Gesture Recognition

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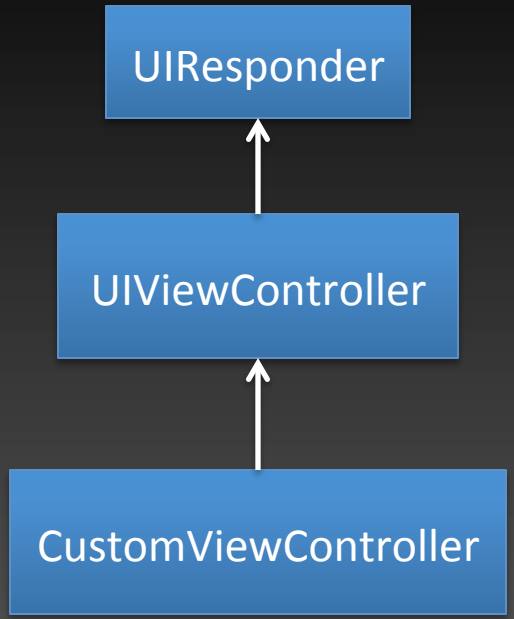
Two methods

- 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;
```

```
@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 UIGestureRecognizer

- 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)

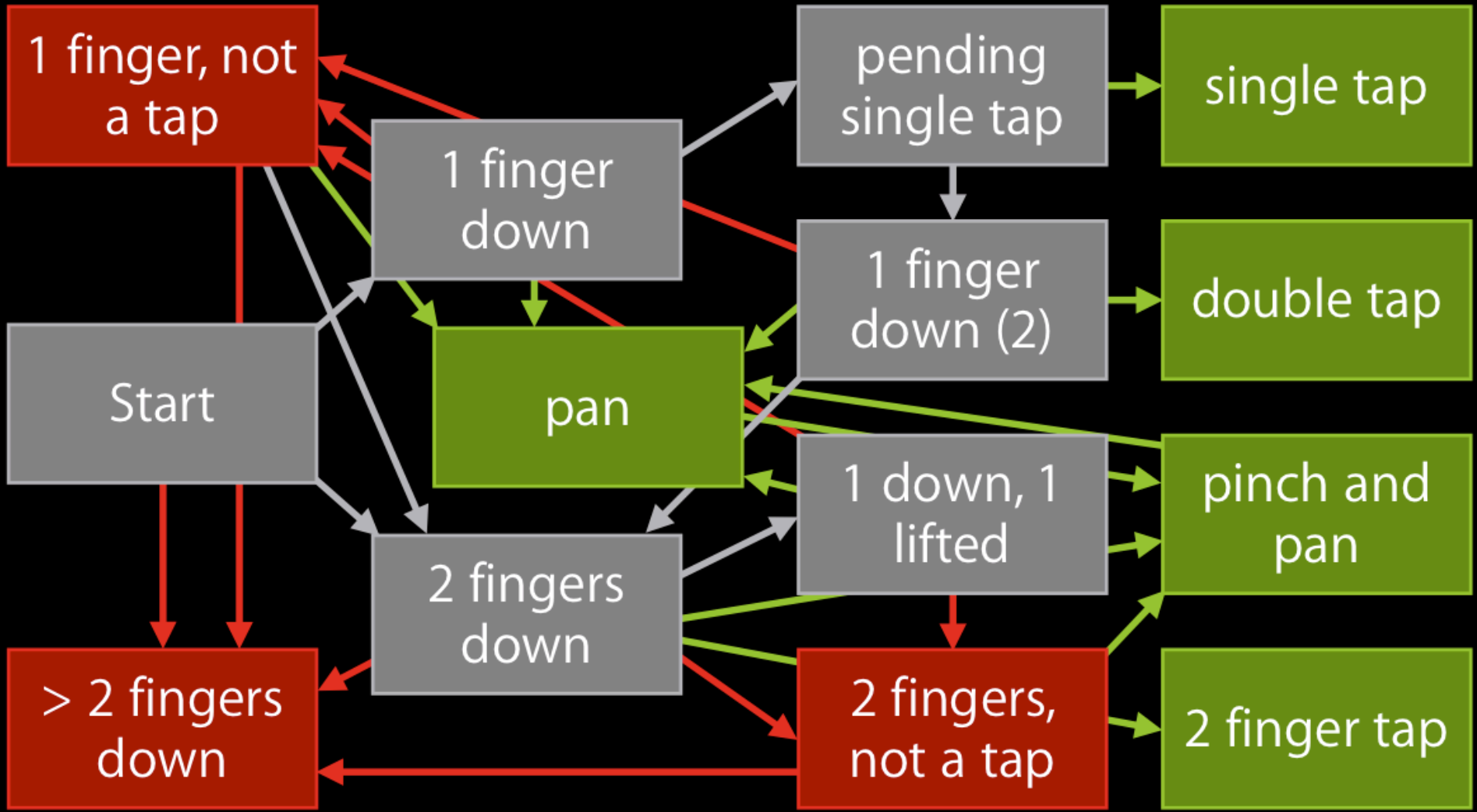
```
@property(nonatomic,copy) NSArray
*gestureRecognizers;

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

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

@end
```

