Gesture Recognition

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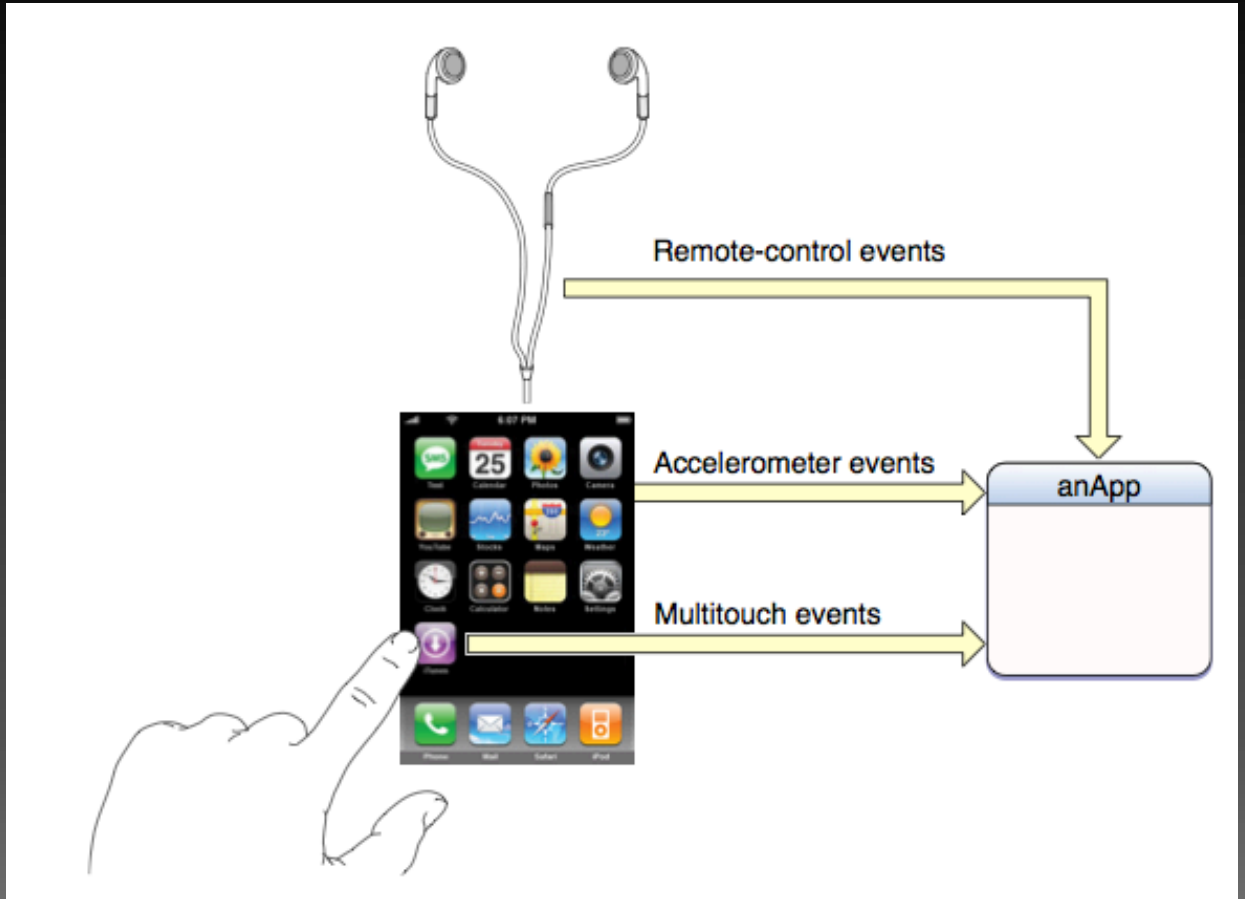
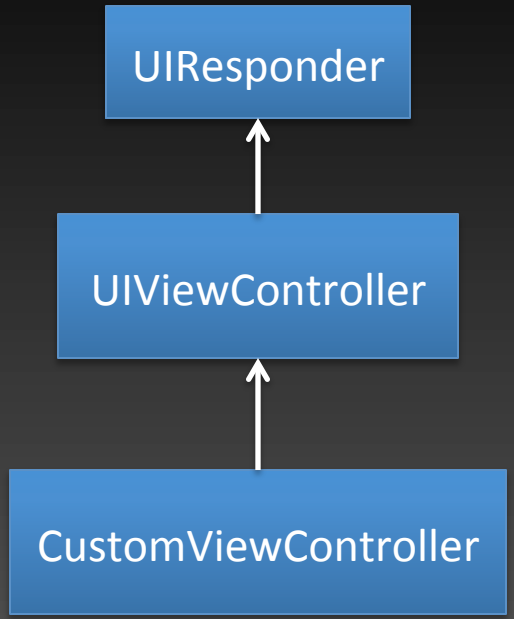
3 Event Types



