To our customers,

Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

Phase-out/Discontinued

3D Graphics Accelerator

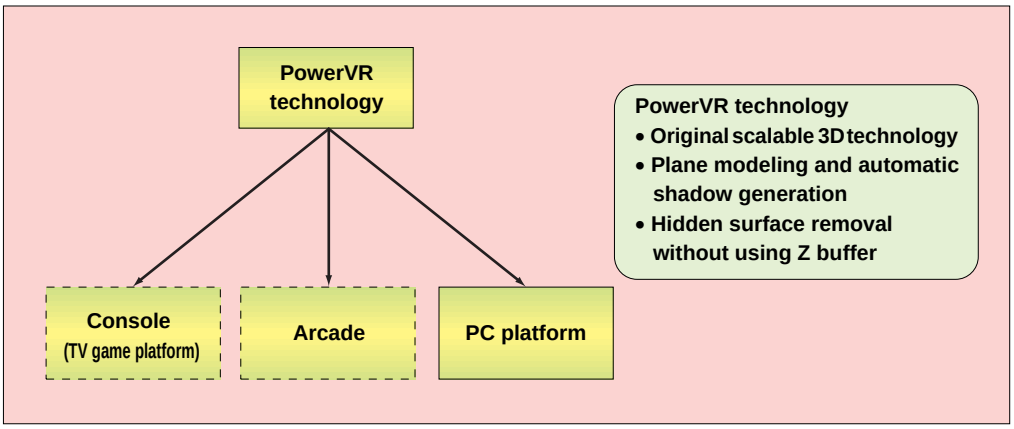
POWER VR™

Phase-out/Discontinued

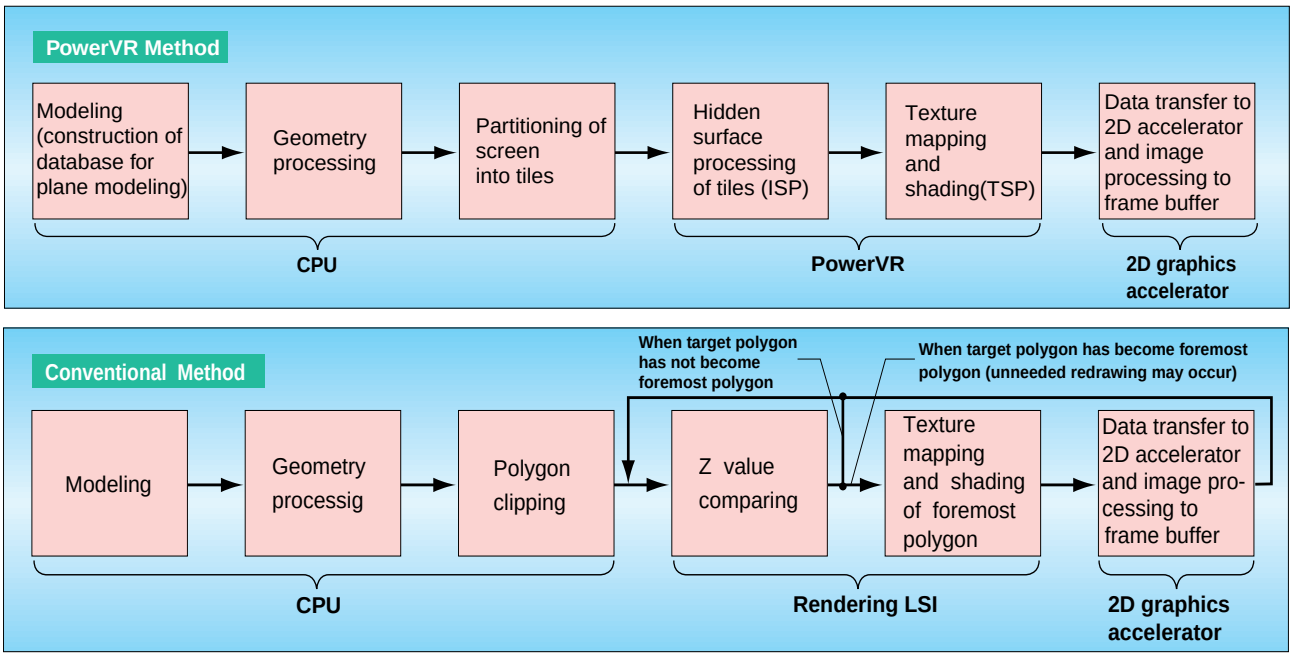
PowerVR — Revolutionary 3D Graphics Technology
Realizing high-level functions at low cost