UIGestureRecognizer

Touch handling vs Built-in gesture recognizer

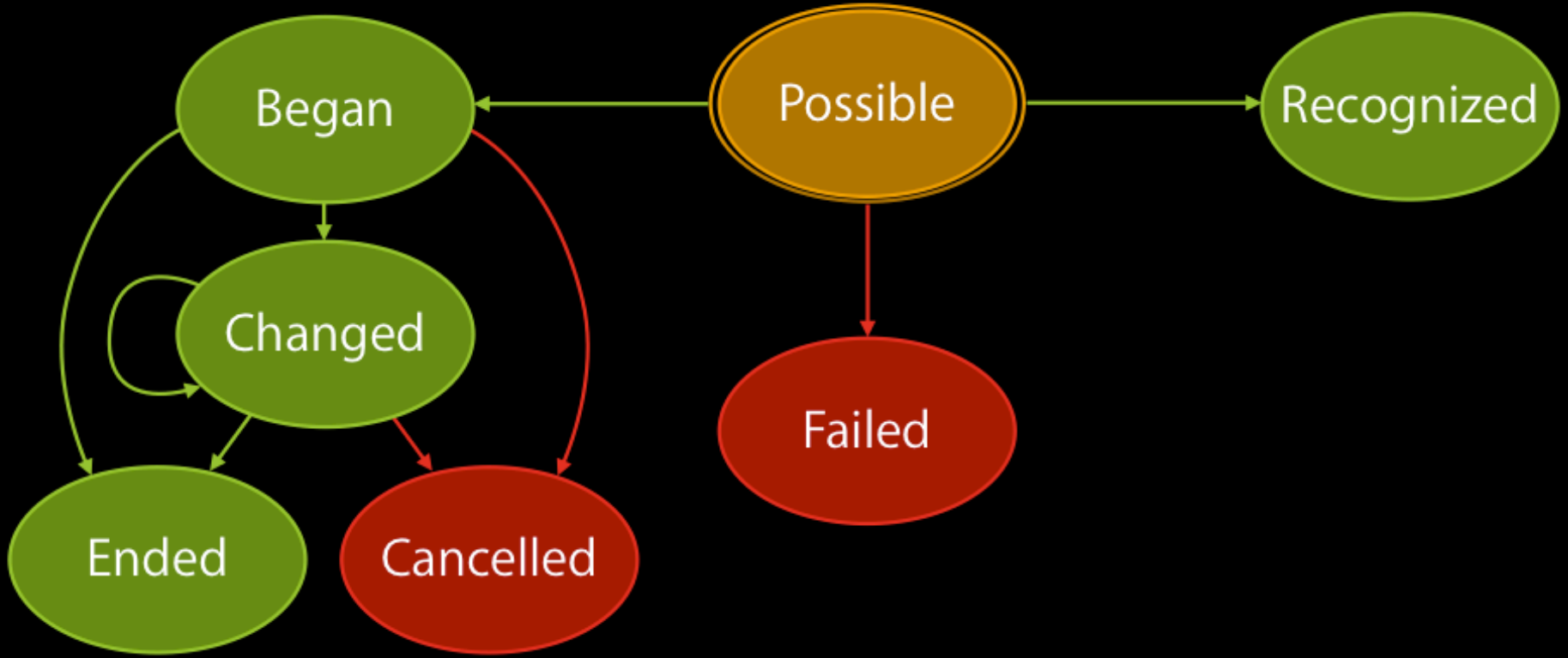
- One UITouch per finger
- UIView hit test
- Responder delivery

