
NSAffineTransform Class Reference

Graphics & Animation: 2D Drawing



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Contents

NSAffineTransform Class Reference 5

Overview	5
Adopted Protocols	6
Tasks	6
Creating an NSAffineTransform Object	6
Accumulating Transformations	6
Transforming Data and Objects	6
Accessing the Transformation Structure	7
Class Methods	7
transform	7
Instance Methods	7
appendTransform:	7
initWithTransform:	8
invert	8
prependTransform:	9
rotateByDegrees:	9
rotateByRadians:	10
scaleBy:	11
scaleXBy:yBy:	11
setTransformStruct:	12
transformPoint:	13
transformSize:	13
transformStruct	14
translateXBy:yBy:	14
Constants	15
NSAffineTransformStruct	15

Document Revision History 17

Index 19

NSAffineTransform Class Reference

Inherits from	NSObject
Conforms to	NSCoding NSCopying NSObject (NSObject)
Framework	/System/Library/Frameworks/Foundation.framework
Availability	Available in Mac OS X v10.0 and later.
Companion guide	Cocoa Drawing Guide
Declared in	NSAffineTransform.h
Related sample code	DockTile FunHouse SpeedometerView WebKitPluginStarter WebKitPluginWithJavaScript

Overview

The `NSAffineTransform` class provides methods for creating, concatenating, and applying affine transformations.

A transformation specifies how points in one coordinate system are transformed to points in another coordinate system. An affine transformation is a special type of transformation that preserves parallel lines in a path but does not necessarily preserve lengths or angles. Scaling, rotation, and translation are the most commonly used manipulations supported by affine transforms, but shearing is also possible.

Note: In Mac OS X v10.3 and earlier the `NSAffineTransform` class was declared and implemented entirely in the Application Kit framework. As of Mac OS X v10.4 the `NSAffineTransform` class has been split across the Foundation Kit and Application Kit frameworks.

Methods for applying affine transformations to the current graphics context and a method for applying an affine transformation to an `NSBezierPath` object are described in `NSAffineTransform Additions Reference` in the Application Kit.

Adopted Protocols

NSCoding

`encodeWithCoder:`

`initWithCoder:`

NSCopying

`copyWithZone:`

Tasks

Creating an NSAffineTransform Object

+ `transform` (page 7)

Creates and returns a new `NSAffineTransform` object initialized to the identity matrix.

- `initWithTransform:` (page 8)

Initializes the receiver's matrix using another transform object and returns the receiver.

Accumulating Transformations

- `rotateByDegrees:` (page 9)

Applies a rotation factor (measured in degrees) to the receiver's transformation matrix.

- `rotateByRadians:` (page 10)

Applies a rotation factor (measured in radians) to the receiver's transformation matrix.

- `scaleBy:` (page 11)

Applies the specified scaling factor along both x and y axes to the receiver's transformation matrix.

- `scaleXBy:yBy:` (page 11)

Applies scaling factors to each axis of the receiver's transformation matrix.

- `translateXBy:yBy:` (page 14)

Applies the specified translation factors to the receiver's transformation matrix.

- `appendTransform:` (page 7)

Appends the specified matrix to the receiver's matrix.

- `prependTransform:` (page 9)

Prepends the specified matrix to the receiver's matrix.

- `invert` (page 8)

Replaces the receiver's matrix with its inverse matrix.

Transforming Data and Objects

- `transformPoint:` (page 13)

Applies the receiver's transform to the specified `NSPoint` data type and returns the results.

- [transformSize:](#) (page 13)
Applies the receiver's transform to the specified NSSize data type and returns the results.

Accessing the Transformation Structure

- [transformStruct](#) (page 14)
Returns the matrix coefficients stored in the receiver's matrix.
- [setTransformStruct:](#) (page 12)
Replaces the receiver's transformation matrix with the specified values.

Class Methods

transform

Creates and returns a new NSAffineTransform object initialized to the identity matrix.

```
+ (NSAffineTransform *)transform
```

Return Value

A new identity transform object. This matrix transforms any point to the same point.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [initWithTransform:](#) (page 8)

Related Sample Code

DockTile

Sketch-112

SpeedometerView

WebKitPluginStarter

WebKitPluginWithJavaScript

Declared In

NSAffineTransform.h

Instance Methods

appendTransform:

Appends the specified matrix to the receiver's matrix.

```
- (void)appendTransform:(NSAffineTransform *)aTransform
```

Parameters*aTransform*

The matrix to append to the receiver.

Discussion

This method multiplies the receiver's matrix by the matrix in *aTransform* and replaces the receiver's matrix with the results. This type of operation is the same as applying the transformations in the receiver followed by the transformations in *aTransform*.

Availability

Available in Mac OS X v10.0 and later.

See Also- [prependTransform:](#) (page 9)**Declared In**

NSAffineTransform.h

initWithTransform:

Initializes the receiver's matrix using another transform object and returns the receiver.

