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Qd3d™

3dPane™

Version 2

No longer must Macintosh developers defer innovative applications requiring three dimensional graphics. Macintosh developers previously faced archaic libraries with sparse documentation or the costly development of their own three dimensional libraries. Now the Qd3d source code library provides the cost effective solution for the Macintosh developer.

Graphic Primitives

Drawing with Qd3d is similar to the familiar QuickDraw environment -- called functional primitives are rendered on the current Qd3d graphics port. Qd3d primitives include point marking, line drawing, and polygon framing and filling. The primitives use the pen mode, size, color, and pattern of the two dimensional graphics port. Point locations are expressed in floating point vectors relative to a developer determined "world coordinate system."

Qd3d Drawing Primitives

MoveTo3d	LineTo3d
Move3d	Line3d
Poly3dMark	Poly3dLine
Poly3dFrame	Poly3dFill
PolyC3dMark	PolyC3dLine
PolyC3dFrame	PolyC3dFill
DrawStringAt3d	

Polygon "C3d" primitives associate colors with each vertex to provide smooth **Gouraud shading** and **color blended lines**.

View Parameters

Unlike QuickDraw, Qd3d cleanly wraps access to all view parameters in messages to "CQd3dPort" objects. Viewing parameters specify the viewer position and point of

attention relative to the world coordinate system. Both **perspective** and **parallel** projections are supported.

CQd3dPort View Parameter Messages:

Get/Set3dPort	Get/SetNearFar
Get/SetView	Get/SetPolarView
Get/SetPerspective	Get/SetParallel
GetProjectionType	
SetQDEnviron	SetQDRect
GetFrom†	PutTo†

Rendering Options

OnlyQD	Color varying primitives are rendered with fast color constant primitives.
Culling	Removes back or front facing polygons for faster rendering.
Wireframe	Maps fill primitives to faster frame primitives.
UseZBuff	Provides software z-buffering for hidden surface removal.
DepthCue	Aids depth perception by blending distant object color with the background color.
Clipping	drastic -- primitives lying outside or crossing the view volume are quickly discarded. better -- clips primitives to view volume but may lose some color information best -- correctly clips primitive geometry

and color to the view volume.

Get/Set messages control these rendering options. Options may be modified as a scene is rendered or used to implement fast preview modes. For example, an application requiring Gouraud-shaded z-buffered rendering is coded using the PolyC3dFill primitive. To implement a preview mode, the same rendering code is used but the control application simply turns on OnlyQD.

† When used with Object Factory's Object I/O Library.

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Stereoscopic Projections

The Qd3dPort subclass **CStereo3dPort** provides cross-eyed and straight-eyed side-by-side stereo projections. CStereo3dPort also serves as a template for more refined client specific color or time-multiplexed stereoscopic systems. Stereoscopic projections dramatically increase depth perception.

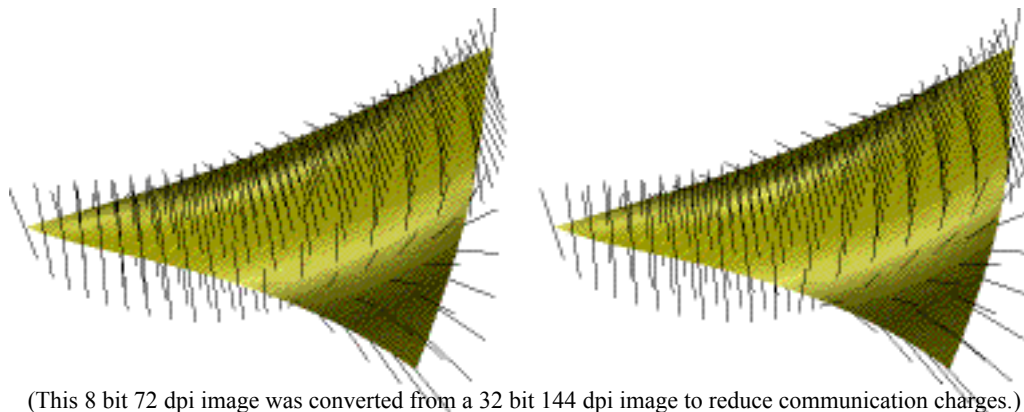
Instructions for stereo pair image below: Hold image square to line of sight. Look cross-eyed at image pair and four images will appear. Vary cross-eyedness so the two inner images overlap. Concentrate on center image until it becomes focused. Practice.

