TERMINATOR 3D
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6.111 Final Project
Game Overview

Something fun........

- A third dimensional experience
- First person shoot-em-up
- Maze based level

- Your key objectives are....
Something to look at.....

- Simple VGA interface to 320x240 resolution monitor:
  - 8-bit colour ID supplied to Colour Palette LUT.
  - Values scaled by Intensity Value.
  - Three 8-bit DACs output 24-bit colour to Screen
Something to play with.....

- Keyboard control via PS2 interface:

- Controls to move and turn
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3D Ray-Casting

Advantages, Disadvantages and Limits:

- Faster than other 3D methods
- Worse quality
- Used in Wolfenstein 3D
- Has three major geometric constraints
  - Walls perpendicular to floors and ceilings
  - Floor and ceiling is flat
  - Walls made from equally sized cubes
3D Ray-Casting

How?

- Map consists of a 64 by 64 grid of squares
- Each square is subdivided into a 64 by 64 coordinate system
- Walls occupy a single large square
- Casts a single ray across a 2D map for each column of pixels
- Simplify - The ray can only hit a wall at a large square boundary
- Check each big square boundary for a wall
• Viewing constraint - no looking up or down
• The distance a ray travels to a wall sets the height of the wall on the screen in pixels
• Walls are textured – must find which bit of the wall a pixel corresponds to
• Have already got which column the pixels are in from Ray-Casting
• Vertical texture coordinate is dependent on which pixel is chosen – scales with wall height
• Single colour for floors and another for ceilings
Separate position data and position update modules:

- Player Position Data delivers player coordinates to the other game control blocks.
- AIC Position Data delivers each game character’s coordinates to other game control blocks.
- Position update calculates new positions of both player and game characters and delivers these to position data, initiated by the game logic block.
• A.I. Block controls the movements of the game characters.

• Proximity of characters governs their attack.
• Player may shoot at a character attacking them.

• Player and all characters have health points which are decremented in the event of an attack.

• Game logic coordinates 3D Rendering, Position Update and game start and end.
Major Obstacles

- Amount of on chip ROM – Move it off chip
- Too many modules needing access simultaneously – Re-order processing steps so that accesses can be efficiently time division multiplexed
- VGA timing requires 25Mhz minimum, with 24-bit colour, DACs not good enough – get better ones
Questions?