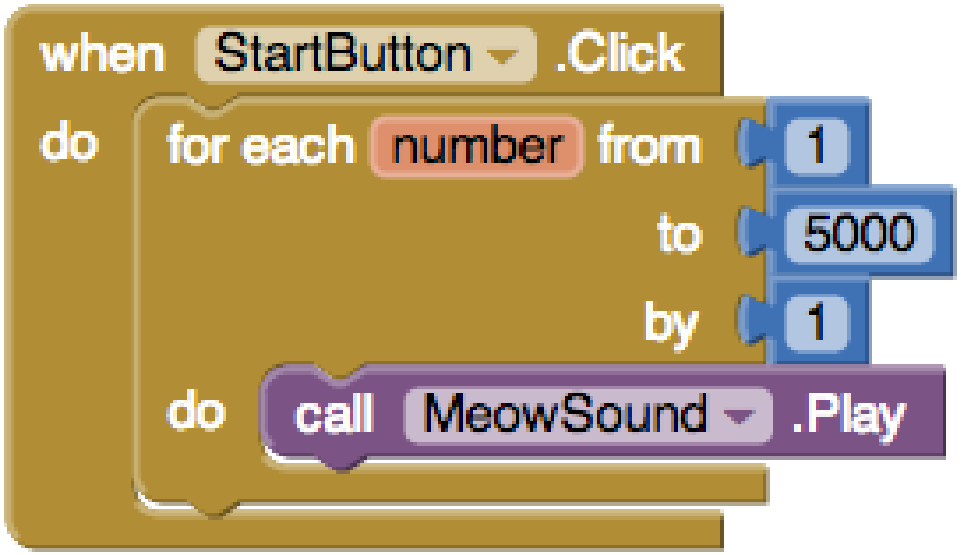


Answer: **NOTHING**.
As before, the first PlayButton.Click event completes quickly.
When the second event executes, the second attempt to play a sound is ignored because the same one is already playing.

What happens when PlayAllButton is clicked?

Answer: Only the last recording is played because each Player1.Start terminates the previous recording. Also, the button text does not display any of the intermediate indices.

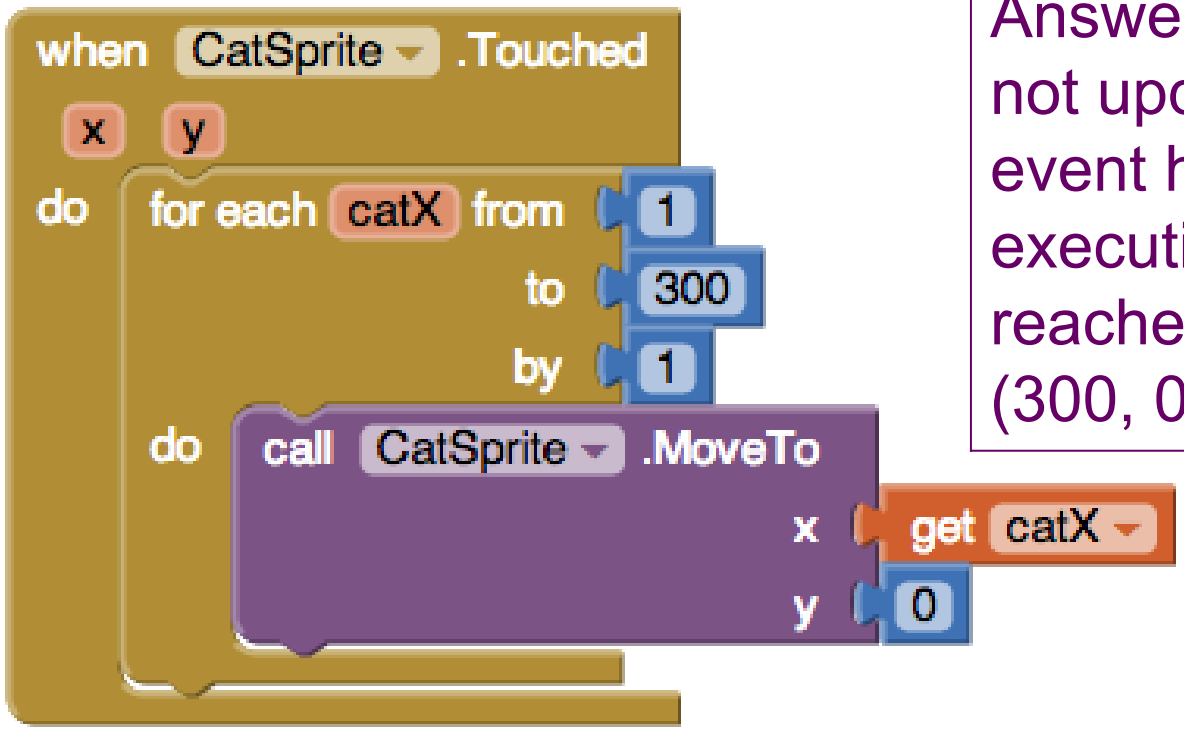
How many times is MeowSound played?