- 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 …



UIGestureRecognizerDelegate

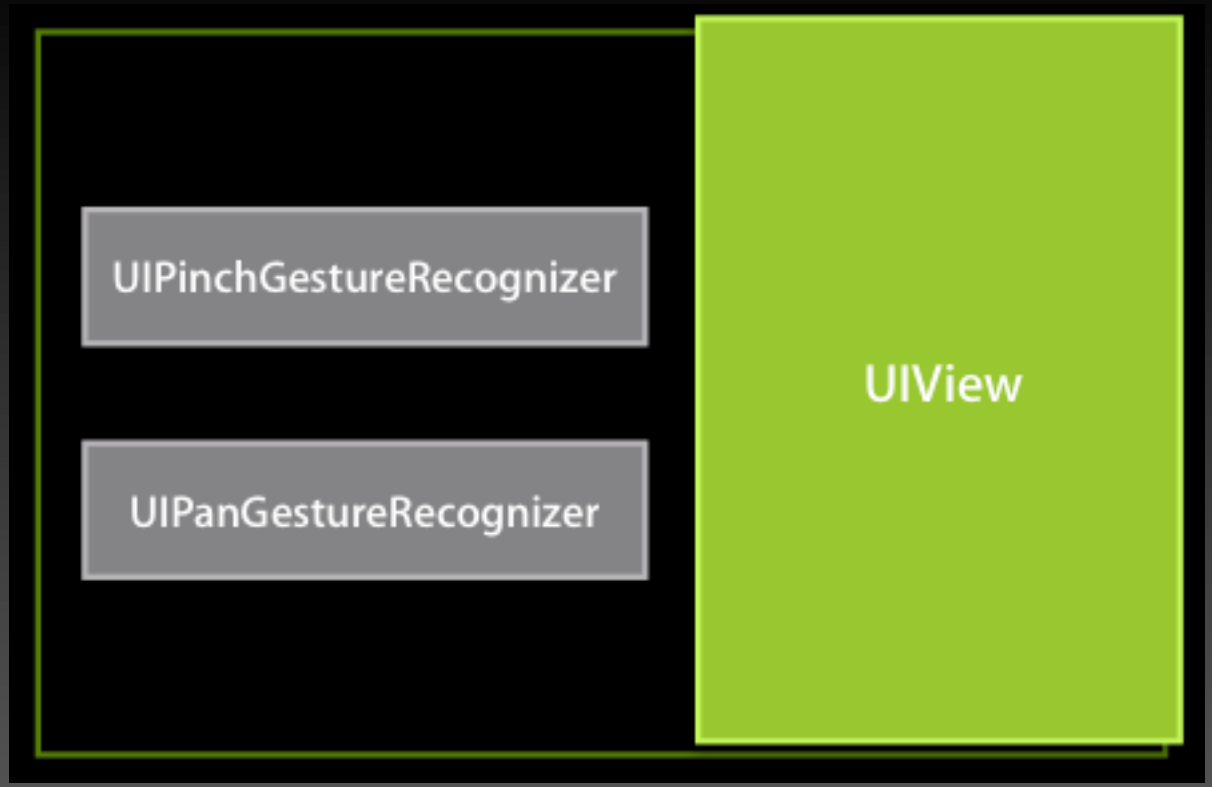
Fine-tune an application's gesture-recognition behavior. *Tinh chỉnh cách nhận dạng tương tác*

