A Programmable Solution for Standard Video Compression

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Video Compression Algorithms

- JPEG standard for still images
- MPEG standard for movies and video
- Px64 H.261 standard for videophone and conferencing
- Proprietary algorithms for
  - backward compatibility
  - certain market segments (e.g. domestic phone lines)
Applications require multiple algorithms

- Video Conferencing requires
  - H.261 standard for compatible transmissions
  - Proprietary algorithm for backward compatibility
  - JPEG standard for still images

- Desktop Multimedia requires
  - H.261 standard for conferences over LAN or ISDN
  - MPEG standard for movie playback
  - JPEG standard for still images

IIT Vision Processor Chip

World's First Programmable Video Signal Processor optimized for DCT-based algorithms

Executes H.261, MPEG, JPEG and Proprietary standards

Programmability allows continual improvement in image quality
IIT Vision Controller Chip

Companion chip to Vision Processor enables complete Video Compression/Decompression subsystem

- Clean interface to System through Pixel Bus and Host Bus
- Complete video I/O in RGB or YUV formats
- On-chip 'C' programmable RISC allows for customization
- Full-duplex operation for QCIF VideoPhone

PC MultiMedia
(MPEG, JPEG, QCIF H.261)
Capabilities
(one VC and one VP with memory)

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<th>Y Pixels</th>
<th>encd/decod</th>
<th>frame rt</th>
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<td>H.261</td>
<td>QCIF</td>
<td>176x144</td>
<td>codec</td>
<td>30 fps</td>
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<tr>
<td>H.261</td>
<td>CIF</td>
<td>352x288</td>
<td>decode</td>
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<td>H.261</td>
<td>CIF</td>
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<td>encode</td>
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<td>SIF</td>
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<td>encode</td>
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<td>encode</td>
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Vision Controller

Diagram showing the Vision Controller architecture with connections to SRAM, ROM, Host interface, Vsync, Hsync, PixClk, 24-bit Video, DRAM Interface, Video Pre- and Post-processing, Video Encoder & Decoder, and Data Bus.
Vision Processor

Programming the VC and VP

1) Vision Control Interface (VCI)
   - MPEG, Px64 and JPEG software supplied with all VC/VP chips

2) Customize VC I/O
   - Handshaking, bitstream, screen sizes, etc.

3) Customize VC Encode Strategy
   - Encoding decisions and Rate Buffering improve image quality

4) Customize Algorithm
   - Use VP microcode library to build custom Algorithm
Vision Control Interface (VCI)

- Video timing
- Video pre- and post-processing
- Compression algorithm and mode
- Compression ratio/data rate
- Buffer sizes
- Picture size and rate
- Test and Loop-back functions

Future Directions

Higher speed chips provide

- **Larger screen sizes**
  - TV resolution
  - CCIR 601 resolution (MPEG II)

- **Higher integration**
  - System, audio and video processing
  - Data mux/demux and line interface
  - Video pre- and post-processing
Conclusion

- Programmability is the key to
  - flexibility to execute MPEG, JPEG and H.261
  - best image quality

- The first products have been announced:
  - AT&T VideoPhone 2500
  - CLI Cameo Personal Video System
  - CLI Rembrandt II/VP Video Codec