

Vision Platform for Mobile Intelligent Robot Based on 81.6 GOPS Object Recognition Processor

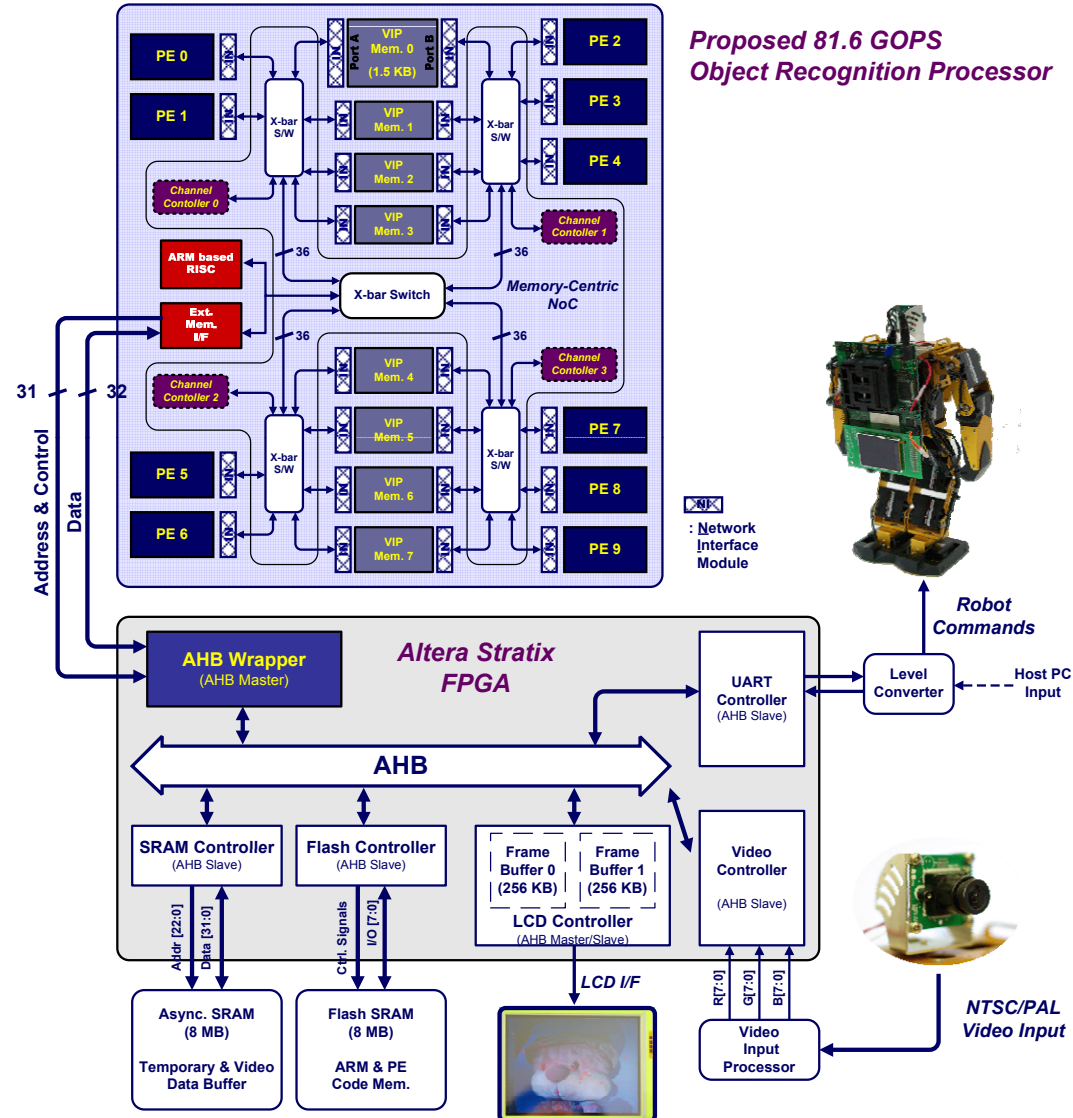
► System Overview

Object Recognition Processor

- 1 ARM Processor
- 10 SIMD PEs
- 8 VIP memories
- Memory-Centric NoC

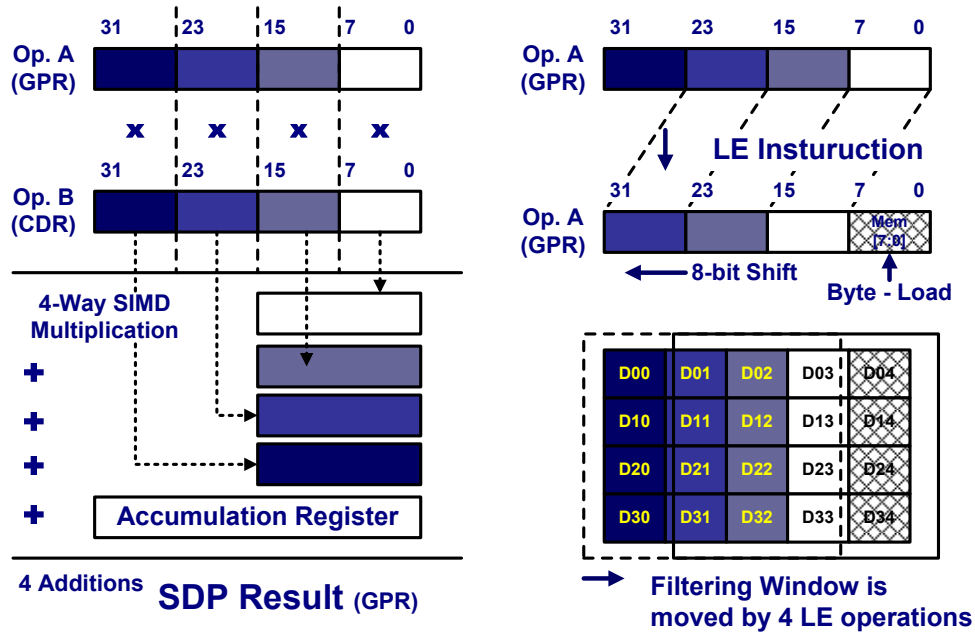
Vision Platform

- Video input processor
- LCD controller
- Memory controllers



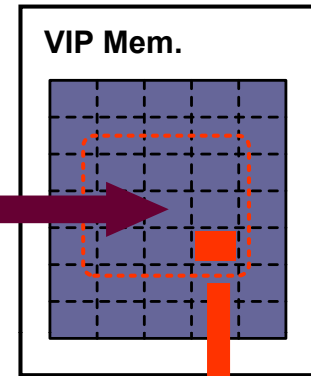
Hardware Accelerator: SIMD PE and Visual Image Processing Memory

► Special Image Filter Instructions



► VIP Memory Function

Address of
Center Pixel
in 3x3
Window



Address of Maximum Value
Pixel in 3x3 Window

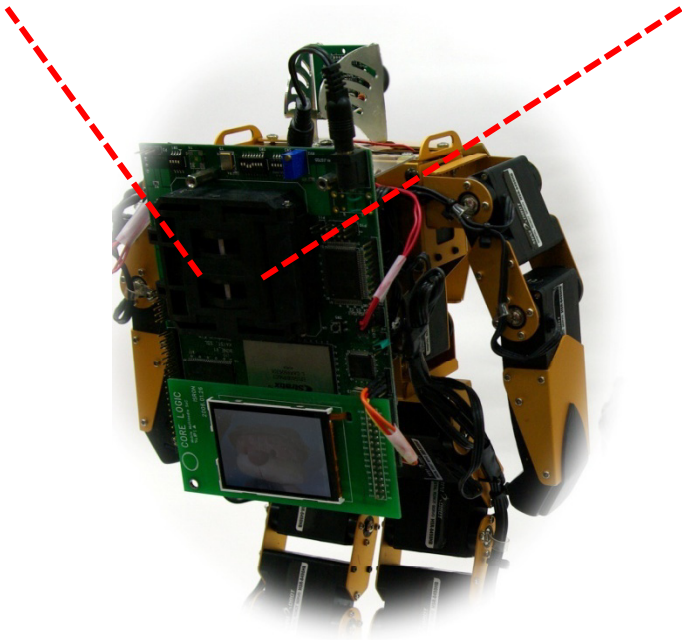