Features of PowerVR technology

- Provides 3D graphics ideal for next-generation interactive entertainment using 3D rendering function for heightened sense of reality.
- The PowerVR architecture provides a 3D graphics system ideal for 3D applications from game consoles and PCs to high-end arcade machines. It enables running 3D titles on a par with high-quality arcade games on PC platforms.
- The PowerVR processing flow differs from the conventional processing flow in that it performs hidden surface removal first, thereby eliminating the need to redraw already rendered polygons.
- PowerVR's original hidden surface removal technology, which does not make use of Z buffer memory, and the use of an efficient processing flow, eliminate the need to have to use the expensive memory required by conventional technology and bring freedom from bandwidth. The result is a system solution that boasts excellent cost performance.
- A 3D rendering algorithm employing unlimited plane modeling realizes significant reductions in data volume and processing volume compared to the conventional method (polygon mesh) and supports automatic shadow generation, producing clearer 3D graphics.



PowerVR Target Platforms



Comparison Between PowerVR and Conventional Method

Phase-out/Discontinued

PowerVR – High-Performance 3D Graphics Technology

PowerVR consists of two internal blocks, the Image Synthesis Processor (ISP) and the Texture and Shading Processor (TSP)

ISP.....Image Synthesis Processor

- Has hidden surface removal and shadow generation functions.
- Contains 32 processor elements (PE) , with each PE performing 3D processing of 32 pixels. By connecting ISPs in parallel, the data processing capacity can be scaled up, by raising the operating frequency, and by incorporating a greater number of PEs through the use of a finer process, polygon performance can be raised.

