CS193P - Lecture 14

iPhone Application Development

Touch Events & Multi-Touch

Announcements

- Presence 4 due tomorrow 5/19 at 11:59PM
  - Questions?

Announcements

- Final projects due Sunday 6/7 at 11:59PM
  - **No late days** may be used!
  - Demos on Monday 6/8 from 12:15-3:15PM
- Some apps from last quarter...
  - http://www.stanfordiphoneclassapps.com/

Air Guitar
James Anthony and Edward Marks

Qingwen
Karan Misra

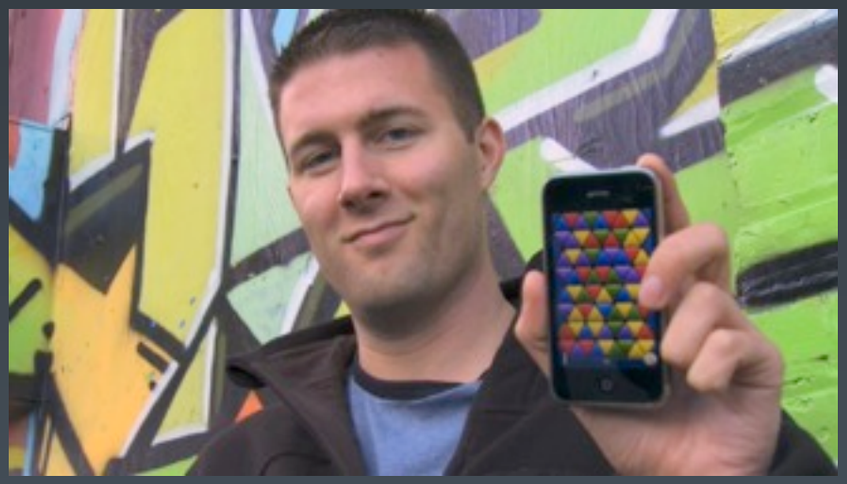
And more...

Special Announcement

Today's Speakers

- Steve Demeter, Demiforce
  - Thoughts & guidelines for touch input in games
  - Five effective multitouch control schemes
- Josh Shaffer, Apple
  - Touches and events
  - Multi-Touch handling
  - Controls

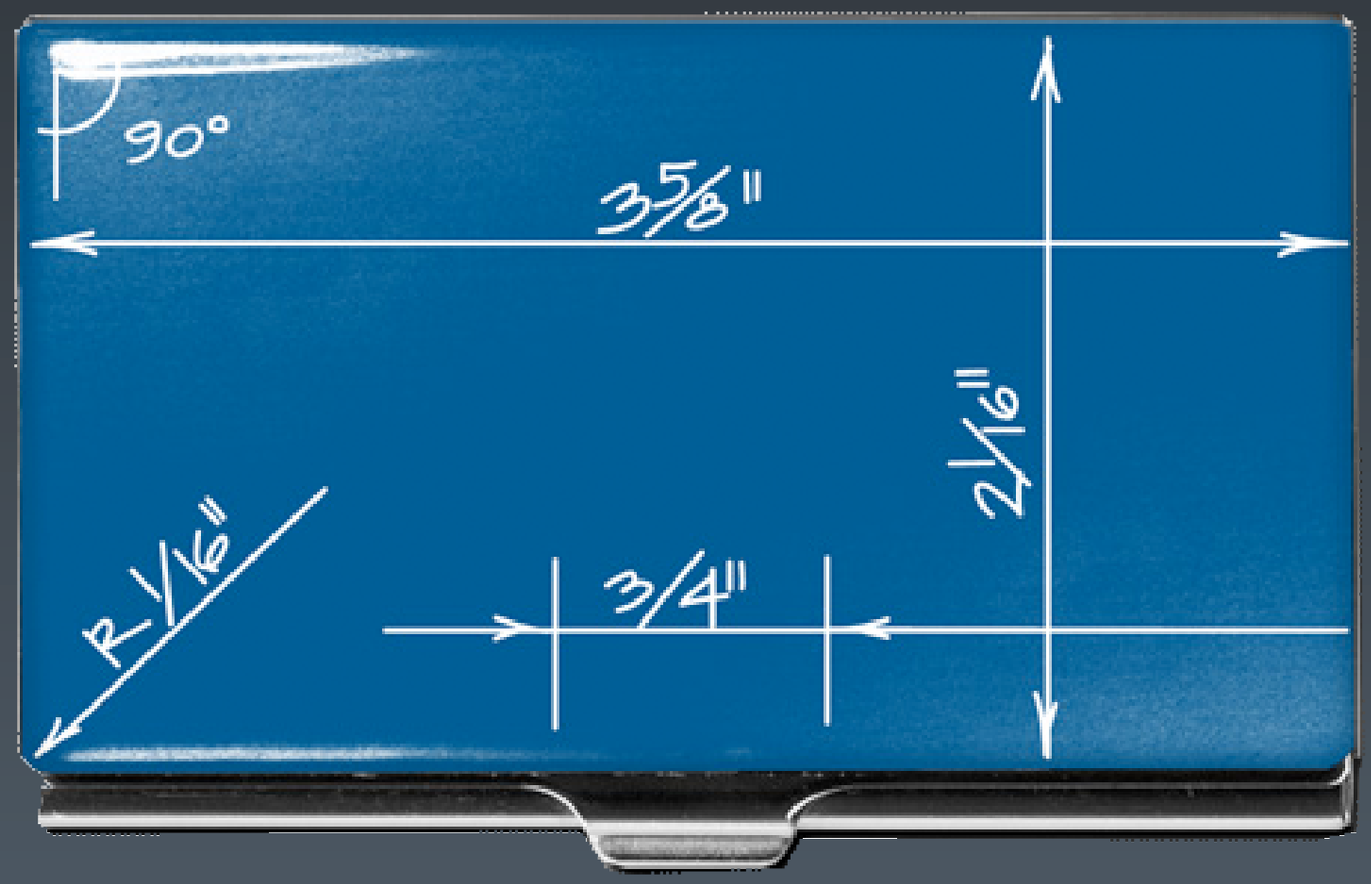
Guest Speaker:
Steve Demeter, Demiforce



Introduction

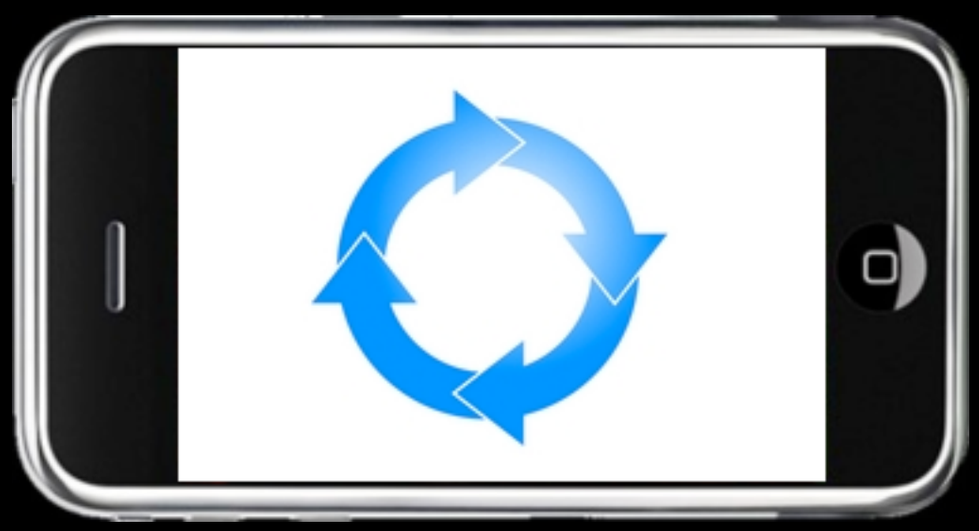
- Steve Demeter, founder of Demiforce
  - Created “Trism” at the launch of the AppStore
  - Demiforce creates original IP & provides whitelabel consulting
- What I’ll be talking about
  - Thoughts & guidelines for using touch input in iPhone games
  - Five forms of multitouch control schemes used in iPhone games

Thoughts & Guidelines For Using Touch Input in iPhone Games



Touch Control vs Tilt Control

- Many see the iPhone is a casual gaming device, meant to be played on the go
- Accelerometer games are "fragile", requiring the user to be in a stable, undisturbed location in order to play
- The most stable, undisturbed location is one's own home, where the user may rather play a console or computer game than an iPhone game