Answer: **Hard to predict, but way less than 5000 times.** The for loop executes quickly, and most requests to play MeowSound are ignored because the same sound is already playing.

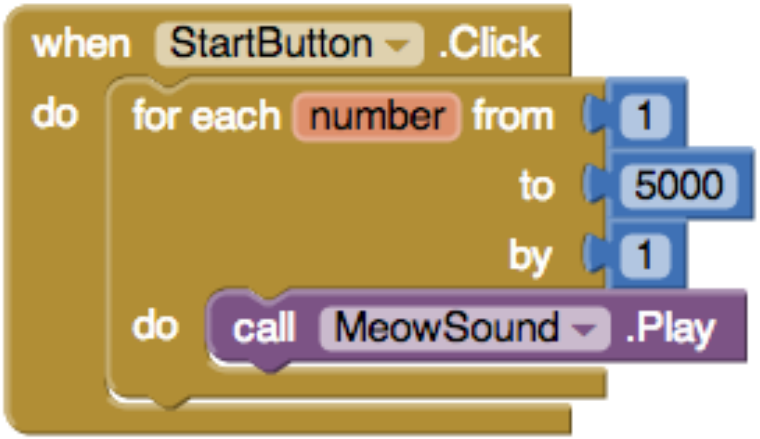
In practice, the answer is about a dozen times.

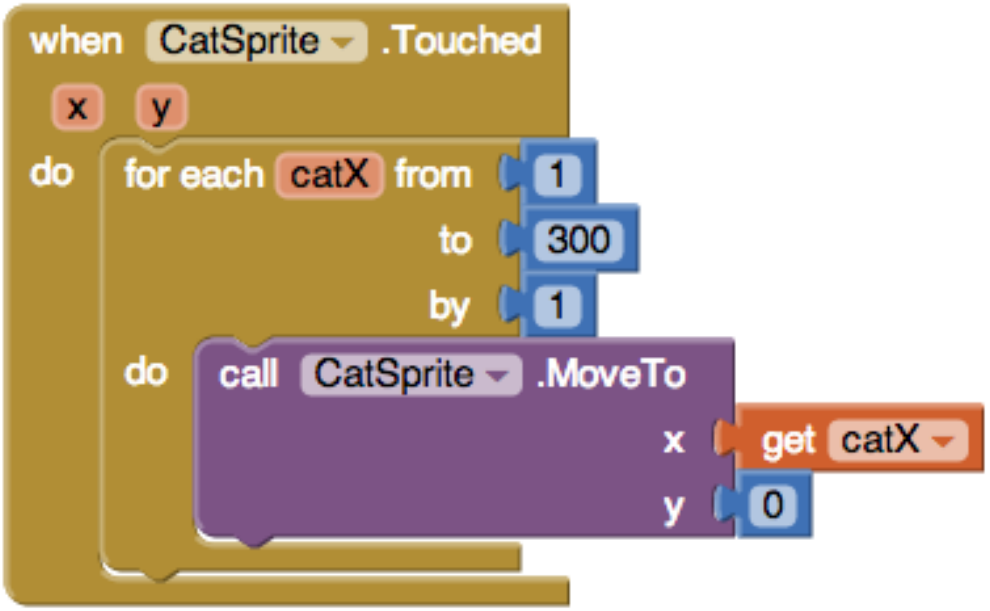
Do we see the cat walk across the screen?



Answer: **NO.** The GUI is not updated until the event handler finishes executing, when the cat reaches its final position, (300, 0).

What happens if we click Start and touch the cat?





Answer: MeowSound is played about a dozen times, during which the cat touch event is queued.
After the sound playing completes, the cat jumps to position (300, 0).

