Reconfigurable Point Based 3-D Graphics Rendering on FPGA

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Design

Hardware

Software
Results
Motivation
Mesh Rendering
Problems

- Complex models require complex meshes to represent
- Meshes smaller than a pixel cannot be displayed
- Needs faster processing and more storage space
Point Rendering

Process

- High-quality, simple to build and maintain
- Flexibility
- Cheaper overall, less design costs
Advantages

- Conceptually simple rendering primitive
- Flexibility
- Simple processing, less storage space
OpenGL Demo
MATLAB
45 Degrees Rotation
90 Degrees Rotation
135 Degrees Rotation
180 Degrees Rotation
225 Degrees Rotation
270 Degrees Rotation
315 Degrees Rotation
Hardware
Vertex Pipeline

Diagram showing the vertex pipeline with the following steps:
- Modelview Output
- Backface Culling
- Projection
- Frustum Clipping
- Perspective Division
- Viewport
- To SDRAM

Inputs:
- Eye Reference Point
- Normal Vector

Outputs:
- Normal Vector
Color Pipeline
Software
Gouraud Shading
Flat Shading
Highlights

• 100,000 point model with 18 bit color at 60 fps
• Reconfigured as Flat or Gouraud shading
• Modularity and Flexibility
• Hardware/software co-design
References


[3] Real time 3-d graphics processing hardware design using field-programmable gate arrays, James Ryan Warner, M.S. University of Pittsburgh, 2008


[5] Xilinx online support
Questions ?
THANK YOU !!!