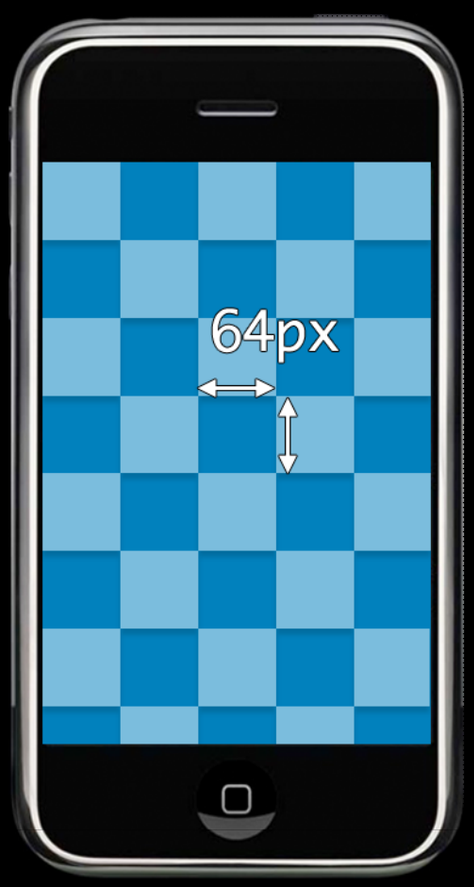


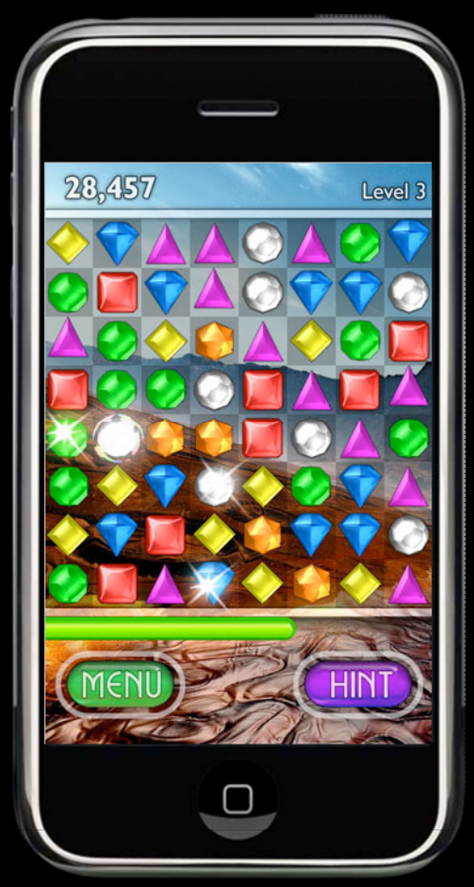
Finger Touch vs Mouse Cursor

- Remember it's a finger you're using to control the game, not a mouse cursor!
- Every time the user touches the screen, they may be sacrificing some kind of display

Accomodating Finger Sizes

- iPhone gamers are all ages, and have all different sized fingers
- 64px * 64px is the smallest area Demiforce uses for touchable shapes
- There are ways to get around this, ie: Bejeweled 2





Aiding Touch Control

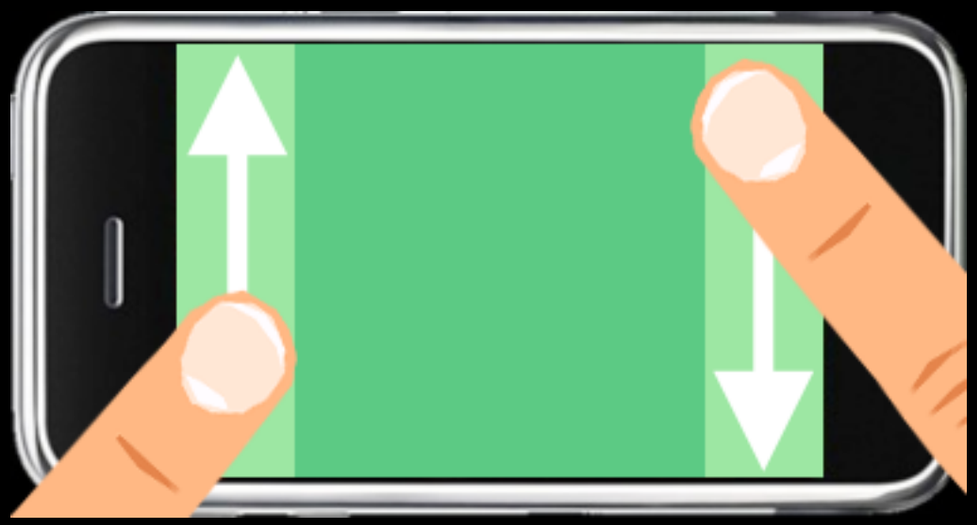
- It's helpful to put some sort of indicator for what's being touched

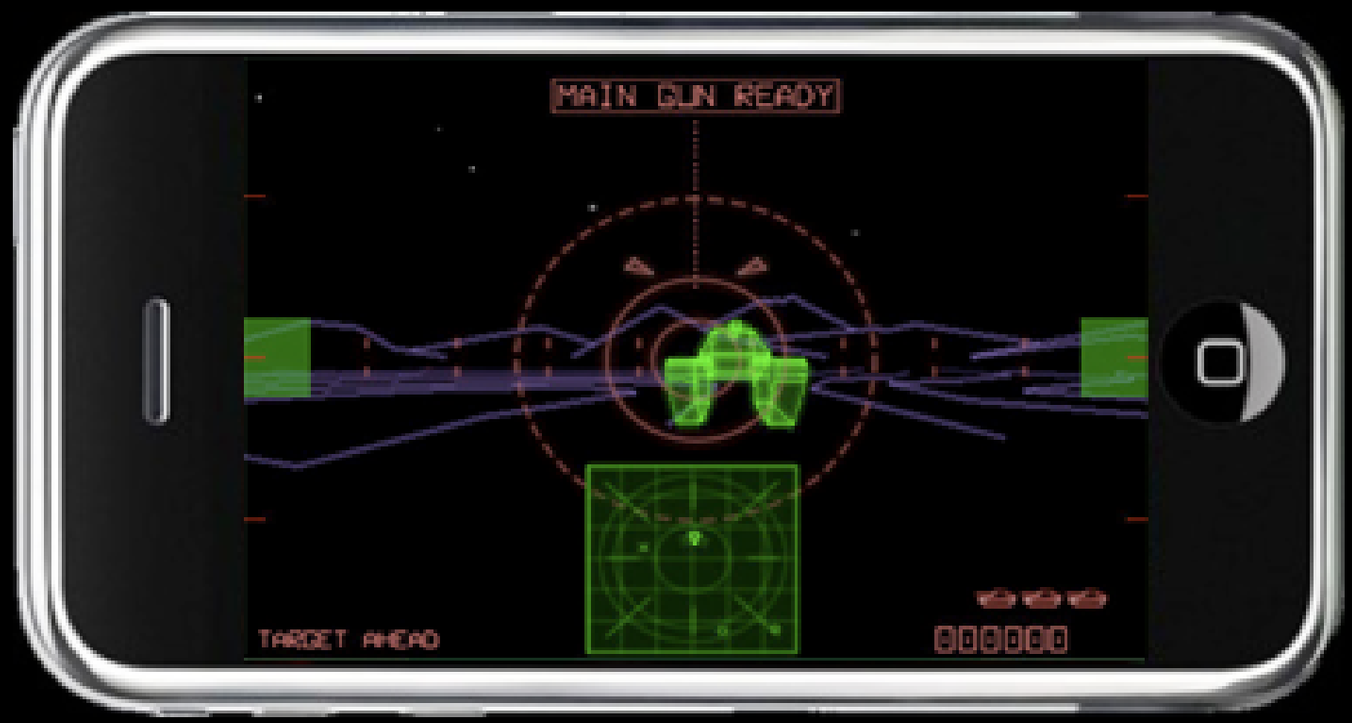
- Trism does this two ways:
  - When you touch a trism, a hilighted marker pops out
  - Once you start sliding a strip, you can move your finger off the selected trism