Two methods

- Old & native: override touch handling function of UIResponder
  - Dev needs to write a lot of code (state machine, if then else if then else… ☹)
- Gesture recognizers:
  - Many well defined, ready to use gesture recognizers
  - Can recognize complex gesture or simultaneous gestures.
  - Can configure how recognizer work

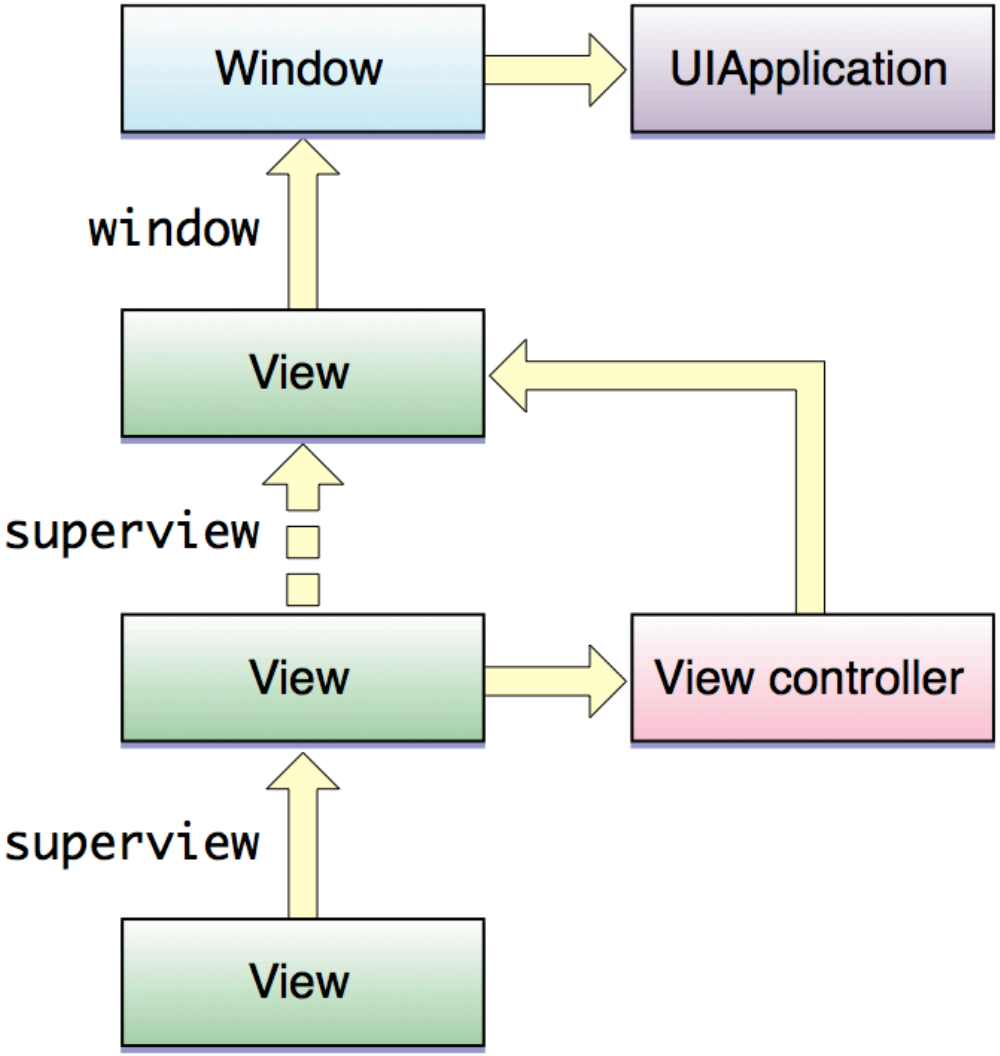
Responding to Touch Events



- touchesBegan:withEvent:
- touchesMoved:withEvent:
- touchesEnded:withEvent:
- touchesCancelled:withEvent:

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;
```



Responder Chain in IOS

```
@interface MyView : UIView {
  UITouch *trackedTouch;
  CGPoint startPoint;
}

- (void)touchesBegan:(NSSet *)touches withEvent:(UIEvent *)event
{
   if (trackedTouch == nil) {
      trackedTouch = [touches anyObject];
      startPoint = [trackedTouch locationInView:self];
   }
}
```