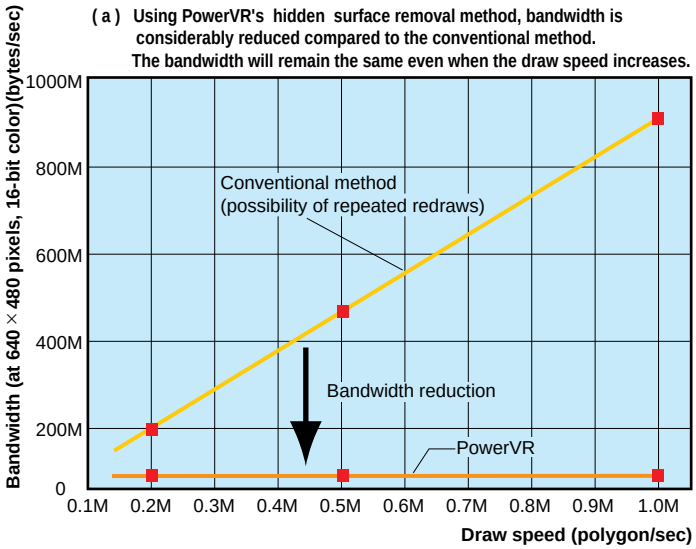
TSP.....Texture and Shading Processor

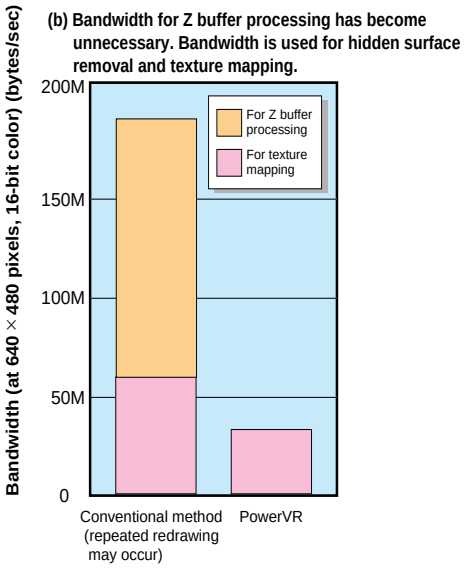
- Texturing and shading are performed for 32-pixel data processed by the ISP.
- Provides display management functions such as double-buffer 3D data, 24-bit RGB, and 2D overlay.

Main 3D Functions of PowerVR

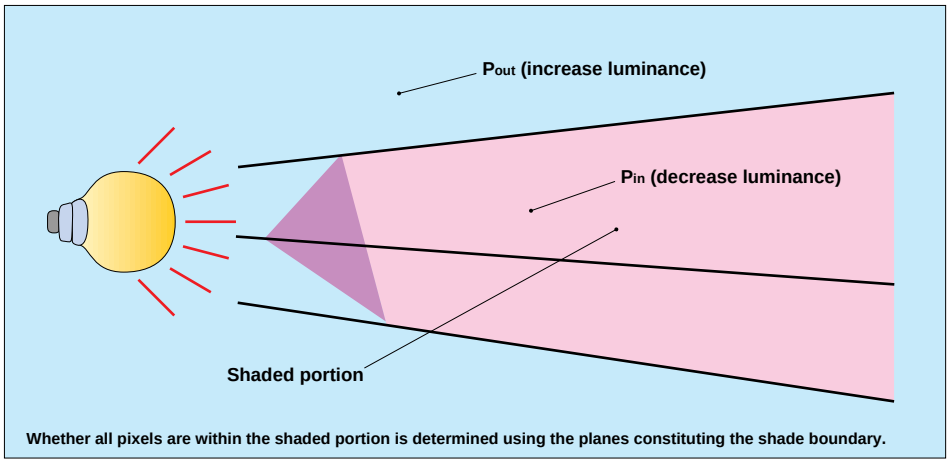
- Projection of shadow on complex objects through realistic shadow generation
- Depth data processing equivalent to 32-bit Z buffer (original hidden surface removal technology)
- MIP mapping
- Perspective correction (more realistic representation of perspective)
- Smooth shading (Gouraud shading, Phong shading)
- Translucent texture, polygon (realistic rendition of flames, water splashes, lens flare, etc.)
- Fog and darkness (fast rendition using hardware)
- High resolution, realistic colors (24-bit RGB)
- Automatic collision judgment (more accurate collision judgment enabled by use of characteristic points in objects).
- Display list (list structure that enables moving several objects together and batch changing of textures, etc.)
- Light volume (support of modeling of light shapes and generation of illumination for non-circular sections)
- Level adjustment (level of detail) (objects in the distance are replaced with simple models defined by the user)
- Parallel light source, point source, environmental light

PowerVR's hidden surface removal method reduces bandwidth and external memory capacity requirements





Shadow / light volume generation using PowerVR



Phase-out/Discontinued

PowerVR – High-Performance 3D Graphics accelerator
μPD62011 3D graphics processor for PCs

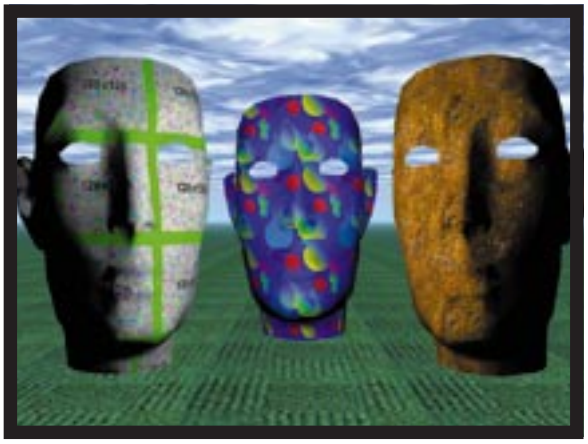
The μPD62011 for PCs is an LSI that integrates an ISP and TSP on a single chip

