Real-Time Full High-Definition Digital Compression Device

Background to the Project

The objective of this project is to design and develop a system to compress and then decompress real-time video data. The video data is full high-definition resolution (1920 x 1200) at a 60Hz frame rate. The system is to interface with the Djehuty™ video controller developed by Capstone Visual Product Development. This product will be used in the digital signage market to allow the customer the ability to transmit compressed video data to the LCD panels video controller using limited bandwidth. Final deliverables include finished circuitry schematics and printed circuit board layouts, a bill of materials, all necessary interfacing cables, software, and a prototype system on a printed circuit board. The prototype will contain both compression and decompression circuitry on the same board but the final product will be separate with a transmission medium between the two.

Technical Goals Accomplished During Phase I: 2008 – 2009

During the F08/S09 academic year, a team of two electrical engineers and two computer engineers began the development of this project. The following goals were accomplished during this time period:

- Compression methods were researched and **wavelet compression** was selected as the video compression method due to the compression ratio and low error rate.
- A wavelet compression IC was selected, the **ADV212**, by Analog Devices.
- All schematics have been completed including power, video inputs and outputs, compression/decompression circuitry, and host communications.
- The PCB layout has been completed with respect to the schematic. This layout includes test points and zero-ohm resistors for testing and easy rework capabilities.
- A cable was made to interface with the Djehuty™ video controller.
- All components, not already part of Capstone Visual's inventory, have been obtained.
- A complete Bill of Materials with quantities, part numbers, and prices has been submitted to the Company technical director.
- Programmed functions to allow the ADV212 chip to be set correctly in the master/slave configuration.
- Altered the software to enable the video output of the Djehuty™ board to output YCbCr video data which is needed for the ADV212.
- Began set-up of the program to allow the Djehuty™ board to act as a host for the compression system.
- Other various software developments detailed in the project file.

*All of the discussed hardware and software developments along with additional research and materials are available in the Final Report and on a CD. The CD contains all schematics, layout, and software along with other various materials.

-Technical Goals to be Accomplished during Phase II, 2009-2010

Since the final product has not been completed, this project will be continued and completed during the coming academic year. The following goals need to be accomplished for the project to be completed during the F09/S10 academic year:

- First, the PCB layout must be reviewed and immediately sent out to be fabricated. During this time team members working on the hardware should familiarize themselves with all of the schematics and layout.
- Members working on the software aspect should familiarize themselves with all existing code and the Genesis programming environment.
- Software must be completed in order for the Genesis to be used as the host communication device.
- Once the board is made, extensive testing should be done on all circuitry to verify functionality, including: Power supplies, Clock circuitry, I2C communications and Video data lines
- With the completed host communication software, the Genesis must be used to program the registers in the ADV212 to the desired values.
- A test video image should be input into the compression side of the board to test the overall functionality.
- Various testing and debugging will need to be done to get the board completely functional; this may require a new revision of the schematics and a re-spin of the PCB.

Engineering Skills Required in the Phase II Team

This will be composed of: 2 electrical engineers and 1 computer engineer. The computer engineer **must** have extensive knowledge with programming in the C++ language. It will also be helpful to be familiar with video applications, host communication device programming, and master/slave configurations. The computer engineer should be able to program register values in the ADV212 once the Genesis code is completed and understand particular video and data timing. It will also be beneficial to have knowledge of testing and debugging electronics to help with the hardware aspect of the design. The electrical engineers **must** be familiar with testing and debugging electronics. This will require the use of such lab equipment as oscilloscopes, multi-meters, and soldering tools along with being able to understand electronic data sheets. It will also be beneficial for these team members to have knowledge of video electronics. These team members will be responsible for the testing of the design, and must figure out any related electrical complications.

Technical Director: Lewis Collier
LCollier@capstonevisual.com
Capstone Visual Product Development