- (id)initWithTransform:(NSAffineTransform *)aTransform

Parameters*aTransform*

The transform object whose matrix values should be copied to this object.

Return ValueA new transform object initialized with the matrix values of *aTransform*.**Availability**

Available in Mac OS X v10.0 and later.

See Also+ [transform](#) (page 7)**Related Sample Code**

DockTile

SpeedometerView

WebKitPluginStarter

WebKitPluginWithJavaScript

Declared In

NSAffineTransform.h

invert

Replaces the receiver's matrix with its inverse matrix.

- (void)invert

Discussion

Inverse matrices are useful for undoing the effects of a matrix. If a previous point (x,y) was transformed to (x',y'), inverting the matrix and applying it to point (x',y') yields the point (x,y).

You can also use inverse matrices in conjunction with the `concat` method to remove the effects of concatenating the matrix to the current transformation matrix of the current graphic context.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DockTile

SpeedometerView

WebKitPluginStarter

WebKitPluginWithJavaScript

Declared In

NSAffineTransform.h

prependTransform:

Prepends the specified matrix to the receiver's matrix.

```
- (void)prependTransform:(NSAffineTransform *)aTransform
```

Parameters

aTransform

The matrix to prepend to the receiver.

Discussion

This method multiplies the matrix in *aTransform* by the receiver's matrix and replaces the receiver's matrix with the result. This type of operation is the same as applying the transformations in *aTransform* followed by the transformations in the receiver.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [appendTransform:](#) (page 7)

Declared In

NSAffineTransform.h

rotateByDegrees:

Applies a rotation factor (measured in degrees) to the receiver's transformation matrix.

```
- (void)rotateByDegrees:(CGFloat)angle
```

Parameters

angle

The rotation angle, measured in degrees.

Discussion

After invoking this method, applying the receiver's matrix turns the axes counterclockwise about the current origin by *angle* degrees, in addition to performing all previous transformations.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [rotateByRadians:](#) (page 10)
- [scaleBy:](#) (page 11)
- [scaleXBy:yBy:](#) (page 11)
- [translateXBy:yBy:](#) (page 14)

Related Sample Code

DockTile

PDF Annotation Editor

SpeedometerView

WebKitPluginStarter

WebKitPluginWithJavaScript

Declared In

NSAffineTransform.h

rotateByRadians:

Applies a rotation factor (measured in radians) to the receiver's transformation matrix.

```
- (void)rotateByRadians:(CGFloat)angle
```

Parameters

angle

The rotation angle, measured in radians.

Discussion

After invoking this method, applying the receiver's matrix turns the axes counterclockwise about the current origin by *angle* radians, in addition to performing all previous transformations.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [rotateByDegrees:](#) (page 9)
- [scaleBy:](#) (page 11)
- [scaleXBy:yBy:](#) (page 11)
- [translateXBy:yBy:](#) (page 14)

Related Sample Code

CircleView

Polygons

TextLayoutDemo

Declared In

NSAffineTransform.h

scaleBy:

Applies the specified scaling factor along both x and y axes to the receiver's transformation matrix.

```
- (void)scaleBy:(CGFloat)scale
```

Parameters

scale

The scaling factor to apply to both axes. Specifying a negative value has the effect of inverting the direction of the axes in addition to scaling them. A scaling factor of 1.0 scales the content to exactly the same size.

Discussion

After invoking this method, applying the receiver's matrix modifies the unit lengths along the current x and y axes by a factor of *scale*, in addition to performing all previous transformations.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [rotateByDegrees:](#) (page 9)
- [rotateByRadians:](#) (page 10)
- [scaleXBy:yBy:](#) (page 11)
- [translateXBy:yBy:](#) (page 14)

Related Sample Code

Aperture Edit Plugin - Borders & Titles

CIAnnotation

FunHouse

Polygons

Transformed Image

Declared In

NSAffineTransform.h

scaleXBy:yBy:

Applies scaling factors to each axis of the receiver's transformation matrix.

```
- (void)scaleXBy:(CGFloat)scaleX yBy:(CGFloat)scaleY
```

Parameters

scaleX

The scaling factor to apply to the x axis.

scaleY

The scaling factor to apply to the y axis.

Discussion

After invoking this method, applying the receiver's matrix modifies the unit length on the x axis by a factor of *scaleX* and the y axis by a factor of *scaleY*, in addition to performing all previous transformations. A value of 1.0 for either axis scales the content on that axis to the same size.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [rotateByDegrees:](#) (page 9)
- [rotateByRadians:](#) (page 10)
- [scaleBy:](#) (page 11)
- [translateXBy:yBy:](#) (page 14)

Related Sample Code

CompositeLab

FunHouse

QuickLookSketch

Sketch+Accessibility

Sketch-112

Declared In

NSAffineTransform.h

setTransformStruct:

Replaces the receiver's transformation matrix with the specified values.

```
- (void)setTransformStruct:(NSAffineTransformStruct)aTransformStruct
```

Parameters

aTransformStruct

The structure containing the six transform values you want the receiver to use.