Features

- On-chip PCI bus 2.1-compliant interface
- On-chip hidden surface removal function
- External texture memory
  Capacity : 1 Mbyte to 4 Mbytes
  Types : Synchronous GRAM or Synchronous DRAM (existing graphics card memory used as frame memory)
- Operating frequency : 66 MHz
- Package : 208-pin plastic QFP (Interchangeable with μPD62010 package)
- Performance : Enhanced performance compared to μPD62010
  (approx.1.5 to 1.7 times, depending on measurement environment such as CPU and memory)
- Functions
  - Shadow generation
  - Collision judgment
  - Texture mapping
  - Bilinear filter
  - Texture mapping with depth correction function (perspective correction)
  - Environment mapping
  - Linear MIP mapping (equivalent to bilinear MIP mapping)
  - Translucent, transparent texture and polygon
  - Smooth shading (Gouraud shading + specular highlight)
  - Display list
  - Light volume
  - Level adjustment (level of detail)
- Image output
  - Max. resolution 1024 x 1024
  - 24-bit RGB color display
- Software compatibility with μPD62010
  - Supports Microsoft Direct3D™
  - Supports original API (Super Graphics Library)

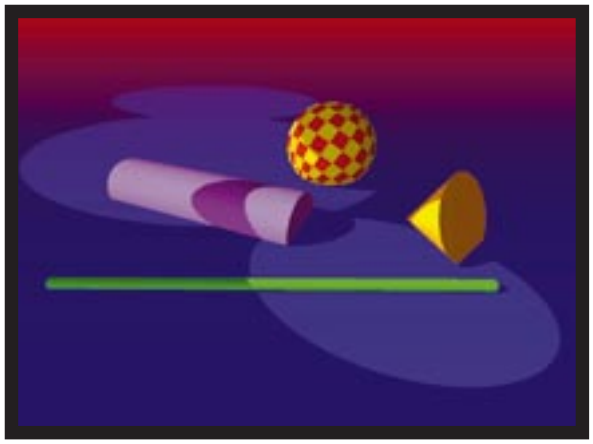
PowerVR – Creating a Realistic 3D world through Special Effects

Texture mapping, lighting (point source), Gouraud shading



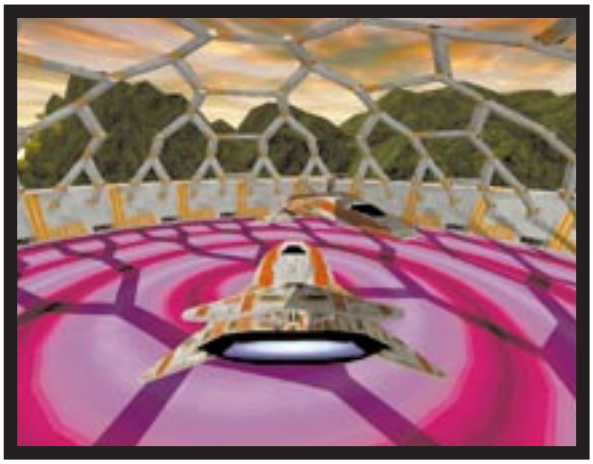
Smooth shading, cylindrical mapping

Shadow (projection on smaller objects)



Light volume (spotlight)

Translucent object, fog



3D rendering using special shadow effects

Phase-out/Discontinued

PowerVR-related URLs

http : // www.ic.nec.co.jp/powervr / index.html (Japanese)
http : // www.powervr.com / (English)

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