Five Effective Multitouch Control Schemes

1: Sliders

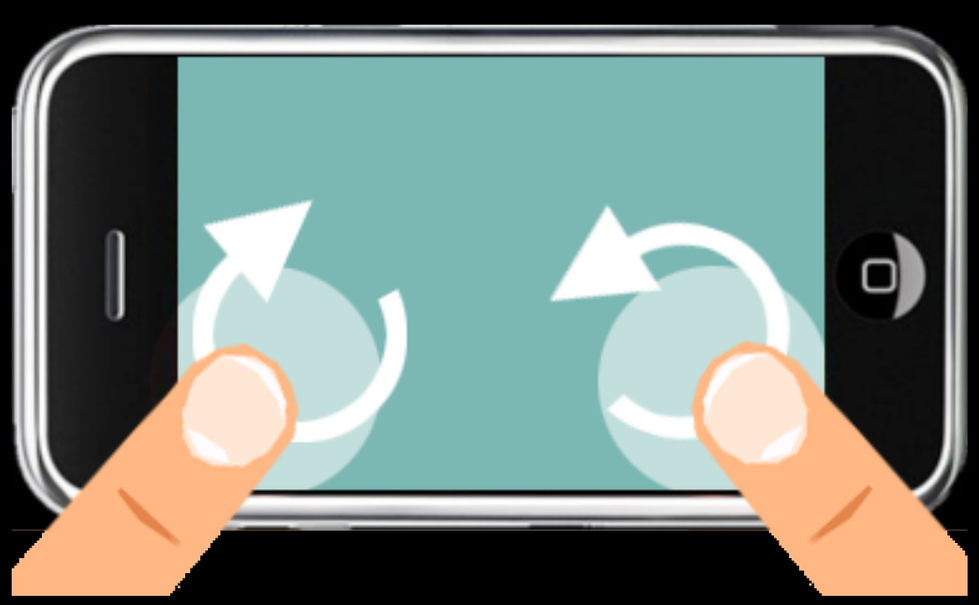
- Provides two single-dimensional inputs
- Pro: Allows a clear barrier between control surface and gameplay area
- Con: This type of control may not be enough for some games
- Example: Vector Tank





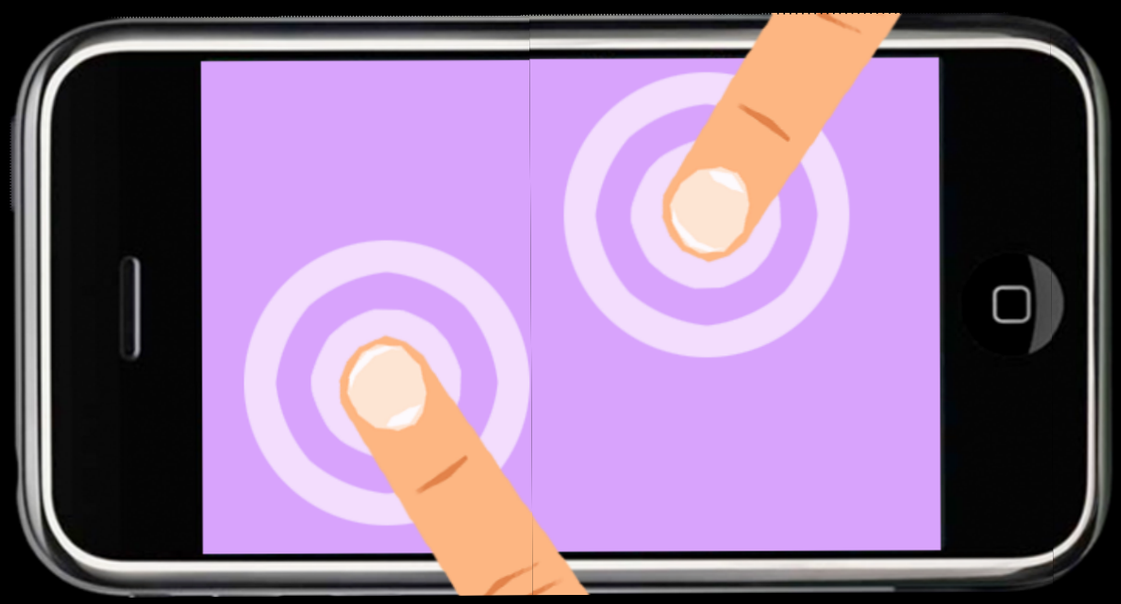
2: Swivels

- Provides two independent controls which report length & direction, similar to analogue joysticks
- Pro: Similar to sliders, the user interacts with thumbs away from the gameplay area
- Con: Works best when the user has his thumbs on the swivels at all times, which may not work well for certain games
- Examples: iDracula (fixed), Dropship (relative)



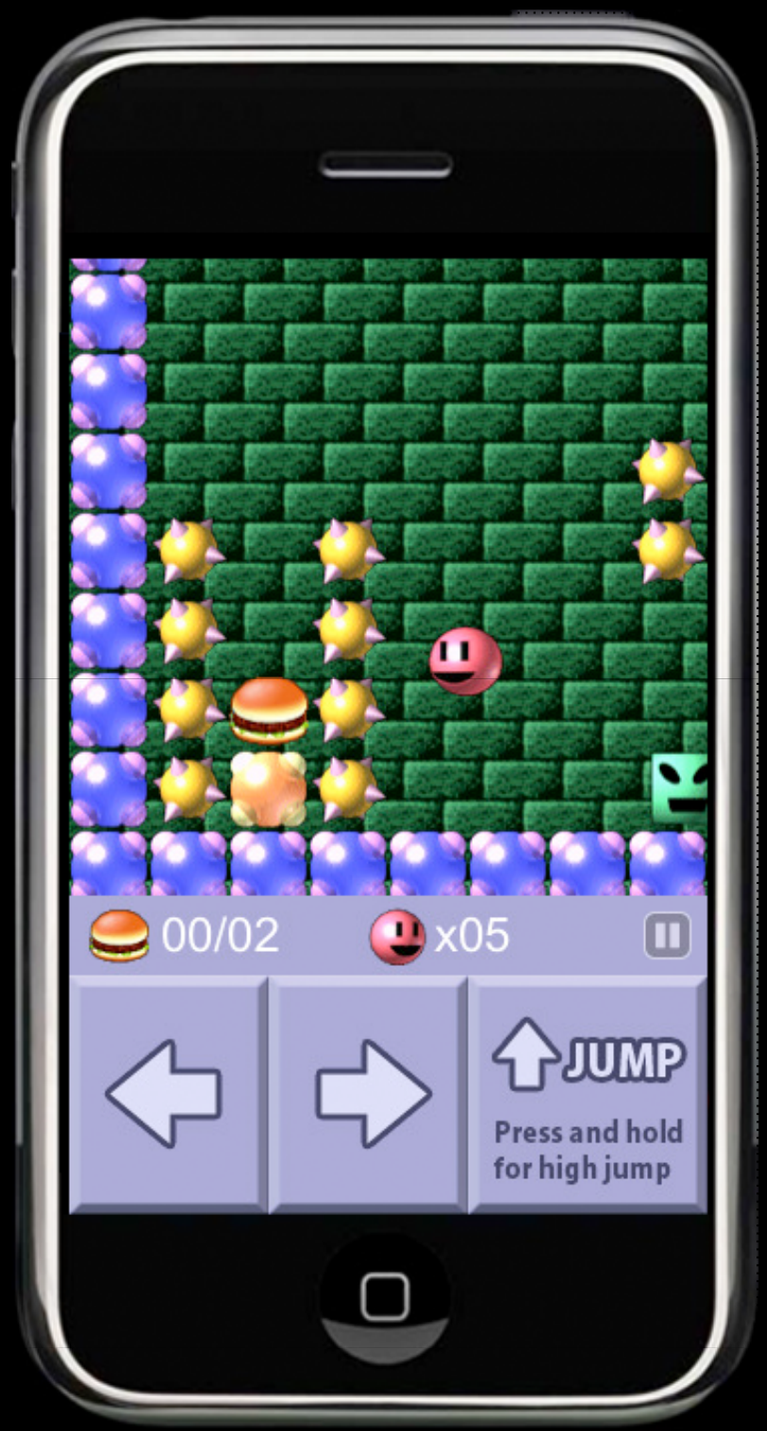
3: Direct Touch

- Provides intuitive multitouch control (ie: pinch, spread)
- Pro: Fundamentally new. These types of game designs are generally seen as “out of the box”
- Con: Too many pinches and swipes can crowd the screen
- Example: Pinch & Pop



4: Face Buttons, Simulated D-Pad

- Provides a pseudo classic controlpad
- Pro: Allows ports & retro-style games on iPhone
- Con: Potential button crowding
- Examples: Archibald's Adventures, Papi Cave



5: Create Your Own!