Event Handler Interleaving in Scratch

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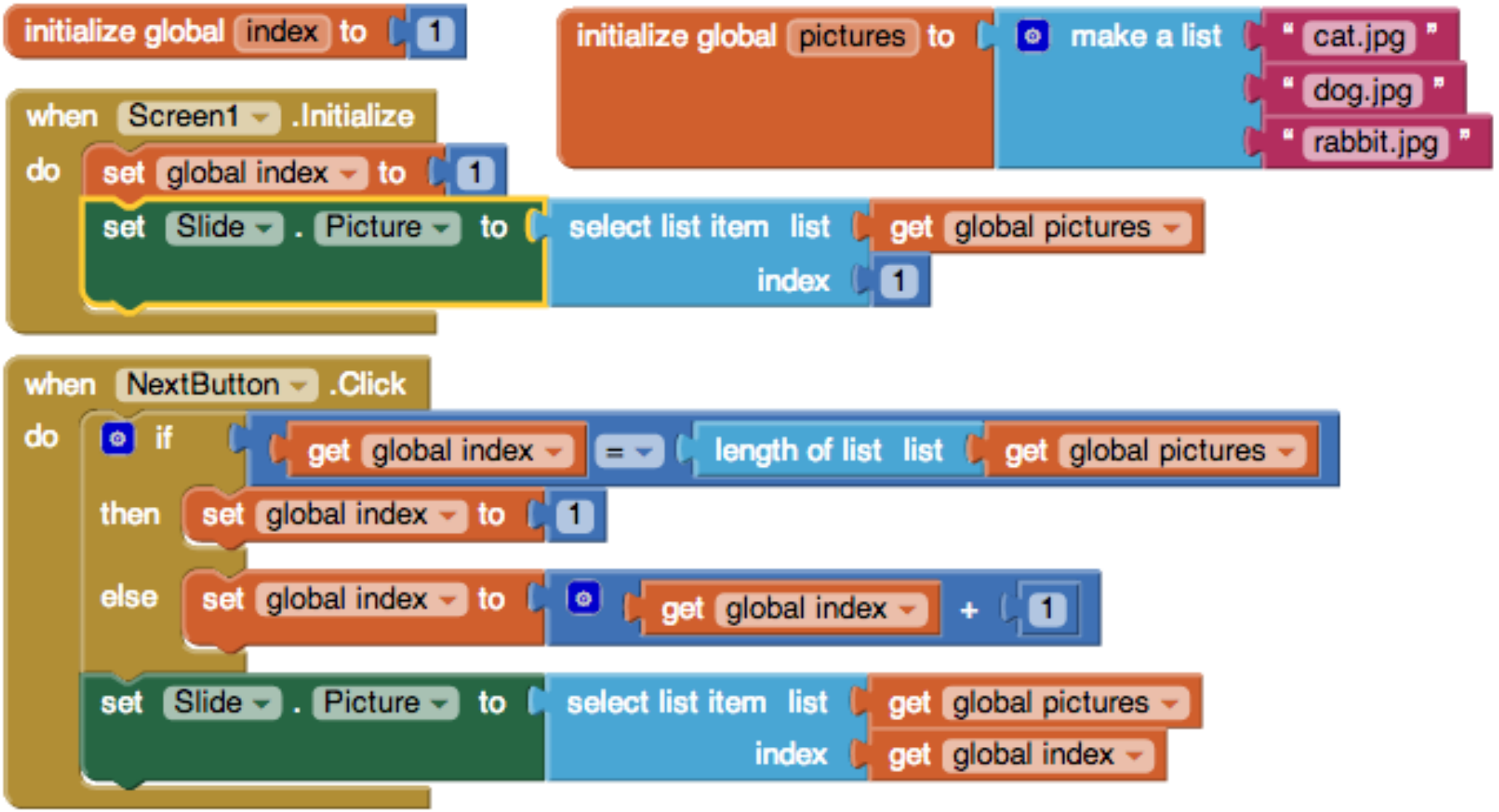
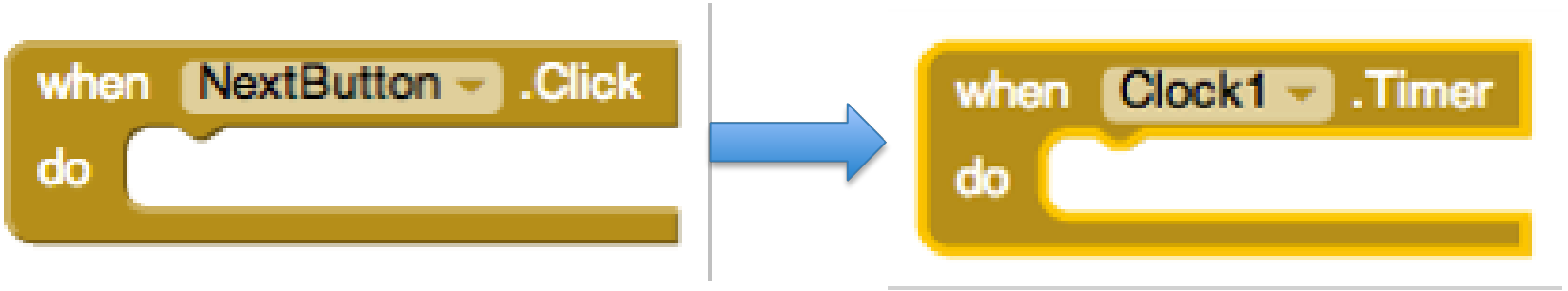
Global State Machines: Manually Advancing Slideshow