Performance Integration Support

Qd3d version 2 has its own internal "graphics pipeline" to perform coordinate transformations and clipping. For increased performance, Qd3d internally caches fixed point representations of world coordinate points. The **PBPoly3dPrim** message provides parameter block access to the first stage of the pipeline and also allows external fixed point caching. PBPoly3dPrim is useful when developing client-specific meta-primitives.

Other advanced features :

- **affector functions** for quick 2d region maintenance for 3d scene updating
- full access to coordinate transformations
- **GetXRay** -- returns the world coordinate ray corresponding to a 2d QuickDraw point



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A cross-eyed stereo pair

- direct access to offscreen pixel maps. This bypasses the SetCPixel bottleneck and increases smooth shading and z-buffering performance by factors from 3 to 5!

Support Libraries

Vect	provides a vector abstraction library for floating point, fixed point, and integer vectors.		
	vunit	vcopy	vscale
	vsub	vvect	vadd
	vsadd	vcross	vdot
	vmag	vdist	vangle
	vmul	vsphere2v	vv2sphere
	vnorm	vmatmul	vcmn
	vcmx	vcabs	vgreater
	vemin	vemax	vvalid
	vCopy	vTranslate	vScale
	vRotate	vRotate3	v2fv
	fv2v	fv2sv	sv2fv
	fvcopy	fvscale	svcopy
	svscale	svvect	svsub
	svadd		
Hedra	provides a polyhedra meta-primitive.		
	HedraVerts	HedraConn	
	HedraFrame	HedraFill	
	HedraIntersect (ray)		
	HedraErase2dBBBox	HedraAffect2dBBBox	
SimpleLighting	provides Lambert and Phong lighting models.		
TriadMouse	maps 2d mouse movements to 3d space.		
Geometry	provides rudimentary types and operations.		

3dPane

The Think Class Library (TCL) automates many of the bookkeeping tasks of resizeable and overlapping windows via its pane mechanism. The 3dPane library integrates Qd3d into the Think C TCL to provide ready to use three dimensional panes.

3dPane provides coordination between Qd3d graphic ports and the panes they are associated with. Developers create application specific 3d panes by overriding a **Draw3dScene** method similar to how the CPane::Draw method is overridden. When application specific model attributes change, **Render** is called. Render is similar to TCL's Refresh method.

When necessary, application specific depth information is supplied to the 3dPane library by overriding a **FindNearFar** method.

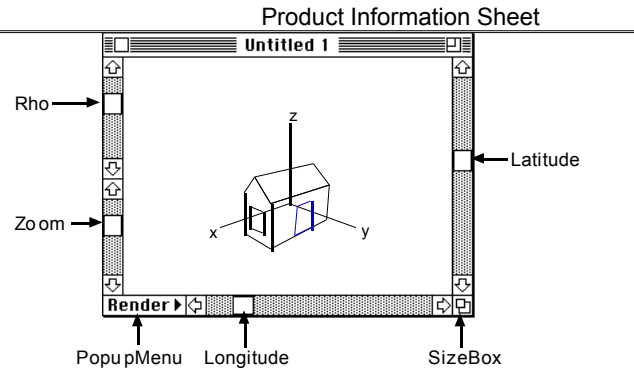
3dPane Inherits from SmartPane

Developers purchasing the SmartPane library allow 3dPane to inherit SmartPane's:

- pixel map buffering for quicker window updating
- dither copying for displays of limited pixel depth
- support for flicker-free animation
- PICS and QuickTime movie recording
- menu level support for:
 - feature control
 - image printing
 - PICT and pixel map file saving
 - image to clipboard copying