- Innovation is celebrated & monetizable on the iPhone
- New types of controls are appearing from students, indies, and corporations
- See what you can create!

Questions?

Josh Shaffer, Apple
Touch Events & Multi-Touch

AT&T 9:42 AM

Distance Themselves From Bush
FOX News - **5 hours ago**
AP, June 5: Republican presidential hopefuls former Massachusetts Gov. Mitt Romney, left, and former New York City Mayor Rudy Giuliani, right, share a lau.
Republicans say would welcome Thompson to 2008 race Washington Post
When Lightning Strikes Newsweek
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Bush, Putin meet at G8 summit as tensions mount
Reuters AlertNet - **37 minutes ago**
By Christian Lowe and Caren Bohan. HEILIGENDAMM, Germany, June 7 (Reuters) - US President George W. Bush and Russian leader Vladimir Putin meet at a summit in Germany on Thursday for the first time in half a year as ties between their countries sink to ...
Blair lands in Germany for his last G8 summit China Daily
Kremlin says Putin's missile threat was "hypothetical" Scotsman
Guardian Unlimited - Baltimore Sun - Monsters and Critics.com - Voice of America
all 3,187 news articles »

Cyclone Gonu batters Gulf states, thousands evacuated (+photos)
New Zealand Herald - **2 hours ago**
By Lin Noueihed. Local fishermen move their boat to a safe place during Cyclone Gonu in Jusk seaport, Iran. Photo / Reuters. Cyclone Gonu made landfall in Iran today, packing winds of 200kmh and forcing the evacuation of tens of thousands of people, ...
Cyclone Hits Oman - To reach Muscat Today Mangalorean.com
Oil Pares Gains; US Supplies of Gasoline

U.S. » edit

Libby Allies Call for Pardon From Bush
Forbes - **5 hours ago**
By MATT APUZZO and PETE YOST 06.06.07, 1:04 PM ET. I. Lewis "Scooter" Libby's allies renewed their call for President Bush to pardon the former White House aide but President Bush rebuffed questions Wednesday about whether he'd intervene to prevent ...
Bush, Cheney Express Support for Sentences White House Aid Voice of America
Libby gets prison, Bush may face dilemma Los Angeles Times
Guardian Unlimited - Globe and Mail - Canada.com - Melbourne Herald Sun
all 1,934 news articles »

GOP seeks to expel Jefferson from House
New Hope Courier - **Jun 5, 2007**
By LAURIE KELLMAN, AP Writer 4 minutes ago. WASHINGTON - Republicans moved Tuesday to seek Rep. William J. Jefferson's expulsion from the House, a day after the Louisiana Democrat was indicted on charges of receiving more than $500000 in bribes.
Jefferson to Take Leave From House Panel

4

Carrier 9:34 AM

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A B C D E F G H

Today's Topics

- Touch Sequences
- Touch and Event Objects
- Touch Delivery
- Single Touch
- Multiple Touches
- Multiple Views
- Touch Routing
- UIControl Objects

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Single Touch Sequence

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UITouch

Represents a single finger

```
@property(nonatomic,readonly) NSTimeInterval      timestamp;
@property(nonatomic,readonly) UITouchPhase        phase;
@property(nonatomic,readonly) NSUInteger          tapCount;

@property(nonatomic,readonly,retain) UIWindow    *window;
@property(nonatomic,readonly,retain) UIView      *view;

- (CGPoint)locationInView:(UIView *)view;
- (CGPoint)previousLocationInView:(UIView *)view;
```

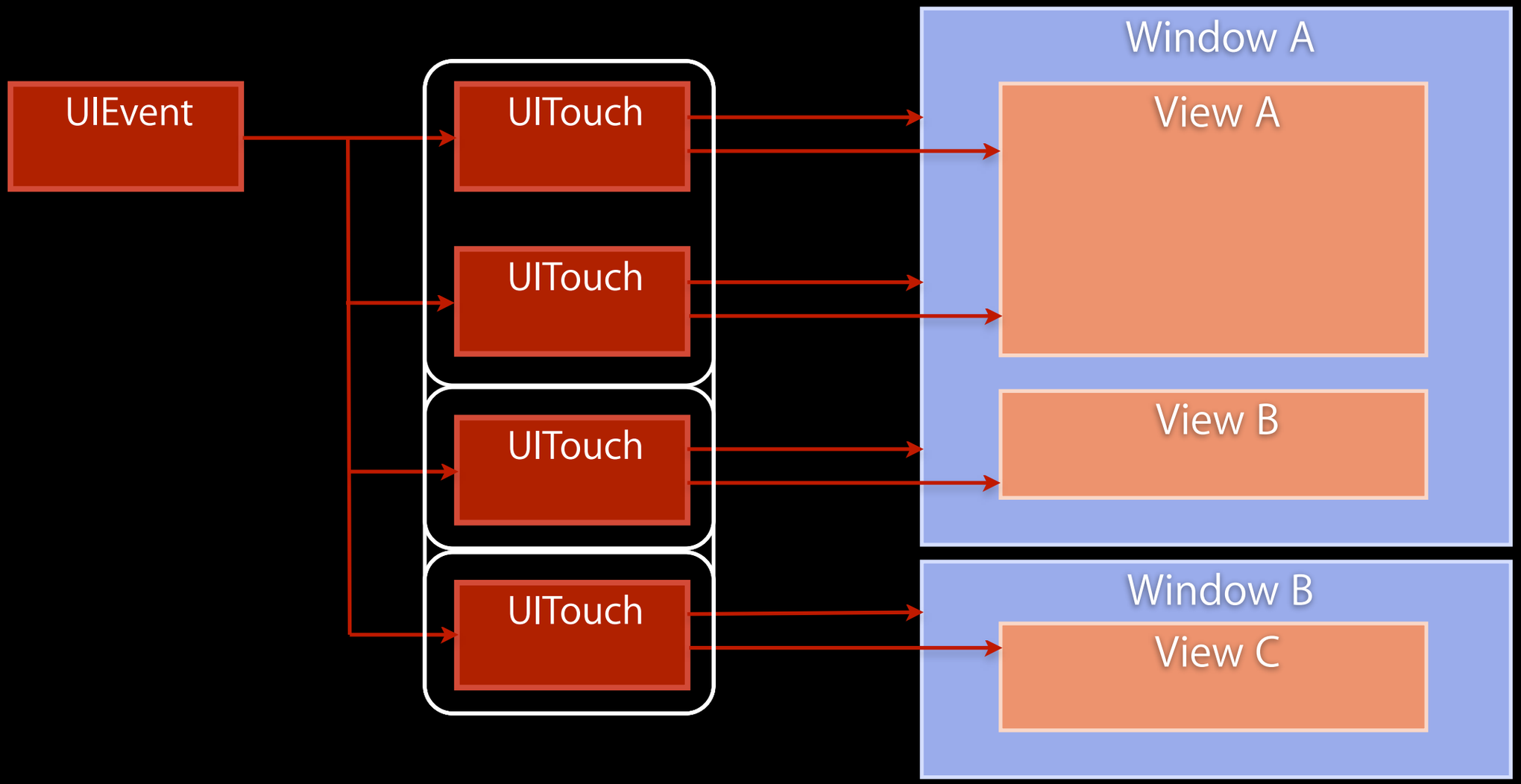
UIEvent

A container for one or more touches

```
@property(nonatomic,readonly) NSTimeInterval timestamp;

- (NSSet *)allTouches;
- (NSSet *)touchesForWindow:(UIWindow *)window;
- (NSSet *)touchesForView:(UIView *)view;
```