```
- (void)touchesMoved:(NSSet *)touches withEvent:(UIEvent *)event
{
   CGPoint currentPoint = [trackedTouch locationInView:self];
   if (currentPoint.x - startPoint.x > MIN_SWIPE_X_THRESHOLD &&
       ABS(currentPoint.y - startPoint.y) < MAX_SWIPE_Y_THRESHOLD)) {
        NSLog(@"Seems like a swipe.")
    }
}

- (void)touchesEnded:(NSSet *)touches withEvent:(UIEvent *)event
{
  if (trackedTouch && [touches containsObject:trackedTouch])
     trackedTouch = nil;
}
```

Demo

- Gesture Basic
- Touches Classic

Problems:

- *Hard to write because limited precision, two many simultaneous inputs*
- *Ambiguity: dễ nhầm lẫn ☹*

UIGestureRecognizer

UIGestureRecognizer có mấy loại cơ bản

Abstract base class UITapGestureRecognizer

- Many concrete subclasses
  - UITapGestureRecognizer
  - UIPinchGestureRecognizer
  - UISwipeGestureRecognizer
  - UIPanGestureRecognizer
  - UILongPressGestureRecognizer
  - UIRotationGestureRecognizer
- Custom subclasses encouraged

Steps to configure UIGestureRecognizer

```
//1. Khởi tạo UIGestureRecognizer
UITapGestureRecognizer *tapRecognizer = [[UITapGestureRecognizer
alloc] initWithTarget:self
action:@selector(tapHandler:)];

//2. Cấu hình UIGestureRecognizer
tapRecognizer.numberOfTapsRequired = 1;
tapRecognizer.numberOfTouchesRequired = 2;

//3. Gắn UIGestureRecognizer vào một UIView cụ thể
[redSquare addGestureRecognizer:tapRecognizer];
```

@interface UIView (UIViewGestureRecognizers)

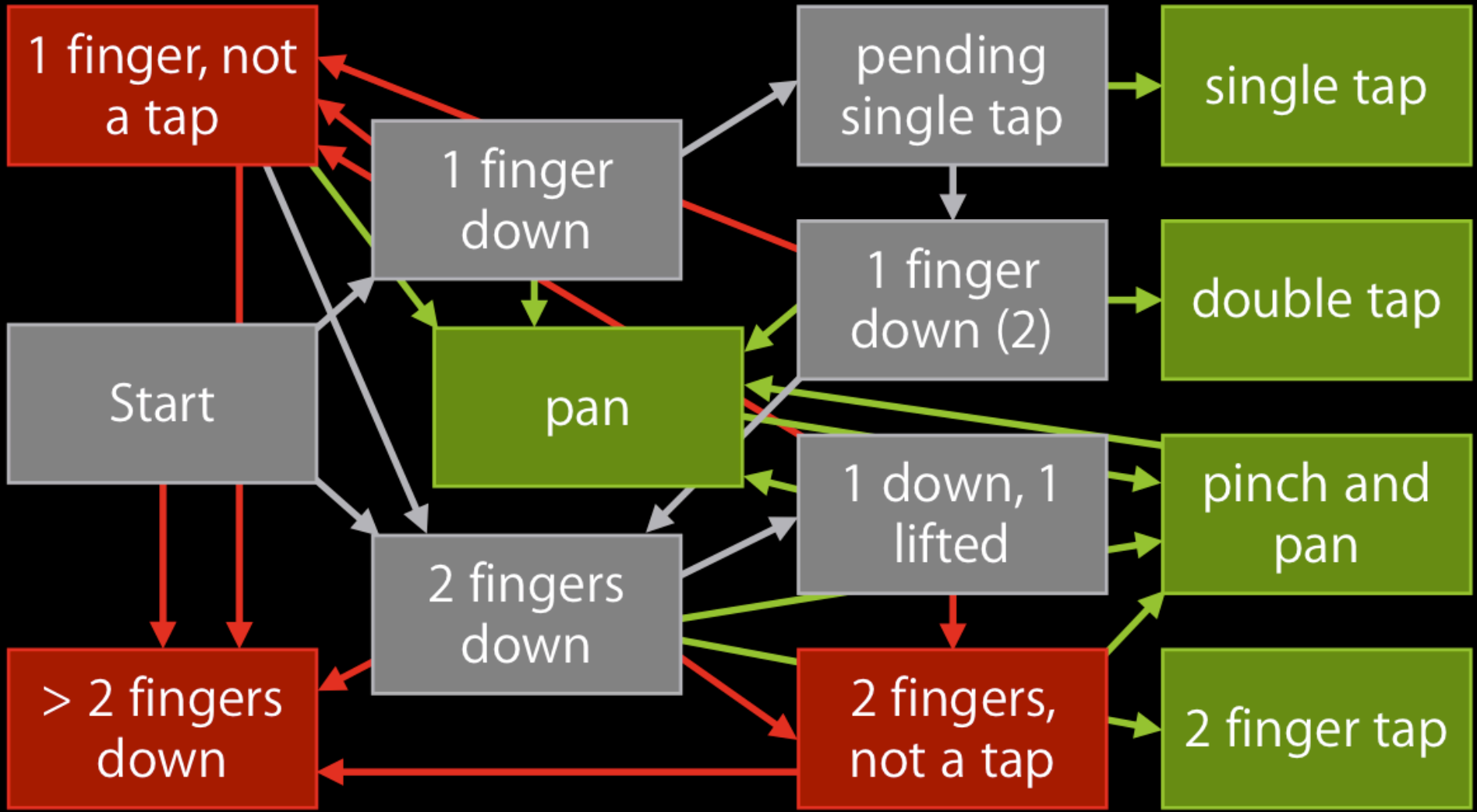
```
@property(nonatomic,copy) NSArray
*gestureRecognizers;