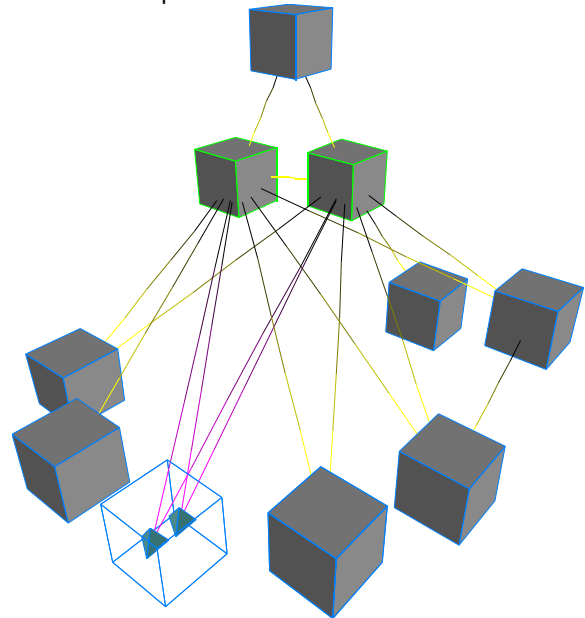
3dPane View Orientation Control

3dPane includes a **C3dControlPane** polar coordinate view orientation controller. The relationship between a C3dControlPane and the 3d pane it controls is similar to the relationship between CScrollPane and CPanorama objects in the TCL. Unlike CScrollPane and CPanorama objects, application specific 3d panes can be created nearly oblivious of being controlled by a 3d control pane. The figure below illustrates the C3dControlPane controls.



Thumbs in C3dControlPane scroll bars provide 3d feedback as they are dragged. This feedback may be customized by overriding the **DrawReference** and **UndrawReference** methods of the controlled 3d pane.

A pop-up menu is provided to give control over the Qd3d and 3dPane options for that window.



Requirements

Qd3d works with ThinkC 6.0, Symantec C++ 6.0, and MPW C++ 3.3. 3dPane works with TCL version 1.1.3.

SmartPane is highly recommended and is required for flicker-free operation and movie creation.

Recommended target system: a Macintosh with floating point coprocessor running either System 6 with color 32 bit QuickDraw version 1.3, or System 7.

Depending on use, 3dPane with SmartPane may require large amounts of memory. Memory management for buffered pixel maps is more efficient under System 7.

What is Included

- All source code for Qd3d and support libraries.
- 3dPane library integrating Qd3d into the Think Class Library (TCL).
- SmartPane demo library: SmartPane root class with associated stub files.
- Printed User Manual for Qd3d, 3dPane, and SmartPane.
- Qd3d/3dPane Demo source code demonstrating rendering and animation with Qd3d and 3dPane.
- Qd3d demo source code illustrating the use of Qd3d without the TCL.

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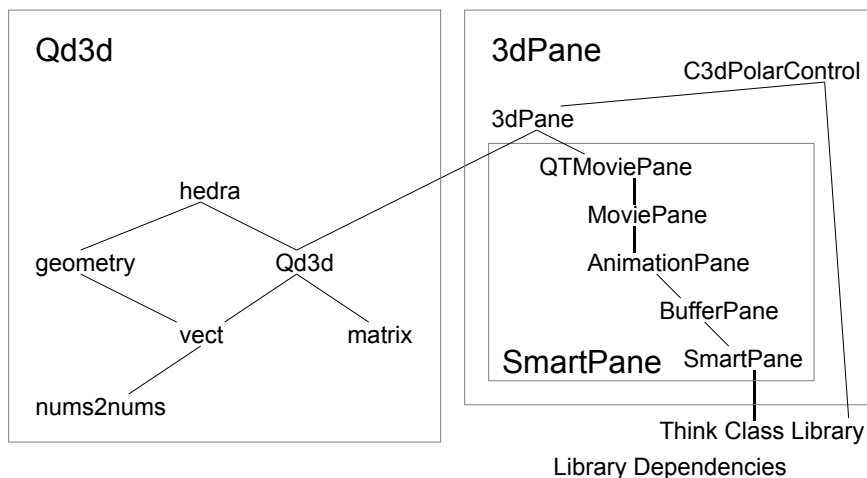
Ordering Information