UIEvent




```
- (NSSet *)touchesForWindow:(UIWindow *)window;
```

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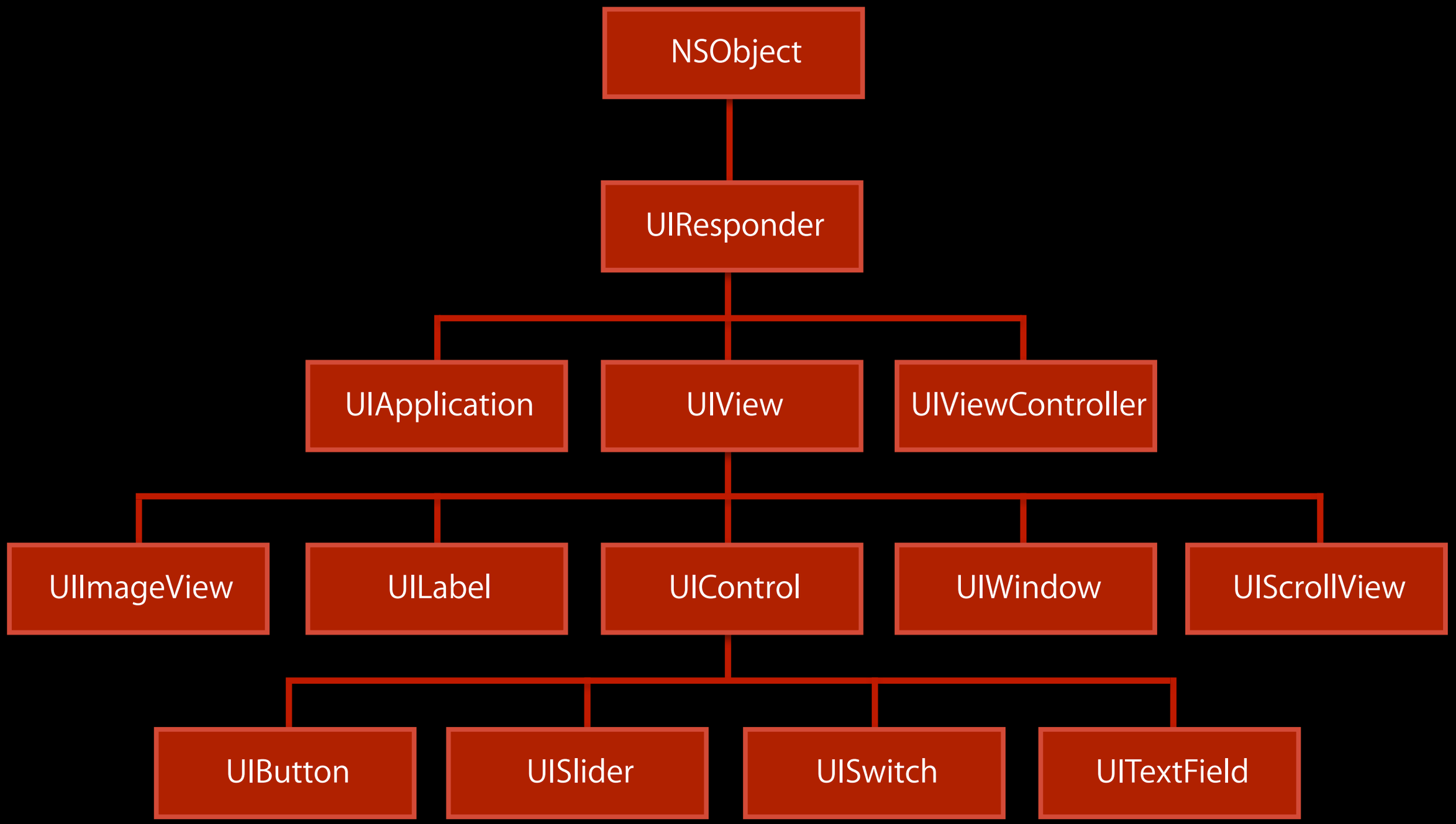
Receiving Touches

UIResponder

```
- (void)touchesBegan:(NSSet *)touches withEvent:(UIEvent *)event;
- (void)touchesMoved:(NSSet *)touches withEvent:(UIEvent *)event;
- (void)touchesEnded:(NSSet *)touches withEvent:(UIEvent *)event;
- (void)touchesCancelled:(NSSet *)touches withEvent:(UIEvent *)event;
```

UIResponder



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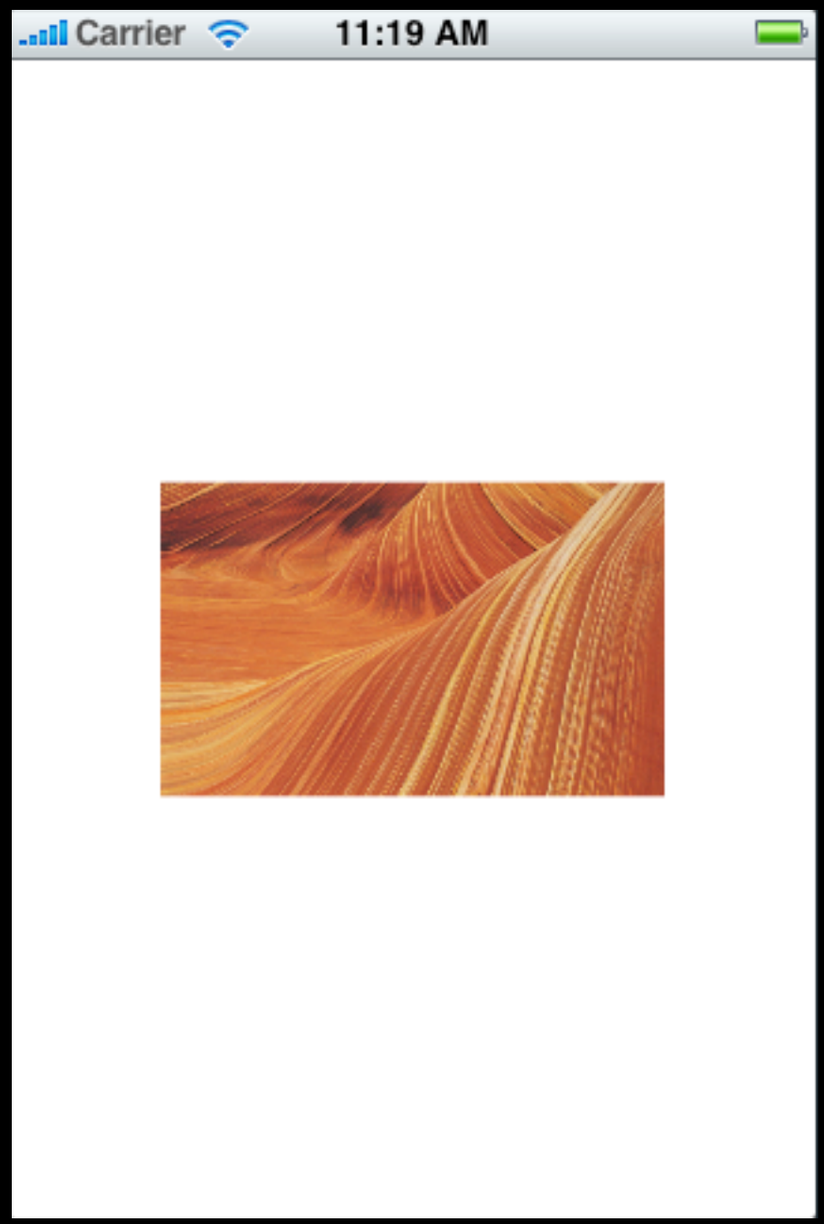
Single Touch Sequence

touchesEnded:withEvent:

Single Touch Demo



Demo

Single Touch

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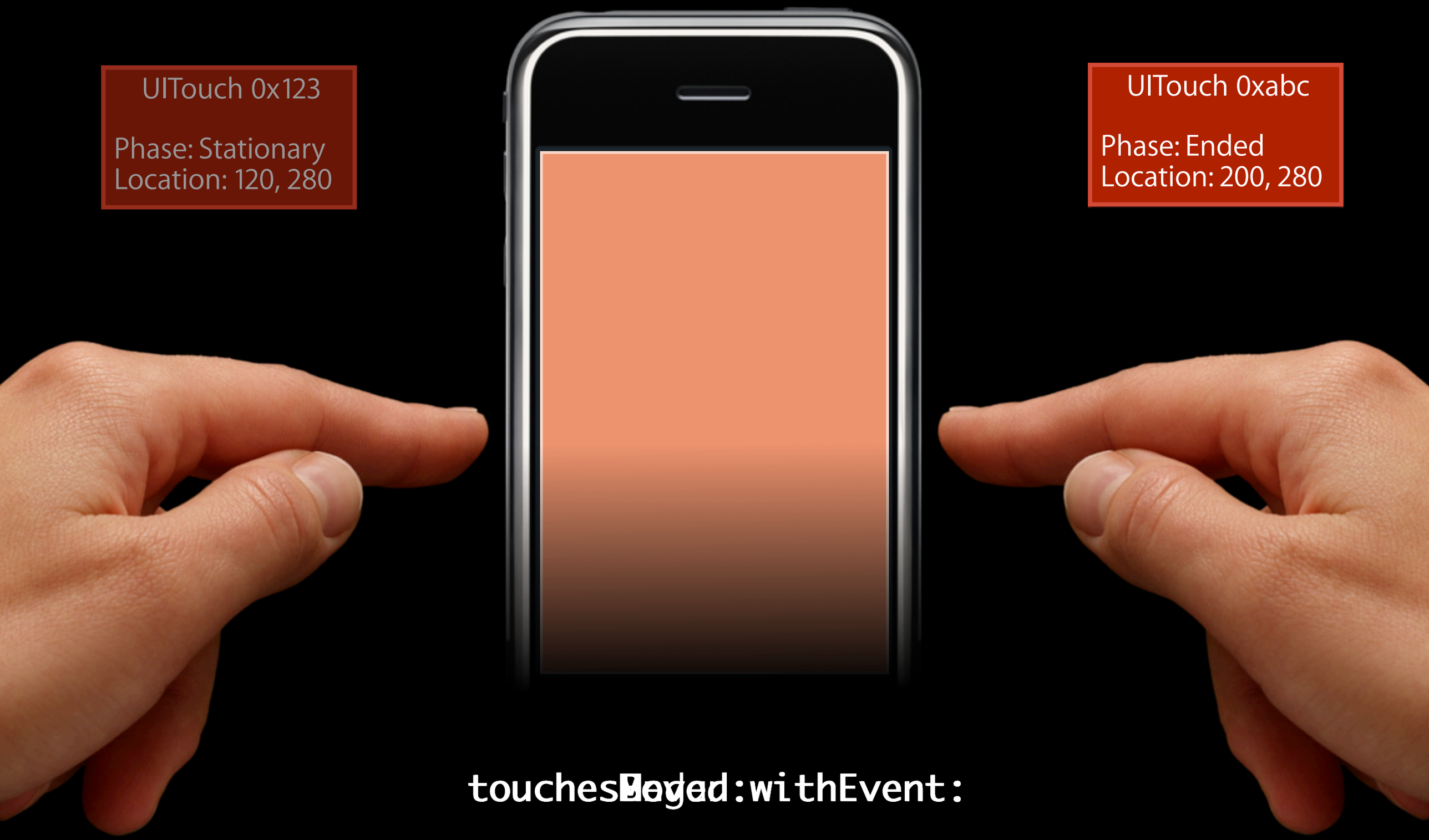
Multiple Touches

UIView Property

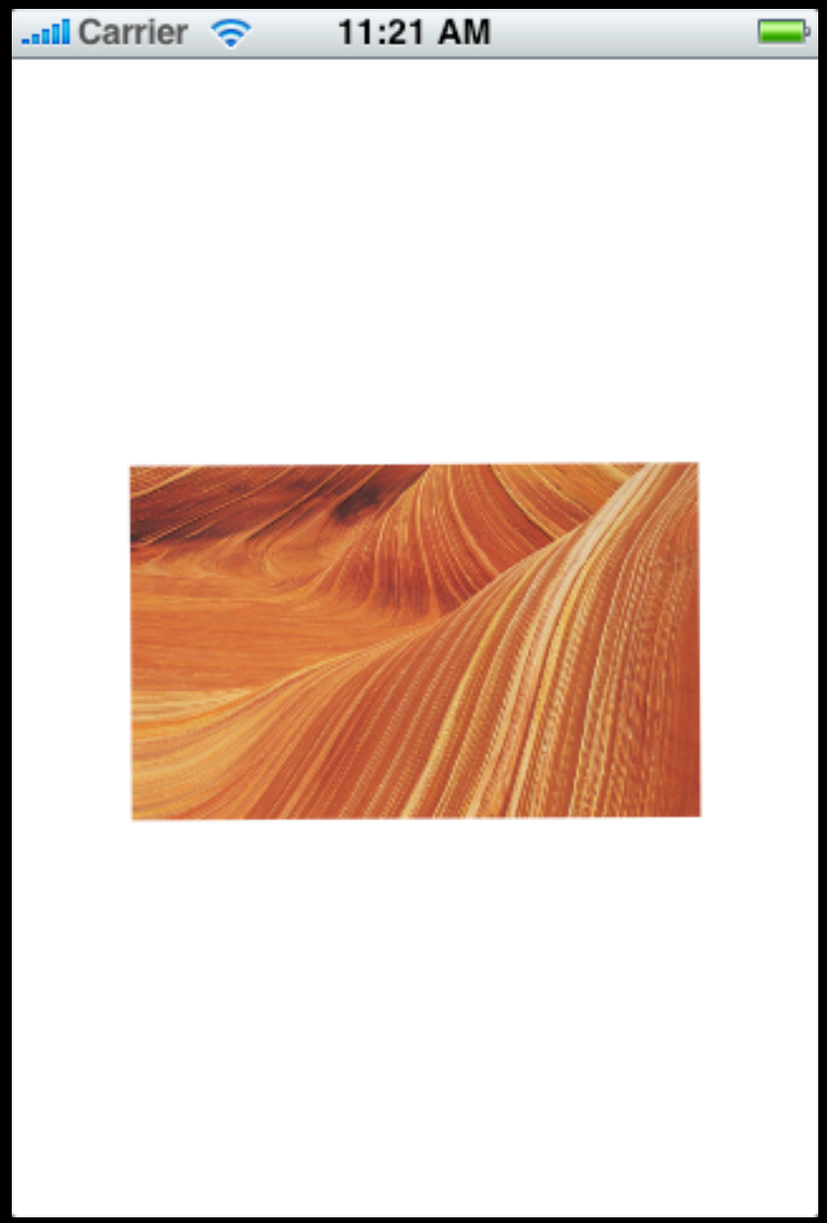
```
BOOL multipleTouchEnabled;
```

Multiple Touch Sequence



touchesMoved:withEvent:

Multiple Touches Demo



Demo

Multiple Touches

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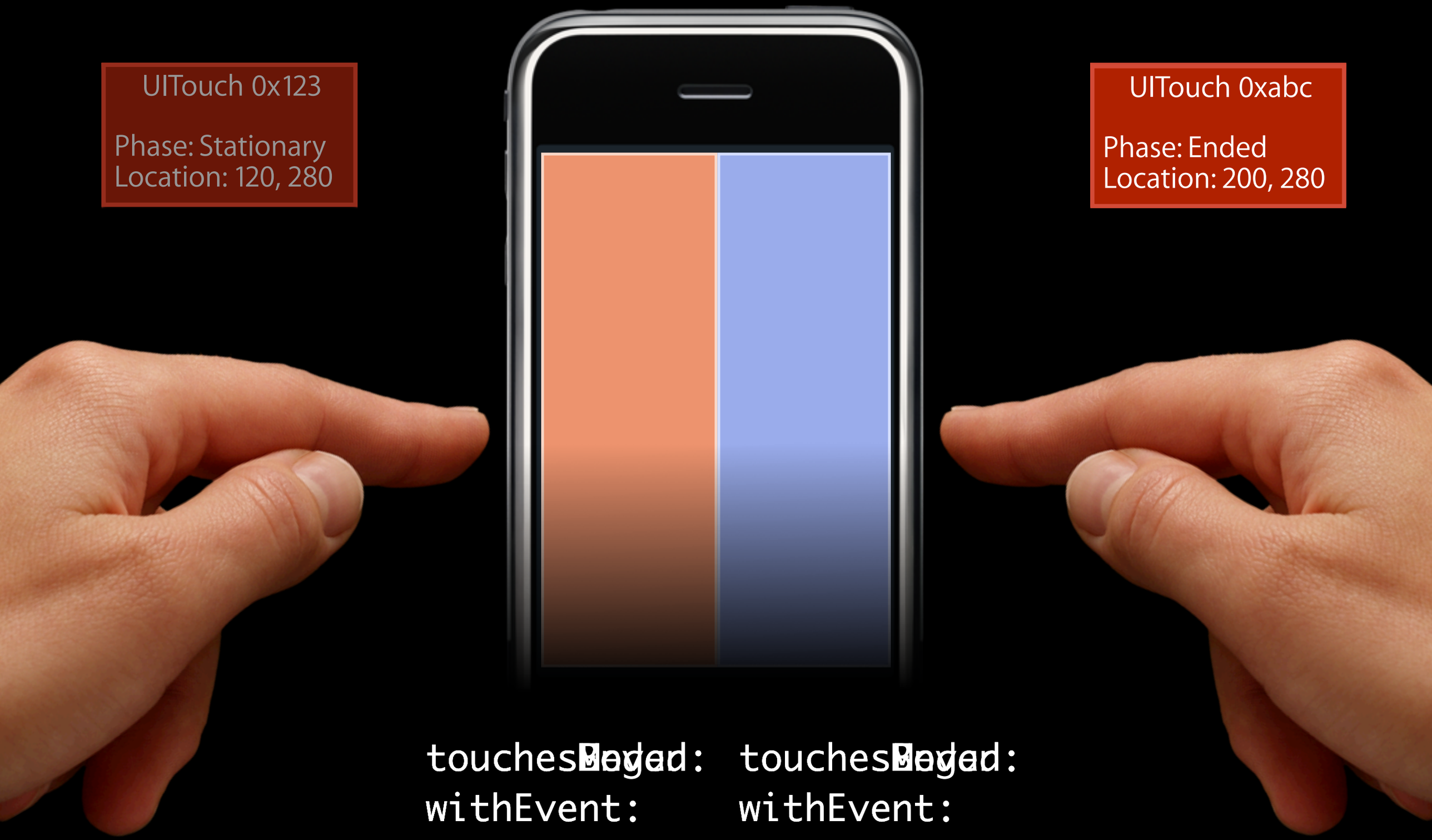
Multiple Views Touch Sequence

