Introduction of IWAYAG, a graphics accelerator based on OpenVG 1.1

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History of Graphics products at NEC System Technologies


Standard Graphics

Fast2D Graphics

Standard 2D Graphics

Lowend 2D Graphics

Video accelerator

LCD support

Notebook

2D Graphics Products

3D Graphics Products

GA88 Series

Graphics IP Products

: LSI

: Board products
IWAYAG is a graphics accelerator dedicated for vector graphics, consisting of:
- Hardware IP core to be incorporated to the customer’s SoC
- OpenVG driver

IWAYAG design and features:
- Native OpenVG accelerator
  - Architecture of IWAYAG is based on the OpenVG pipeline stage design
  - Path generation to Blending/Antialias stages are implemented by hardware
  - No CPU tessellation. Fill is done by hardware using outline buffer
- Hardware bezeir rasterizer
- Extensive cache control mechanism for fast filling
- Support fast FSAA
Why IWAYAG?

Requirements from the consumer devices market
- Flash support
  - Many consumer device manufacturers plan to incorporate richer UI
  - Flash support is a MUST to efficiently develop the rich UI
- Smooth playback of Flash contents while using low-end CPUs
  - Cost and/or battery power limits CPU selection
    - 100Mhz CPU without FPU is common for Digital cameras.
- Long battery life
  - Flash acceleration by 3D engine consumes too much battery powers

Native OpenVG graphics accelerators best meet the requirements
- Good Flash performance while using low-end CPUs
- Much lower power and die size than 3D engine
Total Solution of IWAYAG

Supporting software
- OpenVG1.1 Driver
- FlashLite 3.1.5
- Vector font and drivers

Supporting menu
- Porting to customer’s LSI
- Customization of IWAYAG hardware
- Application Design
- Board Design/Manufacturing
Evaluation Environment of the IWAYAG performance

- ARM9@192MHz
- IWAYAG in FPGA@48MHz clock

IWAYAG has been designed to run at 200MHz clock.
In this evaluation, due to the design of the evaluation board, the testing has been conducted with IWAYAG operating at 48MHz clock.
Performance Improvements on Flash Contents by IWAYAG (1)

(1)002_motionTweenLine.swf

- Software
- IWAYAG, 48MHz
- IWAYAG, 200MHz (Estimated)

Acceleration ratio = 3.4

Acceleration Ratio = 7.1

(2)003_motionTweenGradient.swf

- Software
- IWAYAG, 48MHz
- IWAYAG, 200MHz (Estimated)

Acceleration ratio = 2.5

Acceleration Ratio = 7.1

(3)004_motionTweenBMP.swf

- Software
- IWAYAG, 48MHz
- IWAYAG, 200MHz (Estimated)

Acceleration ratio = 2.7

Acceleration Ratio = 5.2
Performance Improvements on Flash Contents by IWAYAG (2)

(4)005_motionTweenText.swf

Performance - 05
motionTweenText 64.1025 fps

Software
IWAYAG, 48MHz
IWAYAG, 200MHz (Estimated)

Acceleration ratio = 3.0
Acceleration Ratio = 5.7

(5)006_motionTweenMC.swf

Performance - 06
motionTweenMC 64.1025 fps

Software
IWAYAG, 48MHz
IWAYAG, 200MHz (Estimated)

Acceleration ratio = 2.7
Acceleration Ratio = 6.4

(6)007_shapeTween.swf

Performance - 07
shapeTween 64.1025 fps

Software
IWAYAG, 48MHz
IWAYAG, 200MHz (Estimated)

Acceleration ratio = 2.3
Acceleration Ratio = 4.3
Performance Improvements on Flash Contents by IWAYAG (3)

### Fill Operation
- **64x48**: 9.8
- **32x24**: 5.3
- **16x12**: 3.5
- **8x6**: 2.9
- **4x3**: 2.6

### Arc Operation
- **64x48**: 10.5
- **32x24**: 6.7
- **16x12**: 3.9
- **8x6**: 2.7
- **4x3**: 2.3

### Stroke Operation
- **64x48**: 6.5
- **32x24**: 5.2
- **16x12**: 3.6
- **8x6**: 2.5
- **4x3**: 2.3

### Bezier Fill Operation
- **64x48**: 26.1
- **32x24**: 19.7
- **16x12**: 12.3
- **8x6**: 6.7
- **4x3**: 4.1

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<th>Software value</th>
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Performance Improvements on Flash Contents by IWAYAG (4)

Text Operation

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Other Primitives

- Semi-transparent: 1.4
- Radial Gradient: 5.5
- Linear Gradient: 3.6
- Image (Perspective Projection): 2.0
- Image (Projection): 1.3

IWAYAG 48MHz

Software: value

Acceleration Ratio
Future Plan

2007
- OpenVG1.0

2008
- OpenVG1.1

Lowend products
- Smaller gate size
- Lower power consumption
- Lower IP cost

Highend products
- Improved OpenVG acceleration
- Support future versions of OpenVG
- 3D support (OpenVG+3D hybrid)
- Support variety of display devices
- Easier customization

Extends the rich UI by OpenVG and Flash to wider range of the devices
Empowered by Innovation