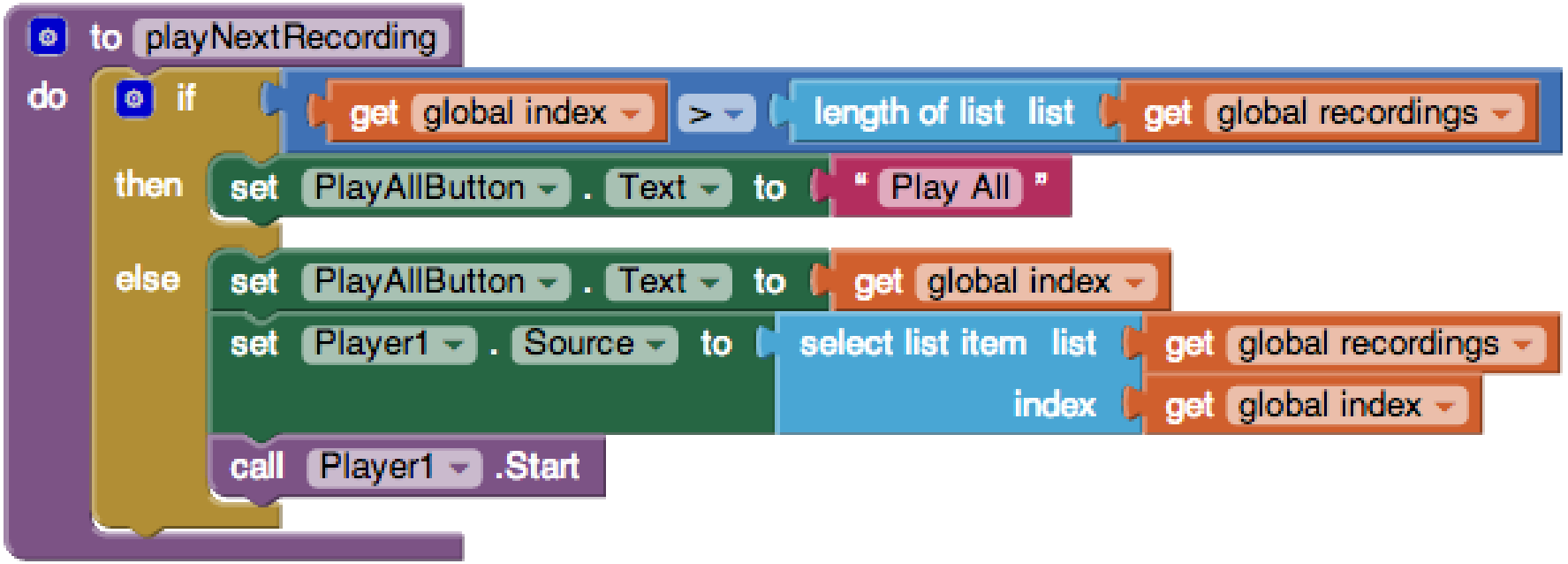


Timers: Automatically Advancing Slideshow

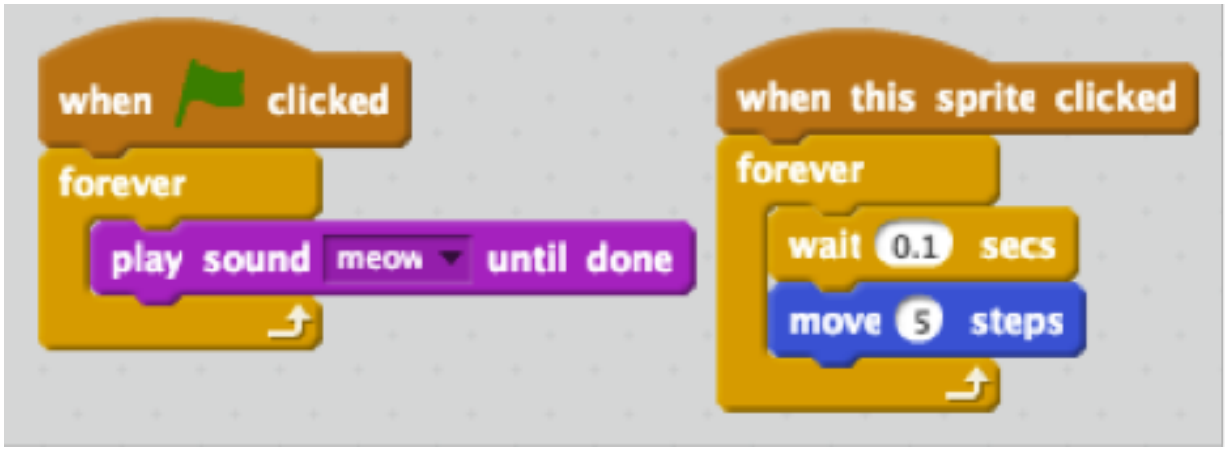


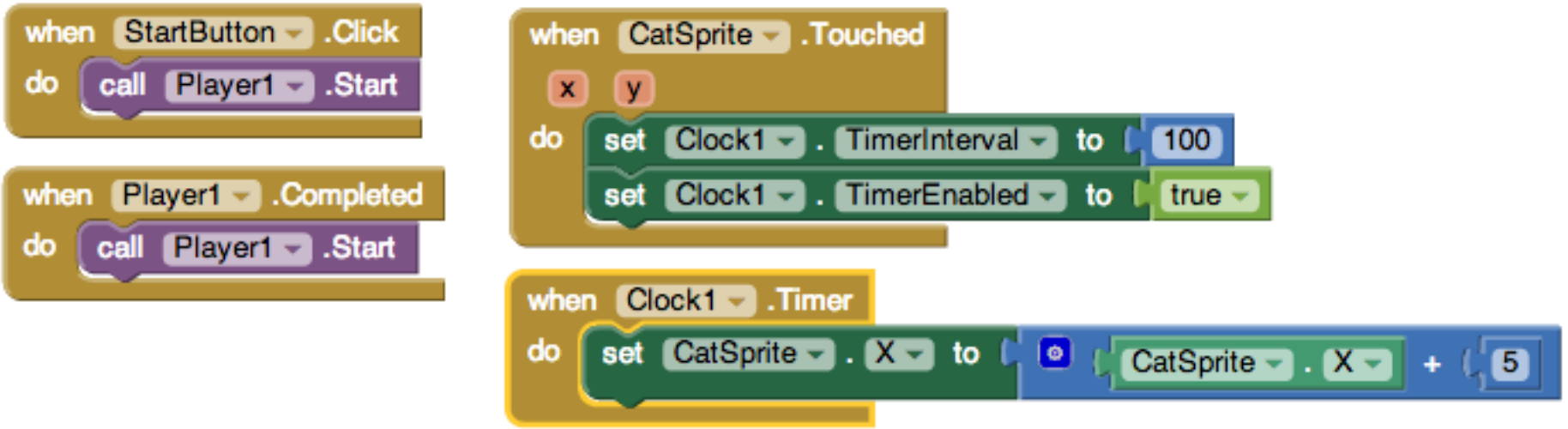
Working Player for Recording, Part 1

Working Player for Recording, Part 2

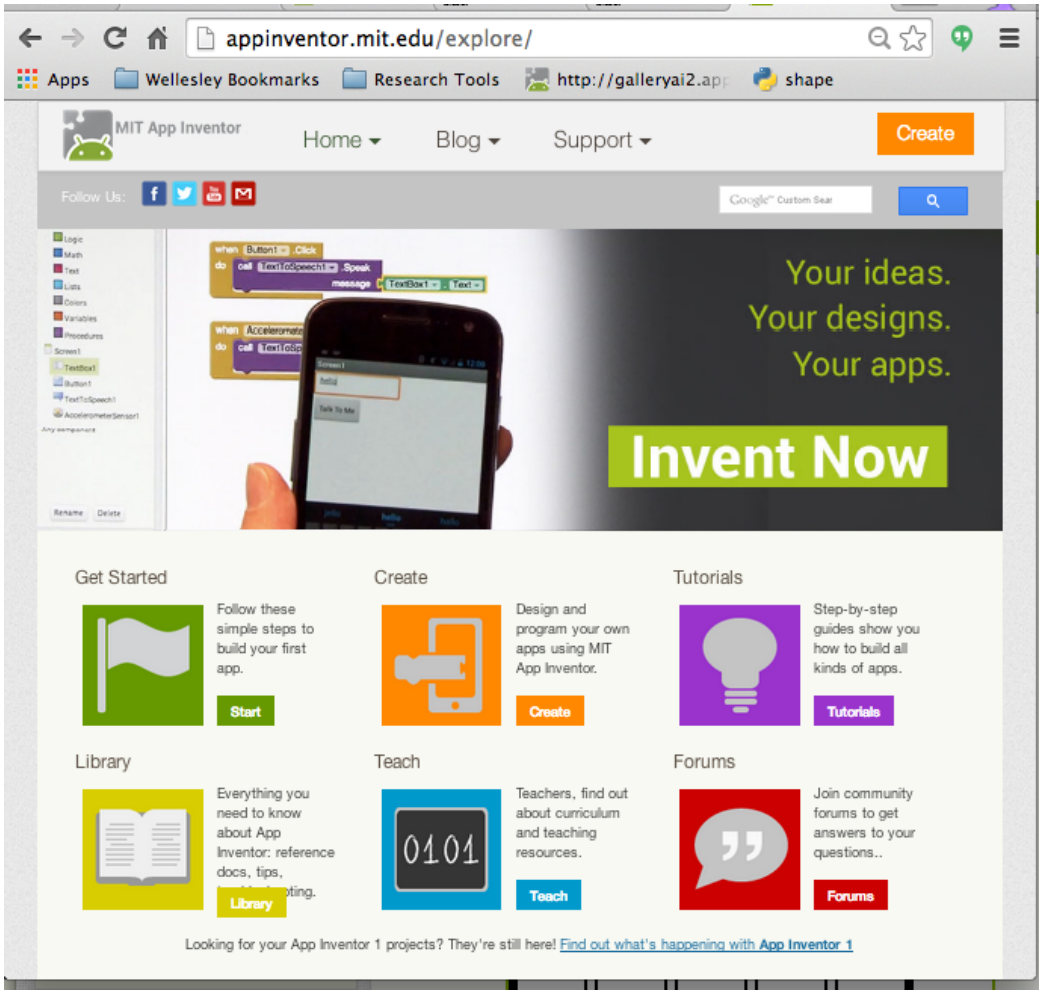


Scratch Example Revisited





Thank You! Questions?



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3-Day App Inventor Workshop for Undergraduate Faculty

Computational Thinking through Mobile Computing

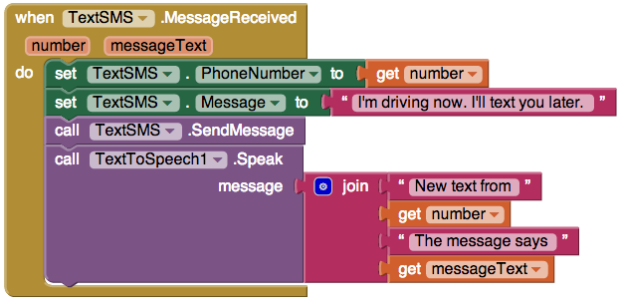
Mon July 21 – Wed July 23, 2014
University of Massachusetts Lowell

Workshop highlights:

- Hands-on sessions learning MIT App Inventor 2, with new browser-based blocks programming interface
- Teach computational thinking in CS0/CS1 while your students build Android phone & tablet apps
- Whole-course designs and modules for existing courses for majors and nonmajors
- Resources: videos, screencasts, tutorials, quiz-making environment, sample student projects
- Rubric for assessing mobile computational thinking
- Field trip to MIT Media Lab

Workshop Leaders: Learn from the creator of App Inventor and some of the early teaching pioneers.

- Hal Abelson (creator), Shay Pokress, Josh Sheldon (MIT)
- Ralph Morelli (Trinity College)
- Dave Wolber (University of San Francisco)
- Fred Martin, Karen Roehr, Mark Sherman (UMass Lowell)
- Eni Mustafaraj, Franklyn Turbak (Wellesley College)
- Larry Baldwin (BIRC, project evaluator)



App Inventor 2 blocks code for *No Texting While Driving App*

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