

Actor Technology Demo

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Overview

This document describes the demonstration program *Actor* that can be downloaded from the Vivid Image website

<http://www.vividimage.co.uk/>

by following the Actor link, or from the MathEngine website at

http://www.mathengine.com/_mathengine_corp/_downloads/demos.html

The Actor Technology Demo features Vivid Image's latest 3D game engine that uses the MathEngine Karma software. Actor demonstrates the successful application of physics in a gaming environment, allowing the user to manipulate complex physical objects in a natural way.

The Actor 3D engine is an ongoing project and further optimization and new features are continually being added.

Hardware Requirements

The suggested minimum requirements to run the Actor technology demo are:

- Windows 98/2000
- Pentium II 266+
- 256MB RAM (less RAM yields acceptable performance)
- 8 MB Video Card with D3D support

Tested with Matrox G200/G400, ATI Rage 128, Voodoo2 (8MB+, Windows 98 only), Voodoo3, NVidia GeForce and TNT/TNT2 graphics cards.

For best performance please make sure that you have installed the latest drivers for your video card.

Vivid Image intends to provide support for more cards and release patches/updates to the demo. Please contact them at (actor@vividimage.co.uk) if the demo does not work on your card.

The Environment

Actor is set inside a room in an ancient oriental building. It is presented as a boxroom, being filled with numerous and varied objects that a user can interact with. A pool table, basketball basket and football goal are in the room with their respective balls. Chairs and tables are present and a running shoe lies on the floor.

Interact with the toys present - throw objects around the room and smash them together. Igniting and dropping a 'bomb' will move objects in the near vicinity. Try setting off a bomb - perhaps blowing up some stacked objects. Pick up the basketball and soccer balls and throw them toward the goal or the basket on the wall. Lift up other objects, such as a chair, and throw it at other objects in the room.

The pool table is readily usable. Click on the light switch over the table, grab a cue and take a few shots. To focus on a ball, click on that ball until it becomes highlighted and move the mouse slightly. The camera view will automatically centre on that ball. Place a cue on the table and adjust its position. When the shot is lined up, hit the ball.

A scene is the set of all the objects in the room. Different scenes can be constructed and saved for later use.

Karma Demonstrated: Dynamics and Collision

The ActorDemo may look like a run-of-the-mill first person shooter game, but it is an interactive environment that demonstrates the power of Karma Dynamics and Collision to simulate a wide range of behaviors in real time.

Dynamics Discussion

All the objects in the room move dynamically according to physical laws. Throw a ball and it will behave as expected, its trajectory being determined by the:

- initial impulse it received from the thrower
- force experienced by the gravitational field
- collisions with other objects in the scene

Collision Discussion

Consider how natural the interactions between the objects look. This is because Karma Collision detects collisions between distinct objects. Karma Collision tracks the position of all the objects, quickly culling those objects that will not collide with one another soon, thus reducing the computational cost of accurately determining collisions between all pairs of objects at each time step.

For objects that will collide, each collision test is performed individually depending on the geometric shape of the objects comprising each pair. A number of collision algorithms are included in Karma Collision that deal with collisions between objects of different, or the same, geometries.

To demonstrate Karma Collision drop a few balls in a paper bin or put one below a chair. Notice that the ball doesn't intersect with the bin or parts of the chair. Try tangling the lamps together or wrapping one around one of the building beams. The lamps can be easily untangled and no sticking effect takes place.

Controls

In the rest of this document, the symbol LMB and RMB stand for Left Mouse Button and Right Mouse Button respectively. A control between brackets (i.e., <LMB>) means that the control (key/mouse) must be activated continuously.

Mouse Controls

Mouse Control	Action and Description
<Roll Up>	Rotate Upward This action rotates the camera upward about a fixed point.
<Roll Down>	Rotate Downward This action rotates the camera downward about a fixed point.
<Roll Left>	Rotate Left This action rotates the camera to the left about a fixed point.
<Roll Right>	Rotate Right This action rotates the camera to the right about a fixed point.
<LMB> + Highlighted Object	Pick Up An Object To pick up an object, first place the mouse pointer over that object so that it becomes highlighted. Then press the Left Mouse Button. As long as the LMB is pressed the object will move along with the mouse pointer.
<Roll Up> + Picked Up Object	Move Object Away This action moves a picked up object away from the camera along the view axis of the camera.
<Roll Down> + Picked Up Object	Move Object Closer This action moves a picked up object closer to the camera along the view axis of the camera.
<SHIFT> + <LMB>	Fly Forward This action moves the camera forward along the view axis of the camera.
<SHIFT> + <RMB>	Fly Backward This action moves the camera backward along the view axis of the camera.

Key Controls

Control Keys	Action and Description
F1	<p>Interactive Help On/Off Toggle</p> <p>This key toggles an on-screen help menu. The help menu is superimposed over the current screen content and the game is not paused during its activation. Press F1 again to see the credit screen. To return to the game, press F1 again.</p>
Esc	<p>Exit Demo</p> <p>This key exits the game. You'll be asked to confirm your choice before returning to Windows.</p>
Enter	<p>Reset Scene</p> <p>This key reset the scene to its initial state.</p>
B	<p>Throw a Bomb</p> <p>A bomb is thrown several feet in front of the camera. If the bomb has not been lit, it must first be picked up to be ignited. There is a delay of three seconds between the ignition and the explosion.</p>
G	<p>Gravity On/Off toggle</p> <p>This key toggles the gravity between zero (no gravity, everything floats) and 9.8m/s² (earth's gravity).</p>
Z	<p>Undo</p> <p>Reset the scene to the state just before the latest action took place.</p>
CTRL + Z	<p>Quick Save</p> <p>Save the current scene configuration as is, under its initial name. No confirmation message will appear.</p>
CTRL + S	<p>Save Scene</p> <p>Save the current scene configuration. You'll be asked to choose a name for the scene file and to confirm your choice.</p>
CTRL + L	<p>Load Scene</p> <p>You are offered a list of saved scene files. Pick one and confirm your choice.</p>
V	<p>Disable Pointer Follow On/Off toggle</p> <p>By default, the viewer orientation follows the mouse pointer with a certain delay. To make the viewer orientation stand still, press V.</p>

Control Keys	Action and Description
SHIFT	Center View Forces the screen to be centered about the mouse pointer.
<SHIFT>	Fly Mode Triggers the Fly Mode that lets the camera move freely in all directions inside the room.