- (void)addGestureRecognizer:
(UIGestureRecognizer*)gestureRecognizer;

- (void)removeGestureRecognizer:
(UIGestureRecognizer*)gestureRecognizer;

@end
```

UIGestureRecognizer

Touch handling vs Built-in gesture recognizer

- One UITouch per finger
- UIView hit test
- Responder delivery

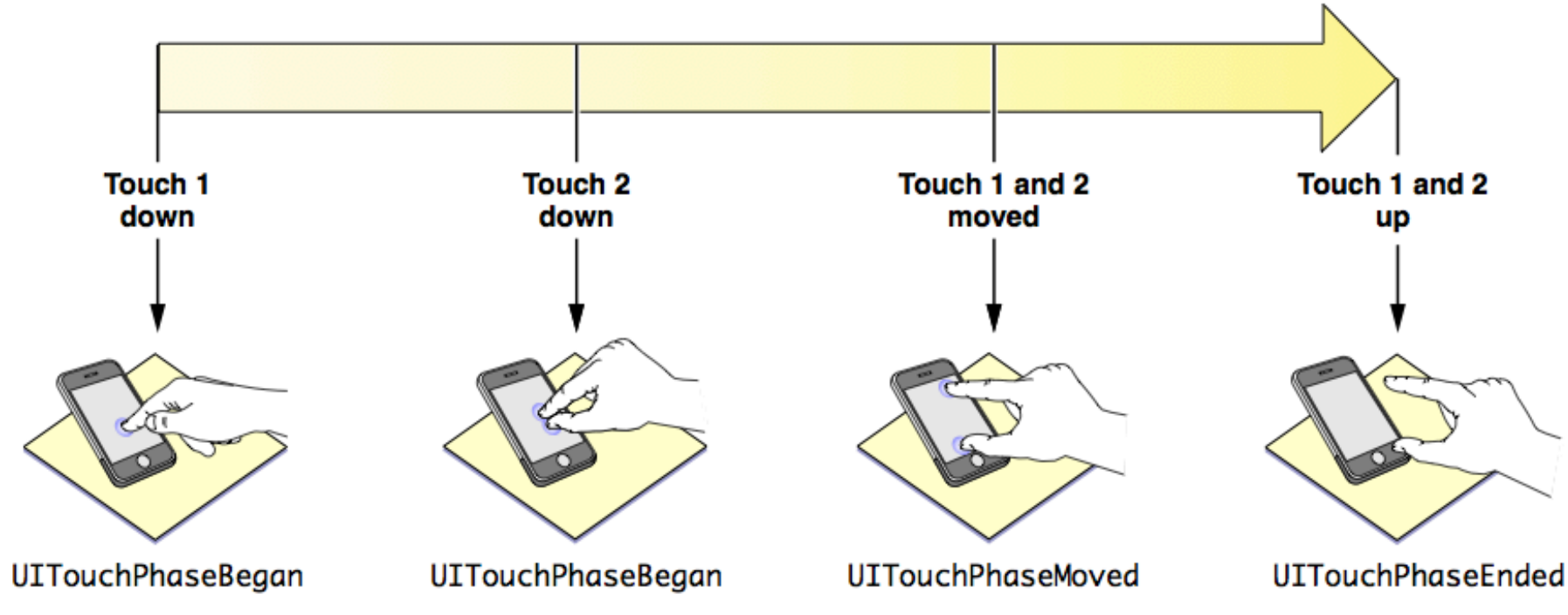
- Instantiate and configure a predefined UIGestureRecognizer
- Designate one or more handlers
- Add recognizer to a view