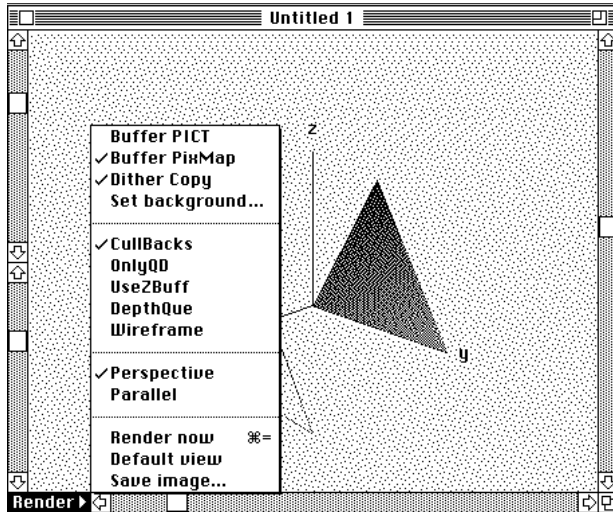
To order, contact ViviStar Consulting as listed below. Demonstration programs and movies are available on CompuServe, AppleLink, and the Internet.

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SmartPane™

The Think Class Library (TCL) automates many of the bookkeeping tasks of resizable and overlapping windows via its pane mechanism. SmartPane refines the pane mechanism and adds image buffering, animation, and QuickTime and PICS movie support.

Features

- pixel map buffering for quicker window updating
- dither copying for displays of limited pixel depth
- support for flicker-free animation
- PICS and QuickTime movie recording
- menu level support for:
 - feature control
 - image printing
 - PICT and pixel map file saving
 - image to clipboard copying

SmartPane

Developers create application specific SmartPanes by simply overriding a **DrawScene** method similar to how the

CPane::Draw is overridden. **Render** provides a more refined version of Refresh that allows the level of updating to be specified.

For panes controlled by CActiveThumbBars, application specific feedback is provided by overriding **DrawReference** and **UndrawReference**.

Finally, CSmartPane introduces the **FixMenus** message. FixMenus is sent to all SmartPanes during a gopher switch and allows menu enabling and disabling similar to the menu item enabling and disabling of CBureaucrat::UpdateMenus.

BufferPane

CBufferPane's **SetOnBuffer** and **SetOffBuffer** provide double-buffer like support for the Macintosh. Onscreen image updating is streamlined by recording affected image regions with the **RescanAppendARectList** call. The affected region list is copied to the screen with **RescanARectList**.

AnimationPane

CAnimationPane provides for interactive animations. Override **Iterate** to bring the image from its old state to the desired state. Details of screen updating are hidden from developer code through the use of BufferPane's affected regions. AnimationPane also provides **TimeToEnd** and **StartIteration** messages.

QuickTime and PICS Movies

CMoviePane provides the template for movie recording by adding a **renfRECF** (record frame) flag to the parameter passed to Render. All images rendered with this flag are appended to the current movie. Pull down menu support of movie file creation is provided. CMoviePane provides for PICS movie recording and **CQTMoviePane** provides for QuickTime recording along with dialog level compression manager access.

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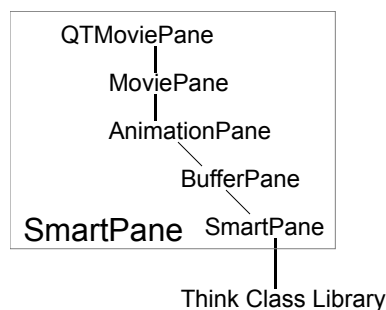
Support Libraries/Classes

Many TCL subclasses are provided with SmartPane. These include:

- CActiveThumbBar** CScrollBar subclass providing feedback during thumb dragging and linkage with the DrawReference message of SmartPane.
- CCommonApp** CApplication subclass providing "Development" menu support and default DoAbout for about boxes.
- InCommandChain** Determines if an object is in the current command chain.
- CSmartWindow** Subclass of CWindow that does not erase window regions containing SmartPanes. This behavior prevents BufferPanes from flashing when being updated.
- CSortedArray** Subclass of CArray which sorts elements for faster querying.
- CCQDEnviron** Subclass of CEnvironment supporting color graphics ports.

Bug fixed versions of several TCL classes are also included.

SmartPane Class inheritance:



Note: AnimationPane and MoviePane are conceptually independent.

Requirements

SmartPane requires Think C or C++ and works with TCL version 1.1.3.

Recommended target system: a Macintosh running either System 6.0.7 with color 32 bit QuickDraw version 1.3, or System 7.

Depending on use, SmartPane may require large amounts of memory. Memory management for buffered pixel maps is more efficient under System 7.

What is Included

- Complete SmartPane source code.
- Printed user manual.

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