Discussion

The matrix is of the form shown in "Transform Mathematics" in *Cocoa Drawing Guide*, and the six-element structure defined by the `NSAffineTransformStruct` structure is of the form:

```
{m11, m12, m21, m22, tX, tY}
```

The `NSAffineTransformStruct` structure is an alternate representation of a transformation matrix that can be used to specify matrix values directly.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [initWithTransform:](#) (page 8)
- [transformStruct](#) (page 14)

Related Sample Code

FunHouse

Transformed Image

Declared In

NSAffineTransform.h

transformPoint:

Applies the receiver's transform to the specified `NSPoint` data type and returns the results.

```
- (NSPoint)transformPoint:(NSPoint)aPoint
```

Parameters*aPoint*

The point in the current coordinate system to which you want to apply the matrix.

Return Value

The resulting point after applying the receiver's transformations.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [transformSize:](#) (page 13)

Declared In

NSAffineTransform.h

transformSize:

Applies the receiver's transform to the specified `NSSize` data type and returns the results.

```
- (NSSize)transformSize:(NSSize)aSize
```

Parameters*aSize*

The size data to which you want to apply the matrix.

Return Value

The resulting size after applying the receiver's transformations.

Discussion

This method applies the current rotation and scaling factors to *aSize*; it does not apply translation factors. You can think of this method as transforming a vector whose origin is (0, 0) and whose end point is specified by the value in *aSize*. After the rotation and scaling factors are applied, this method effectively returns the end point of the new vector.

This method is useful for transforming delta or distance values when you need to take scaling and rotation factors into account.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [transformPoint:](#) (page 13)

Declared In

NSAffineTransform.h

transformStruct

Returns the matrix coefficients stored in the receiver's matrix.

- (NSAffineTransformStruct)transformStruct

Return Value

The structure containing the receiver's six matrix values.

DiscussionThe matrix is of the form shown in "Transform Mathematics" in *Cocoa Drawing Guide*, and the six-element structure defined by the `NSAffineTransformStruct` structure is of the form:`{m11, m12, m21, m22, tX, tY}`The `NSAffineTransformStruct` structure is an alternate representation of a transformation matrix that can be used to specify matrix values directly.**Availability**

Available in Mac OS X v10.0 and later.

See Also

- [initWithTransform:](#) (page 8)
- [setTransformStruct:](#) (page 12)

Related Sample Code

FunHouse

Transformed Image

Declared In

NSAffineTransform.h

translateXBy:yBy:

Applies the specified translation factors to the receiver's transformation matrix.

- (void)translateXBy:(CGFloat)deltaX yBy:(CGFloat)deltaY

Parameters*deltaX*

The number of units to move along the x axis.

deltaY

The number of units to move along the y axis.

DiscussionSubsequent transformations cause coordinates to be shifted by *deltaX* units along the x axis and by *deltaY* units along the y axis. Translation factors do not affect `NSSize` values, which specify a differential between points.

Availability

Available in Mac OS X v10.0 and later.

See Also

- [rotateByDegrees:](#) (page 9)
- [rotateByRadians:](#) (page 10)
- [scaleBy:](#) (page 11)
- [scaleXBy:yBy:](#) (page 11)

Related Sample Code

PDF Annotation Editor

QuickLookSketch

Sketch+Accessibility

Sketch-112

SpeedometerView

Declared In

NSAffineTransform.h

Constants

NSAffineTransformStruct

This type defines the three-by-three matrix that performs an affine transform between two coordinate systems.

```
typedef struct _NSAffineTransformStruct {
    CGFloat m11, m12, m21, m22;
    CGFloat tX, tY;
} NSAffineTransformStruct;
```

Fields

m11 , m12, m21, m22

Elements of a two-by-two matrix for rotation, scale, and shear transformations.

tX, tY

x and y translation elements

Discussion

For more details, see *Cocoa Drawing Guide*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

NSAffineTransform.h

Document Revision History

This table describes the changes to *NSAffineTransform Class Reference*.

Date	Notes
2009-07-15	Corrected declaration of <code>NSAffineTransformStruct</code> .
2007-01-15	Updated for Mac OS X v10.5.
2006-05-23	First publication of this content as a separate document.

REVISION HISTORY

Document Revision History

Index

A

appendTransform: [instance method 7](#)

I

initWithTransform: [instance method 8](#)

invert [instance method 8](#)

N

NSAffineTransformStruct [data type 15](#)

P

prependTransform: [instance method 9](#)

R

rotateByDegrees: [instance method 9](#)

rotateByRadians: [instance method 10](#)

S

scaleBy: [instance method 11](#)

scaleXBy:yBy: [instance method 11](#)

setTransformStruct: [instance method 12](#)

T

transform [class method 7](#)

transformPoint: [instance method 13](#)

transformSize: [instance method 13](#)

transformStruct [instance method 14](#)

translateXBy:yBy: [instance method 14](#)