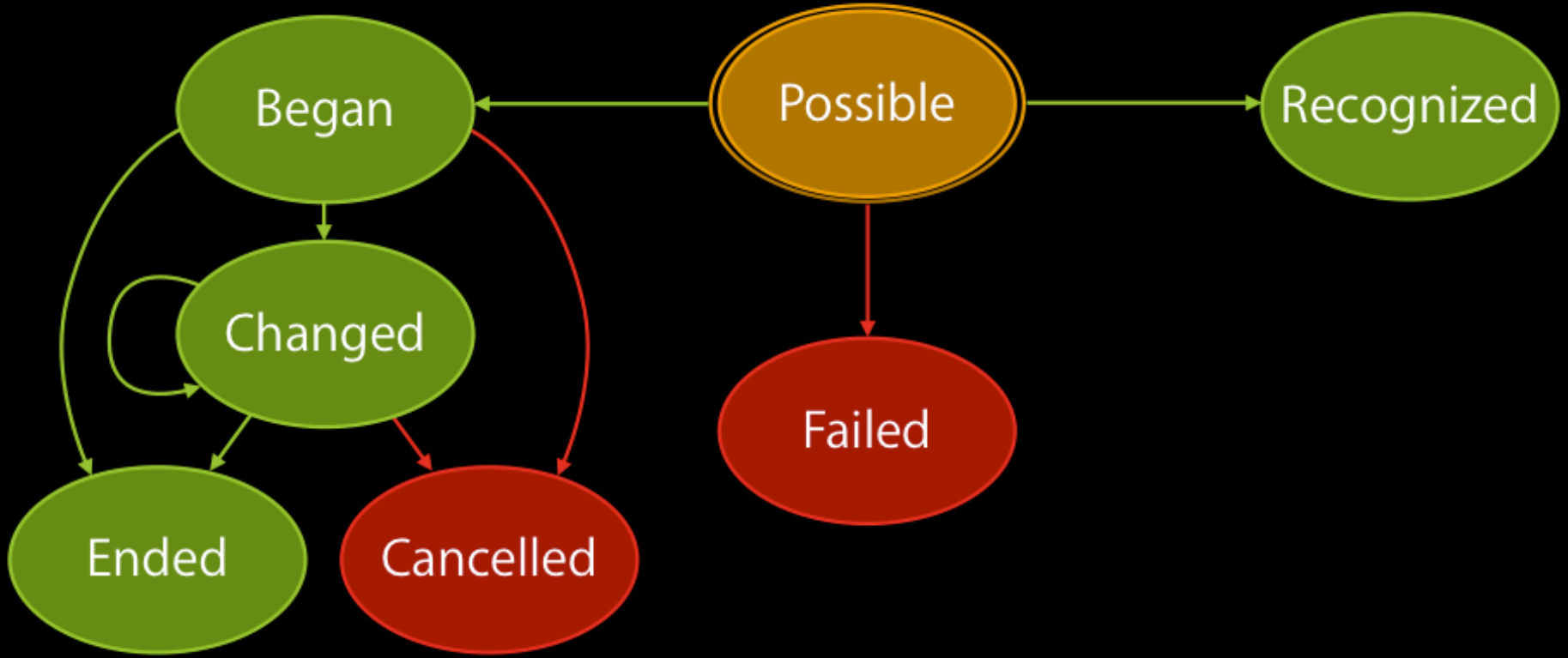

1 finger, not a tap
1 finger down
pending single tap
single tap
1 finger down (2)
double tap
Start
pan
1 down, 1 lifted
pinch and pan
2 fingers down
> 2 fingers down
2 fingers, not a tap
2 finger tap

GestureRecognizer hoạt động thế nào?

- Configure to recognize several gestures at same time
- But infact …

Các trạng thái

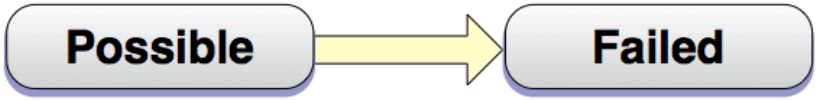




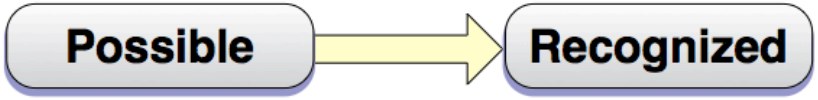
Các trạng thái nhận dạng