They receive messages from the gesture recognizer, and their responses to these messages enable them to affect the operation of the gesture recognizer or permit the simultaneous operation of two gesture recognizers.

```
- (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

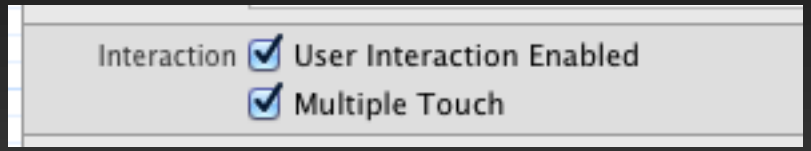
```
- (BOOL)gestureRecognizer:(UIGestureRecognizer
*)gestureRecognizer shouldReceiveTouch:
(UITouch *)touch;
```

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

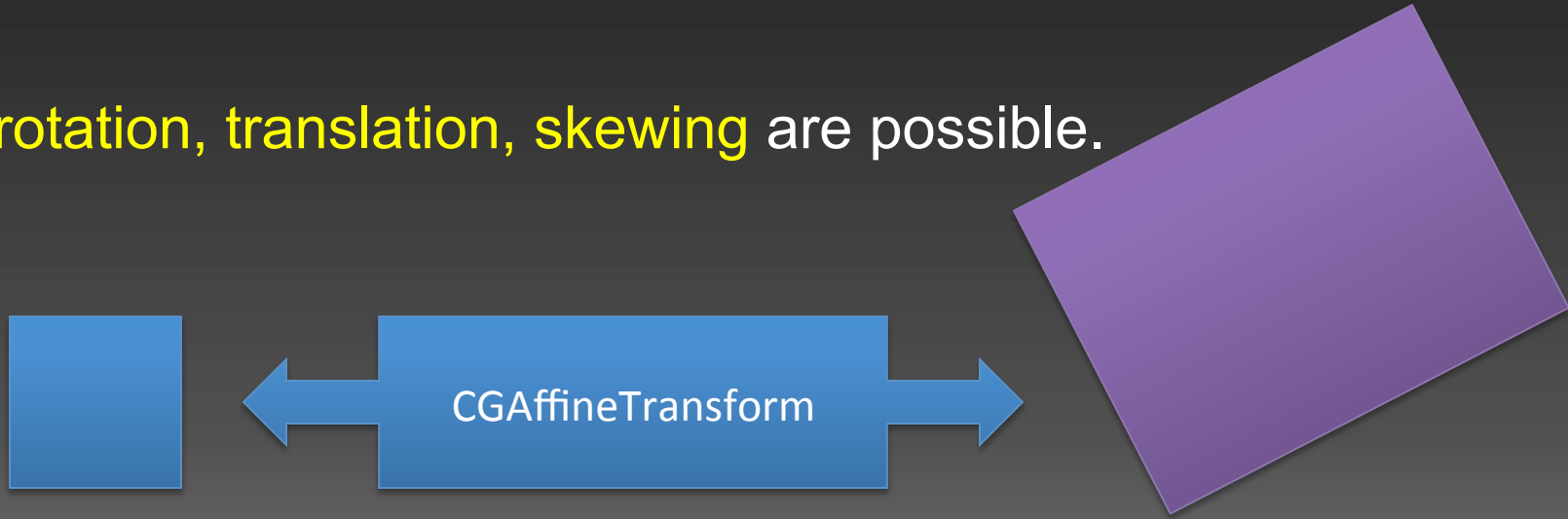
```
- (IBAction)handleRotationFrom:(UIRotationGestureRecognizer
*)recognizer {


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)
{
 …
}];
```

TOÀN NHỮNG CÁI HỌC RỒI, CODE THÔI !