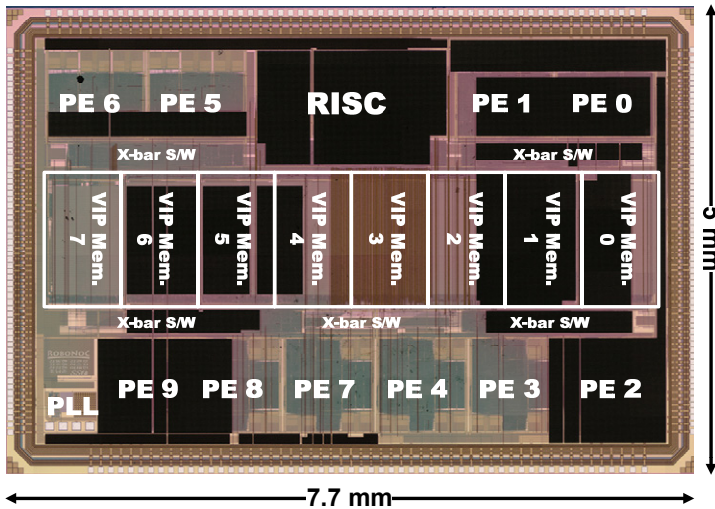
→ **41 Cycles of operation
is replaced with single
read operation**

$$10 \times 8 \text{ Ops/Cycle} \times 200\text{MHz} + 8 \times 41 \text{ Ops/Cycle} \times 200\text{MHz} = \mathbf{81.6 \text{ GOPS}}$$

SIMD PEs

VIP Memories

Implementation Results & Summary



Process	0.18um 1-poly 6 Metal
Chip Size	7.7mm x 5mm
Clock Freq.	400 MHz (NoC) / 200 MHz (Other Part)
Gate Counts (NAND2 Equiv.)	838.8K Gates
On-Chip Memory	Total : 30 KB VIP Memory : 1.5KB x 8 PE Local Mem. : 1KB x 10 RISC Cache : Data \$ 4KB, Inst. \$ 4KB
Power Consumption	1.4W at 1.8V (Peak) 540mW at 1.8V (@100MHz) 2.3W (Vision Platform)