```
typedef NS_ENUM(NSInteger,
UIGestureRecognizerState) {
    UIGestureRecognizerStatePossible,
    UIGestureRecognizerStateBegan,
    UIGestureRecognizerStateChanged,
    UIGestureRecognizerStateEnded,
    UIGestureRecognizerStateCancelled,
    UIGestureRecognizerStateFailed,
    UIGestureRecognizerStateRecognized =
UIGestureRecognizerStateEnded
};
```

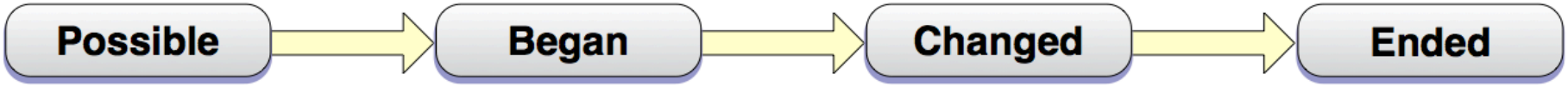
Fails to recognize gesture — all gesture recognizers



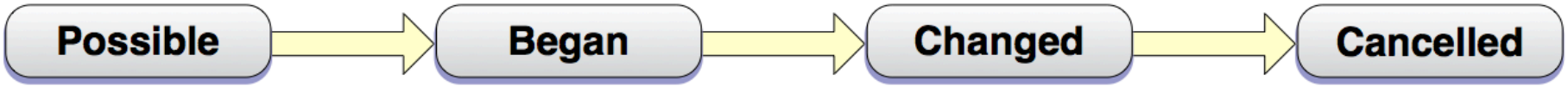
Recognizes gesture — discrete gestures



Recognizes gestures — continuous gestures



Gesture cancelled — continuous gestures



UIGestureRecognizerDelegate

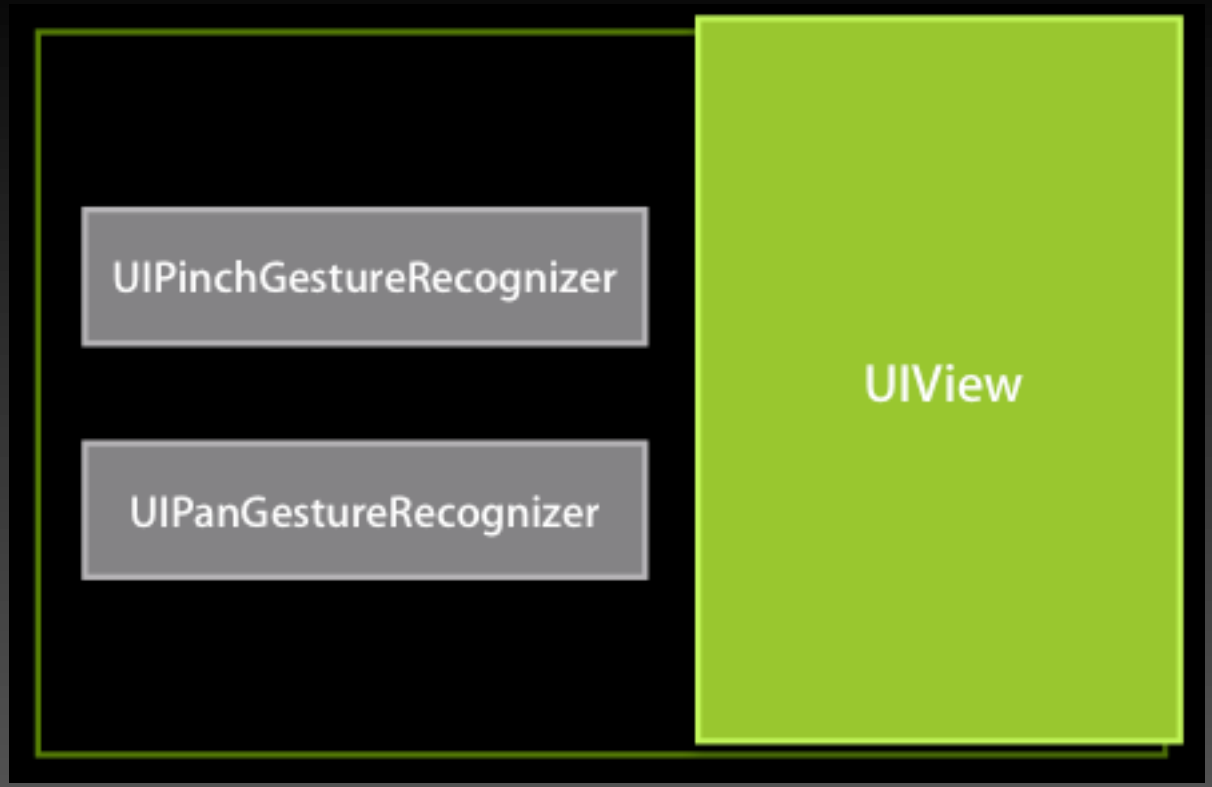
Tinh chỉnh cách ứng dụng nhận dạng tương tác hay bỏ qua

