

# Adanaxix Rendering Demo

<http://www.mushware.com/>

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## Overview

Adanaxix is a game in four spatial dimensions. The game world has the usual three dimensions (left/right, up/down and forward/back) and another, new direction in space. We don't have this dimension in our physical world but it's possible to imagine and simulate a fourth dimension. This game is my attempt to do this. It's also difficult to visualise and understand a 4D world, but it's fairly easy to navigate, much as an insect can fly to a flower without comprehending the world around it.

This demo contains playable levels showing the rendering and control system. The game itself should be available towards the end of 2006.

## Quick Start

The game menus are controlled using the arrow and enter keys. The game itself can be played like a normal shooter with one exception. As well as aiming left/right and up/down, you need to aim in the third, hidden axis. This is done by holding down the mouse button (the left button if you have more than one) and dragging the mouse left/right. Each object has a three-dot marker showing where it is in 4D space. When all three dots are lined up at the top of the marker, you are aiming directly at the object.

## Default Controls

The demo can be played with just a few controls.

- **Mouse left/right** : Look left and right (rotate in  $xz$  plane)
- **Mouse up/down** : Look up and down (rotate in  $yz$  plane)
- **Hold mouse button down, drag mouse left/right** : Look in hidden axis (rotate in  $zw$  plane)
- **Space** : Fire
- **Up and down arrows** : Move forward/back ( $w$  axis)

The full set of 4D movement and rotations are also available.

- **Left and right arrows** : Dodge left/right ( $x$  axis)
- **W and S** : Move up/down ( $y$  axis)
- **E and D** : Move in hidden axis ( $z$  axis)
- **T and G** : Rotate in  $xy$  plane
- **Y and H** : Look in hidden axis (rotate in  $zw$  plane)
- **U and J** : Rotate in  $xz$  plane
- **I and K** : Look up and down (rotate in  $yz$  plane)
- **O and L** : Look left and right (rotate in  $xz$  plane)
- **P and ;** : Rotate in  $yz$  plane
- **Esc** : Menu

Joysticks with a twist control are especially good, as the hidden axis can be controlled by twisting the stick. It is possible to play with a touchpad, but if your laptop touchpad has a 'palm check' or 'prevent accidental pointing' feature you might need to turn that off, otherwise the touchpad may freeze for a few seconds every now and then.

## Details

Instead of the usual six degrees of freedom in 3D there are ten in 4D; four directions and six rotations. Three directions are displayed on the screen just like 3D. The  $x$  axis is left/right, the  $y$  axis is up/down, and the  $w$  axis is away from you into the screen. There's no direction left to use for the  $z$  axis, so the game represents  $z$  in two ways:

- Tinting the object red (negative  $z$ ) or green (positive  $z$ ) to show where it is in  $z$ .
- Using the three-dot markers to show where the object is in  $x$ ,  $y$  and  $z$ .

To make the  $z$  axis consistent with  $x$  and  $y$ , objects fade away as they move a long way off in  $z$ . You can't see objects with large  $x$  or  $y$  values (compared to  $w$ ) because they go off the screen, and the fading does the same for  $z$ . The fading essentially gives you a *viewing angle* in  $zw$  which is roughly the same as that in  $xw$  and  $yw$ .

In 3D there is one rotation that will leave you pointing in the same direction; it's the *roll* rotation in  $xy$ . In 4D there are three rotations that work like this. The  $xy$ ,  $xz$  and  $yz$  rotations all have this property. It's possible to aim whilst, say, holding down the **U** and **P** keys without using the hidden axis, just like you can aim in 3D using just left/right if you continually roll the craft.

Aiming at moving targets can be tricky. In 3D you need to aim ahead of the target, aiming at where the target will be instead of where it is now. It's the same in 4D, but if the object is moving in  $z$  you need to aim at where the object will be in  $z$  as well. The movement of the blue dot can help there.

## Future Plans

Mushware's aim is to spread and expand gaming in four and more dimensions, and eventually bring it into the commercial mainstream. There are many ways that you can help, either by spreading the word, sending in bug reports, or just letting me know how you get on with this demo.

Over the next few months I'll be working towards completion of the Adanaxis game, including a set of missions and more sounds and music. This should be released, both as a free demo and shareware, towards the end of 2006. You can keep up to date by receiving a digest of the *Announcements and Releases* forum at the [Mushware web site](http://www.mushware.com) (under Digests on the left menu after you log in).

## More Information

At [www.mushware.com](http://www.mushware.com) there are some technical documents in the download section, and details about how to create new levels and objects using the Adanaxis script system. The *Projection and Rendering* paper has a lot of detail and diagrams about 4D rendering and viewing. The web site [tetraspace.alkaline.org](http://tetraspace.alkaline.org) has some good information on general 4D.

## **About Recovery Mode**

On some platforms there is a link to start Adanaxis in recovery or 'safe' mode. This can be used to recover things when, for example, a display mode has been chosen that the monitor cannot display. Usually this will not be necessary, and normal mode should be used because it allows better performance.

## **Version History**

1. 2005-08-04: Release for Adanaxis Control Demo (version 0.0.1).
2. 2006-08-02: Release for Adanaxis Rendering Demo (version 0.1.1).



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