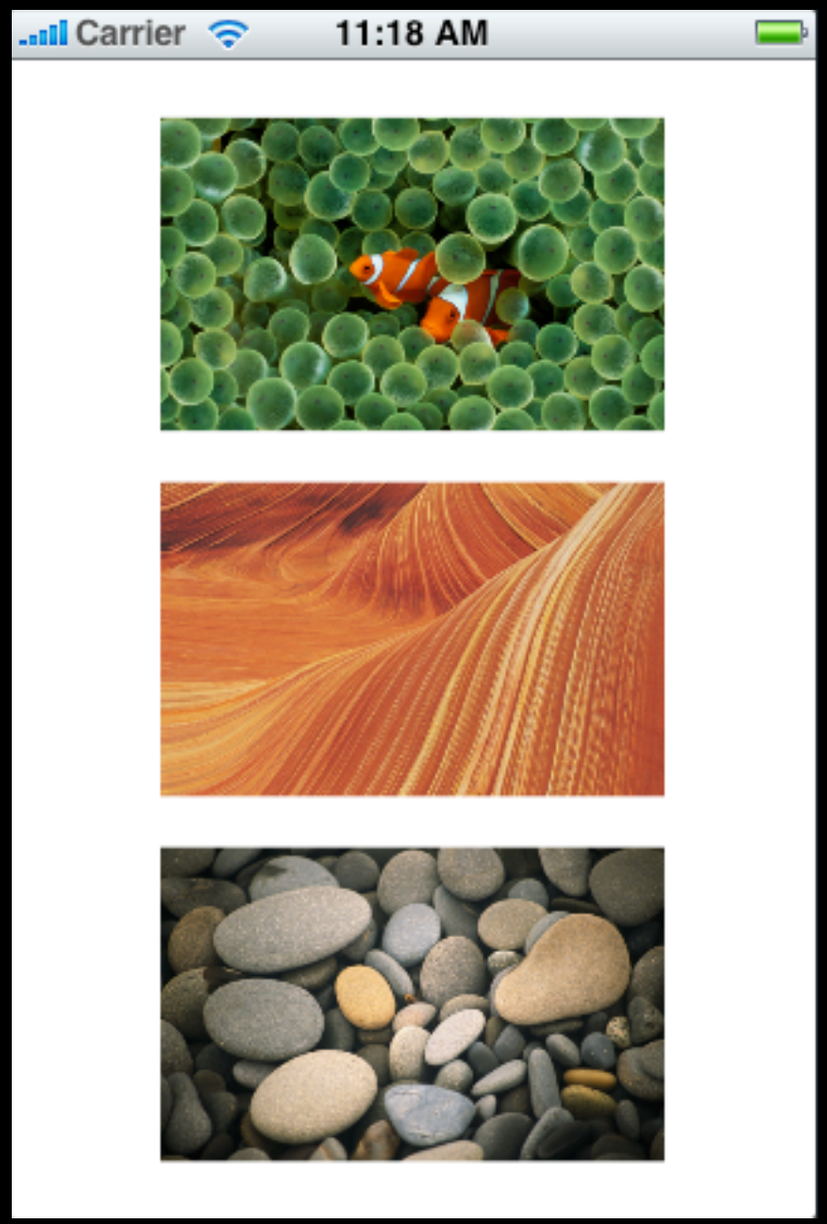


Multiple Views

UIView Property

```
BOOL exclusiveTouch;
```

Multiple Views Demo



Demo

Multiple Views

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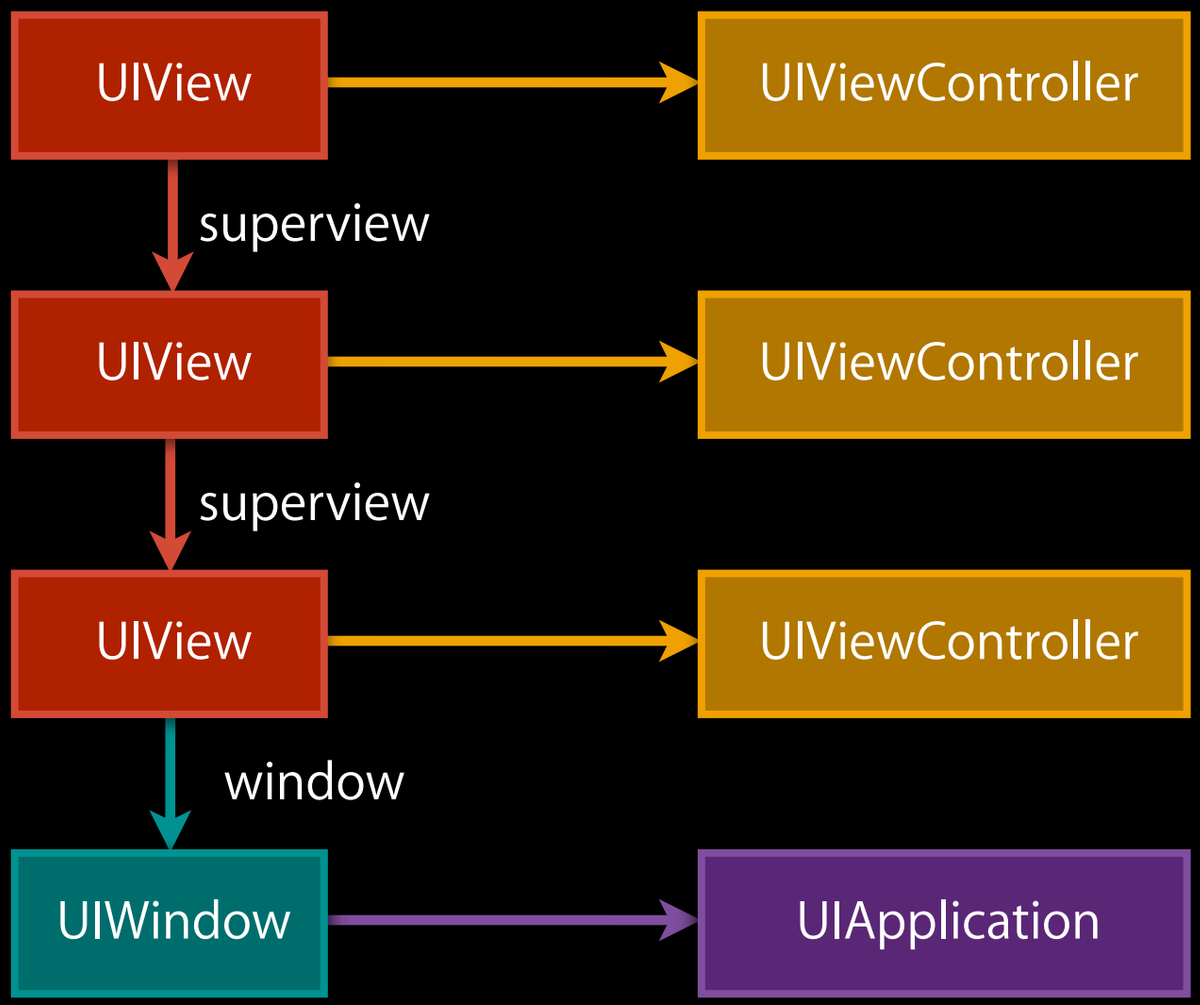
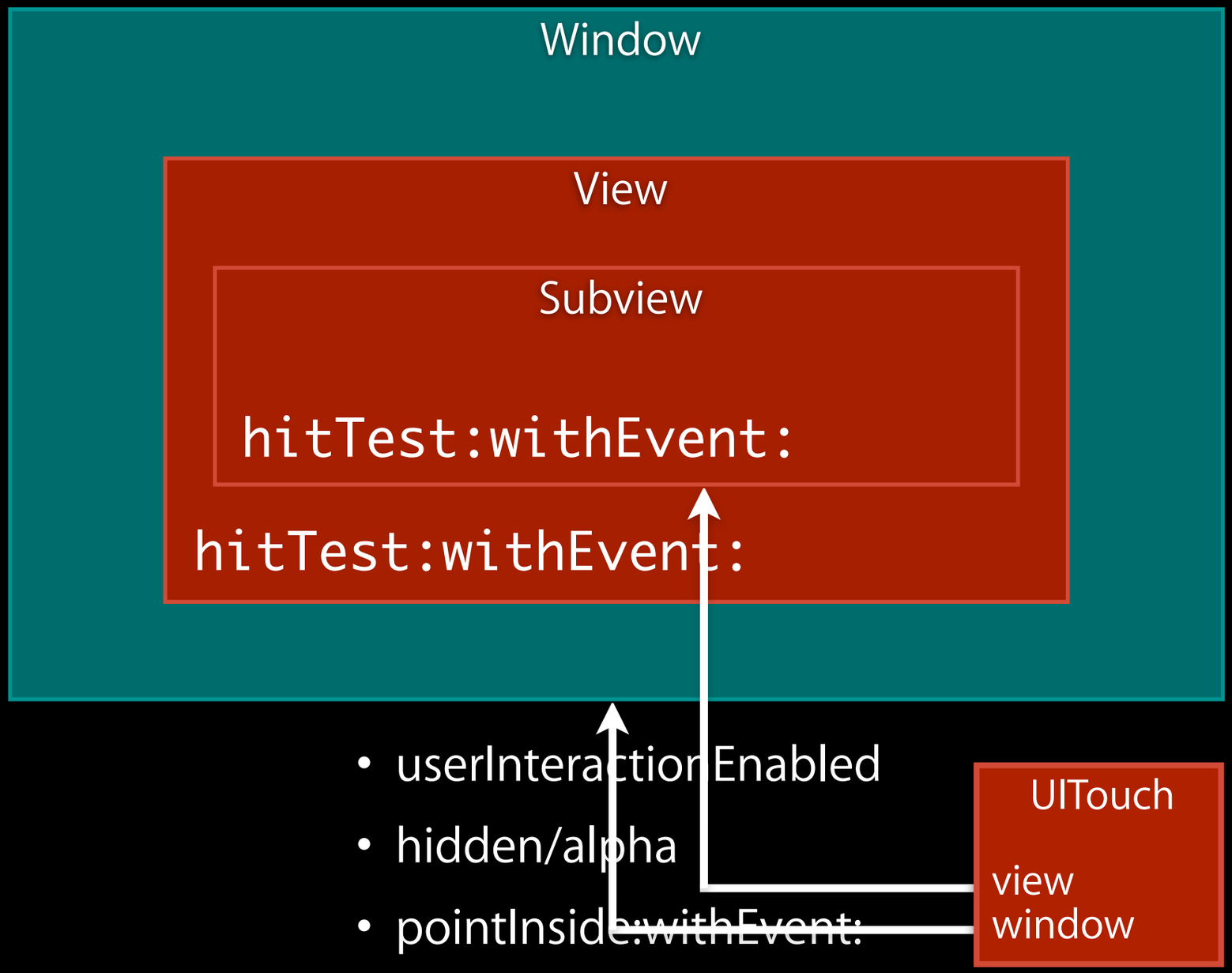
Responder Chain