```
- (BOOL)gestureRecognizerShouldBegin:(UIGestureRecognizer
*)gestureRecognizer;

- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer
shouldRecognizeSimultaneouslyWithGestureRecognizer:
(UIGestureRecognizer *)otherGestureRecognizer;

- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer shouldReceiveTouch:(UITouch *)touch;
```

```
- (BOOL)gestureRecognizerShouldBegin:
  (UIGestureRecognizer
  *)gestureRecognizer;
```

Trả về YES: nếu muốn kích hoạt recoginzer

Trả về NO: tương đương với việc chuyển từ trạng thái UIGestureRecognizerStatePossible (có thể) sang UIGestureRecognizerStateFailed (không nhận dạng thành công)



```
- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer
shouldRecognizeSimultaneouslyWithGestureRecognizer:
(UIGestureRecognizer *)otherGestureRecognizer;
```

Dùng khi có hai bộ nhận dạng có thể được kích hoạt đồng thời,

- Trả về NO: để kích hoạt cái này, bỏ cái kia
- Trả về YES: cho phép hai bộ nhận dạng cùng chạy

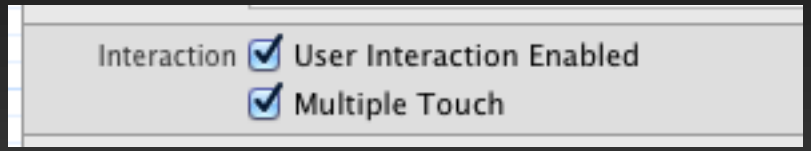
```
- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer shouldReceiveTouch:
(UITouch *)touch;
```

Trả về No khi muốn tắt bộ nhận dạng đối với một Touch thỏa mãn điều kiện nào đó, ví dụ:

Touch vào một vùng nào đó trên màn hình, thì không kích hoạt nhận dạng

UIImageView

- Need to enable: User Interaction & Multiple Touch



Tap vs Touch

```
UITapGestureRecognizer *tapRecognizer = [[UITapGestureRecognizer
alloc] initWithTarget:self action:@selector(tapHandler:)];

tapRecognizer.numberOfTapsRequired = 1;

tapRecognizer.numberOfTouchesRequired = 2;

