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EC551 Project

Attempts to implement a camera:

The first camera we tried to use is the OmniVision 7670. To first understand what would be needed to interface the camera with the FPGA, we read a project report which involved interfacing the OV7670 with a Nexys3. After reading what that project team did, we attempted to modify the code on the HamsterWorks wiki (2) and translate it to Verilog from VHDL. This required a frame buffer, and since we were not familiar with using the block RAM on the FPGA, we implemented a small buffer module which, if we had gotten a usable image, would have only been able to fit a small portion of the image.

Just using the code from HamsterWorks translated into Verilog resulted in a blank screen. Suspecting this to be a product of the timing, we changed his overall 50MHz clock to the 100MHz clock provided by the board, and as a result got crazy colors on the screen that went almost dark when the camera was covered. Clearly the camera was feeding some information through. After trying to locate the problem with the image, we suspected it was in the camera configuration; therefore, we changed the camera controller to use the 50MHz clock originally in the HamsterWorks code. This resulted in even crazier colors on the screen that were still very responsive to the camera being covered.

After more research, we decided this was due to the proprietary SCCB connection the camera utilized for configuration. This is because every source we found either had conflicting information about how to use the bus, or stated the users had to play a guessing game to configure it correctly. The documentation from OmniVision wasn't helpful at all. Even the HamsterWorks guy, when we managed to get in contact with him, said we should start playing around with the configuration until we found something that worked.

Not having time to play a guessing game at this point, we decided to switch to Digilent's VModCam (3). We figured this would be a sure bet because example code was provided on Digilent's website that would just need the modification of outputting VGA signals instead of HDMI signals. Unfortunately, after receiving the camera and beginning to look over the example code, we realized the Nexys3 didn't have enough memory to buffer full 640x480 frames.

Our next option was to switch to the Atlys board, and we had one in our possession, but when we looked at it we realized there weren't enough PMod ports to do the rest of our project. Checking the Nexys4 and the ZedBoard revealed plenty of memory and PMod ports, but no VMod port for the camera. At this point we gave up.

References:

(1) Camera Controller Final Report. Einar Vading, Alexander Nässlander, Carl Cristian Arlock. June 1, 2013.
http://fileadmin.cs.lth.se/cs/Education/EDA385/HT13/projects/CameraController/final_report.pdf

(2) OV7670 Camera. HamsterWorks wiki. Mike Field. June 28, 2013.
http://hamsterworks.co.nz/mediawiki/index.php/OV7670_camera

(3) VModCam. Digilent.
https://www.digilentinc.com/Products/Detail.cfm?NavPath=2,648,931&Prod=VMOD-CAM