Hit Testing


Window
View
Subview
hitTest:withEvent:
hitTest:withEvent:
• userInteractionEnabled
• hidden/alpha
• pointInside:withEvent:
UITouch
view
window

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UIControlEvents

```
UIControlEventTouchDown
UIControlEventTouchDownRepeat
UIControlEventTouchDragInside
UIControlEventTouchDragOutside
UIControlEventTouchDragEnter
UIControlEventTouchDragExit
UIControlEventTouchUpInside
UIControlEventTouchUpOutside
UIControlEventTouchCancel
```

Associating actions with UIControlEvents

```
- (void)addTarget:(id)target
           action:(SEL)action
 forControlEvents:(UIControlEvents)controlEvents;
```

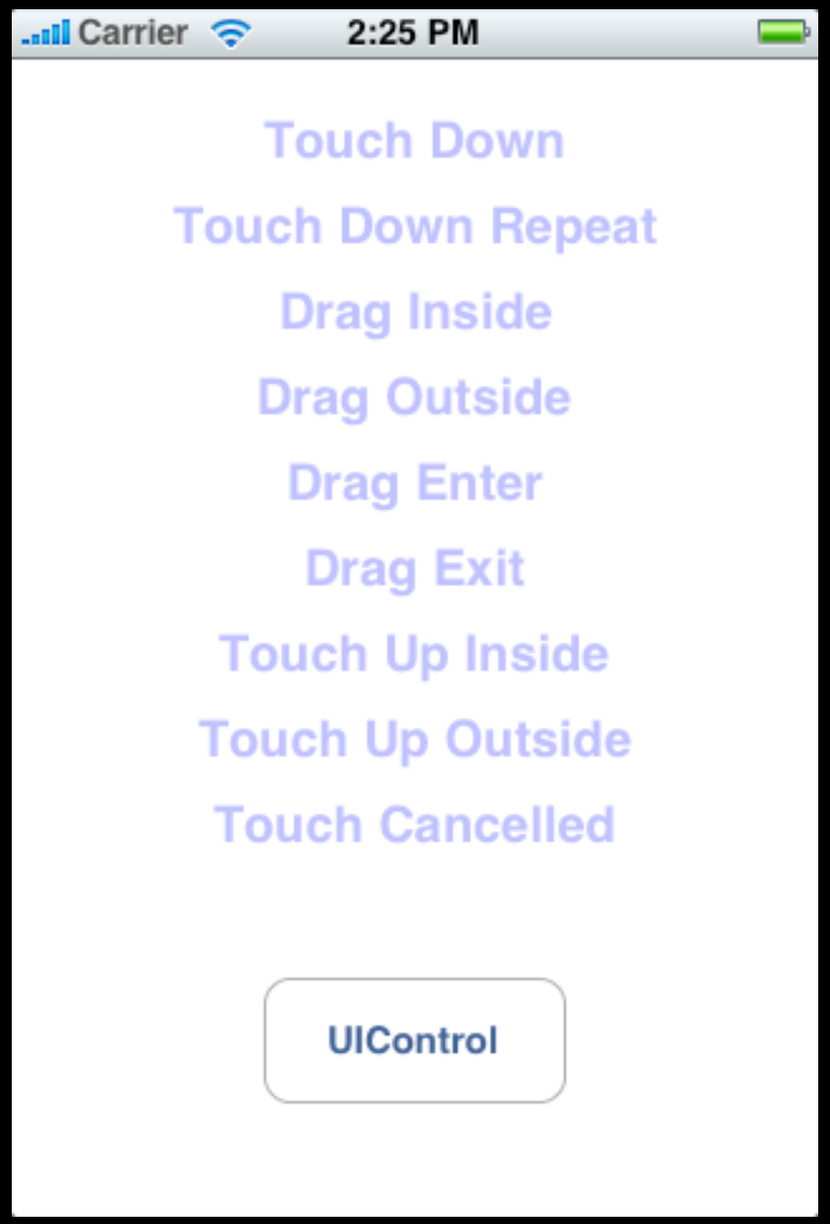
Action Signatures

```
- (void)performAction;
- (void)performAction:(id)sender;
- (void)performAction:(id)sender withEvent:(UIEvent *)event;
```

UIControl Touch Tracking

```
- (BOOL)beginTrackingWithTouch:(UITouch *)touch
                     withEvent:(UIEvent *)event;
- (BOOL)continueTrackingWithTouch:(UITouch *)touch
                         withEvent:(UIEvent *)event;
- (void)endTrackingWithTouch:(UITouch *)touch
                   withEvent:(UIEvent *)event;
- (void)cancelTrackingWithEvent:(UIEvent *)event;
```

UIControl Demo



Demo

UIControl

Summary

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Questions?