[redSquare addGestureRecognizer:tapRecognizer];
```

Hứng sự kiện Tap

```
- (IBAction)handleTapFrom:(UITapGestureRecognizer *)recognizer {

 CGPoint location = [recognizer locationInView:self.view];
}
```

Hứng sự kiện xoay

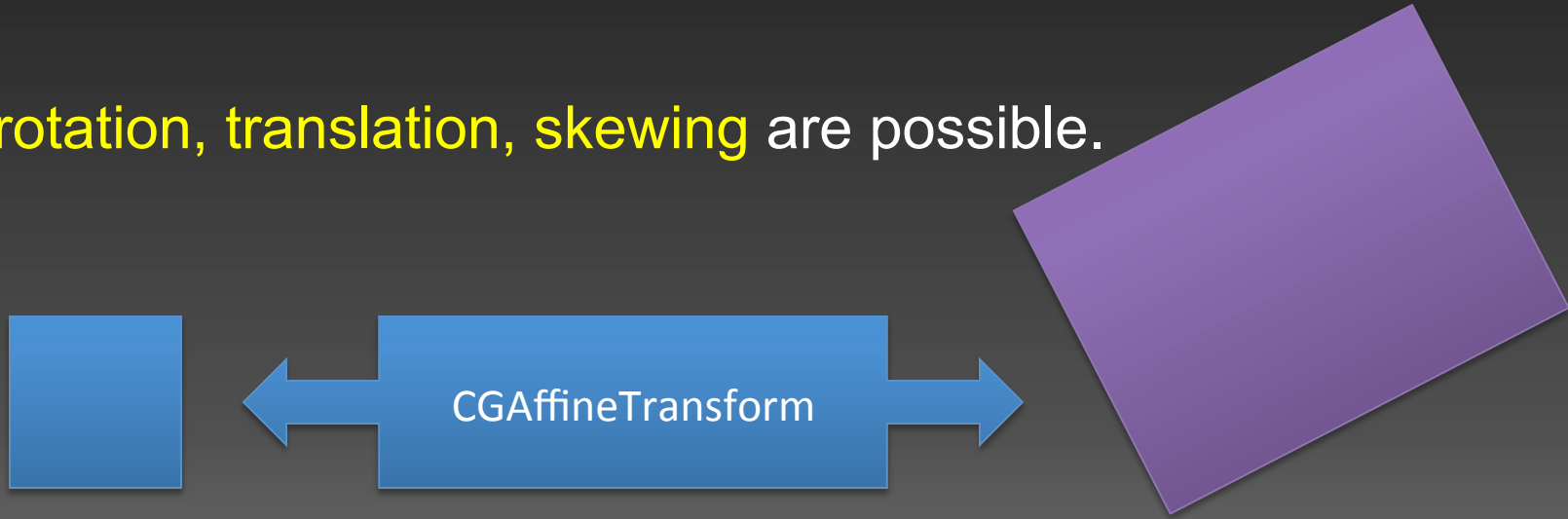
```
- (IBAction)handleRotationFrom:(UIRotationGestureRecognizer
*)recognizer {


CGAffineTransform transform =
CGAffineTransformMakeRotation([recognizer rotation]);

self.imageView.transform = transform;
[self showImageWithText:@"rotation" atPoint:location];

[UIView animateWithDuration:0.65 animations:^{
      self.imageView.alpha = 0.0;
        self.imageView.transform = CGAffineTransformIdentity;
       }];
}
```

CGAffineTransform

A matrix used for affine transformations.

A transformation specifies how points in one coordinate system map to points in another coordinate system.

Scaling, rotation, translation, skewing are possible.



Creating an Affine Transformation Matrix

```
CGAffineTransformMake
CGAffineTransformMakeRotation
CGAffineTransformMakeScale
CGAffineTransformMakeTranslation
```

Modifying Affine Transformations

```
CGAffineTransformTranslate
CGAffineTransformScale
CGAffineTransformRotate
CGAffineTransformInvert
CGAffineTransformConcat
```

Applying Affine Transformations

```
CGPointApplyAffineTransform
CGSizeApplyAffineTransform
CGRectApplyAffineTransform
```

Evaluating Affine Transforms

```
CGAffineTransformIsIdentity
CGAffineTransformEqualToTransform
```

Nhiệm vụ

1. Hứng sự kiện user chạm , tạo một bức ảnh mới, góc nghiêng bất kỳ
2. Ấn vào sọt rác thì xóa tất cả ảnh trên màn hình, kèm theo âm thanh xóa rác

Gợi ý

- Phải sử dụng 2 thư viện
  - AVFoundation và QuartzCore
- Hứng sự kiện Tap rất đơn giản nhưng phải tránh xung đột với sự kiện ấn vào nút thùng rác.

tránh xung đột với sự kiện ấn nút

```
- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer
shouldReceiveTouch:(UITouch *)touch
{
    if ((touch.view == trashButton)) {
        return NO;
    }
    return YES;
}
```

```
#import "UIImageView+Photo.h"
#import <QuartzCore/QuartzCore.h>
@implementation UIImageView (Photo)
- (void) makeItCool
{
    [self.layer setMasksToBounds:NO];
    [self.layer setBorderWidth:5.0f];
    [self.layer setBorderColor:[[UIColor whiteColor] CGColor]];
    [self.layer setShadowRadius:5.0f];
    [self.layer setShadowOpacity:.85f];
    [self.layer setShadowOffset:CGSizeMake(1.0f, 2.0f)];
    [self.layer setShadowColor:[[UIColor blackColor] CGColor]];
    [self.layer setShouldRasterize:YES];
    [self.layer setMasksToBounds:NO];
    CGAffineTransform transform =
CGAffineTransformMakeRotation(((float)rand()/RAND_MAX - 0.5)*0.4);
    self.transform = transform;
}
@end
```

Hoạt hình với UIView

```
[UIView animateWithDuration:1.0f
animations:^(void)
{
   …

}
 completion:^(BOOL finished)
{
 …
}];
```