Core Animation Cookbook

Graphics & Imaging > Quartz

2008-03-11

Apple Inc.
© 2008 Apple Inc.
All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, mechanical, electronic, photocopying, recording, or otherwise, without prior written permission of Apple Inc., with the following exceptions: Any person is hereby authorized to store documentation on a single computer for personal use only and to print copies of documentation for personal use provided that the documentation contains Apple's copyright notice.

The Apple logo is a trademark of Apple Inc.

Use of the "keyboard" Apple logo (Option-Shift-K) for commercial purposes without the prior written consent of Apple may constitute trademark infringement and unfair competition in violation of federal and state laws.

No licenses, express or implied, are granted with respect to any of the technology described in this document. Apple retains all intellectual property rights associated with the technology described in this document. This document is intended to assist application developers to develop applications only for Apple-labeled computers.

Every effort has been made to ensure that the information in this document is accurate. Apple is not responsible for typographical errors.

Apple Inc.
1 Infinite Loop
Cupertino, CA 95014
408-996-1010

Apple, the Apple logo, Cocoa, Mac, Mac OS, and Quartz are trademarks of Apple Inc., registered in the United States and other countries.

Times is a registered trademark of Heidelberger Druckmaschinen AG, available from Linotype Library GmbH.

Simultaneously published in the United States and Canada.

Even though Apple has reviewed this document, APPLE MAKES NO WARRANTY OR REPRESENTATION, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT, ITS QUALITY, ACCURACY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. AS A RESULT, THIS DOCUMENT IS PROVIDED "AS IS," AND YOU, THE READER, ARE ASSUMING THE ENTIRE RISK AS TO ITS QUALITY AND ACCURACY.

IN NO EVENT WILL APPLE BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT OR INACCURACY IN THIS DOCUMENT, even if advised of the possibility of such damages.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED. No Apple dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Contents

Core Animation Cookbook 7

Organization of This Document 7
See Also 7

Drawing 9

Drawing Layer Content With Application Kit Classes 9

Timing 11

Using a Single Timing Function For a Keyframe Animation 11

Document Revision History 13

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

Listings

Drawing 9

Listing 1 Drawing into a layer using Application Kit classes 9

Timing 11

Listing 1 Using a single timing function for a keyframe animation 11

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

Core Animation Cookbook

This document provides instructions and code fragments that describe how to perform common Core Animation tasks.

Organization of This Document

This document has the following chapters:

- "Drawing" (page 9) describes various drawing techniques when working with layers.
- "Timing" (page 11) describes various timing techniques when working with animations.

See Also

These programming guides discuss some of the technologies that are used by Core Animation:

- *Core Animation Programming Guide* describes the Core Animation technology and shows how to use the Core Animation API.
- *Quartz 2D Programming Guide* describes the two-dimensional drawing engine used to draw the content of an `CALayer` instance.
- *Core Image Programming Guide* describes the Mac OS X image processing technology and shows how to use the Core Image API.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

Drawing

This chapter discusses drawing issues when using Core Animation and other technologies.

Drawing Layer Content With Application Kit Classes

Core Animation `CALayer` class defines a delegate method, `drawLayer:inContext:`, that you can implement and draw your layer content using Quartz 2D drawing functions. However, Cocoa developers who have complete and working drawing solutions based on the Application Kit drawing classes may wish to continue using that code.

Listing 1 shows an implementation of the CALayer delegate method `drawLayer:inContext:` that creates an `NSGraphicsContext` from the `CGContextRef` passed as the *`inContext:`* parameter. Layer delegates can use this technique to display content created using `NSBezierPath`, `NSColor`, `NSImage` and other Application Kit classes.

Listing 1 Drawing into a layer using Application Kit classes

```
- (void)drawLayer:(CALayer *)layer inContext:(CGContextRef)ctx
{
   NSGraphicsContext *nsGraphicsContext;
   nsGraphicsContext = [NSGraphicsContext graphicsContextWithGraphicsPort:ctx
                                                                  flipped:NO];
   [NSGraphicsContext saveGraphicsState];
   [NSGraphicsContext setCurrentContext:nsGraphicsContext];

   // ...Draw content using NS APIs...
   NSRect aRect=NSMakeRect(10.0,10.0,30.0,30.0);
   NSBezierPath *thePath=[NSBezierPath bezierPathWithRect:aRect];
   [[NSColor redColor] set];
   [thePath fill];

   [NSGraphicsContext restoreGraphicsState];
}
```


2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

Timing

This chapter discusses timing issues when using Core Animation.

Using a Single Timing Function For a Keyframe Animation

The `CAKeyframeAnimation` class provides a powerful means of animating layer properties. However, `CAKeyframeAnimation` does not allow you to specify a single animation timing function that is used for the entire path. Instead you are required to specify the timing using the `keyTimes` property, or by specifying an array of timing functions in the `timingFunctions` property.

You can provide a single timing function for the animation by grouping the keyframe animation in a `CAAnimationGroup`, and setting the group animation's timing function to the desired `CAMediaTimingFunction`. The animation group's timing function and duration take precedence over the keyframe animation's timing properties.

A code fragment that implements this strategy is shown in Listing 1.

Listing 1 Using a single timing function for a keyframe animation

```
// create the path for the keyframe animation
CGMutablePathRef thePath = CGPathCreateMutable();
CGPathMoveToPoint(thePath,NULL,15.0f,15.f);
CGPathAddCurveToPoint(thePath,NULL,
                      15.f,250.0f,
                      295.0f,250.0f,
                      295.0f,15.0f);

// create an explicit keyframe animation that
// animates the target layer's position property
// and set the animation's path property
CAKeyframeAnimation *theAnimation=[CAKeyframeAnimation

                                   animationWithKeyPath:@"position"];
theAnimation.path=thePath;

// create an animation group and add the keyframe animation
CAAnimationGroup *theGroup = [CAAnimationGroup animation];
theGroup.animations=[NSArray arrayWithObject:theAnimation];

// set the timing function for the group and the animation duration
theGroup.timingFunction=[CAMediaTimingFunction

                                functionWithName:kCAMediaTimingFunctionEaseIn];
theGroup.duration=15.0;
// release the path
CFRelease(thePath);
```


2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

```
// adding the animation to the target layer causes it
// to begin animating
[theLayer addAnimation:theGroup forKey:@"animatePosition"];
```


2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

Document Revision History

This table describes the changes to *Core Animation Cookbook*.

Date	Notes
2008-03-11	Corrected typos.
2007-10-31	Reorganized the content. Added new examples.
2007-05-15	New document that demonstrates common Core Animation tasks.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.

2008-03-11 | © 2008 Apple Inc. All Rights Reserved.