

Juan Barroso
Abelardo Gutierrez
Embedded Systems Design

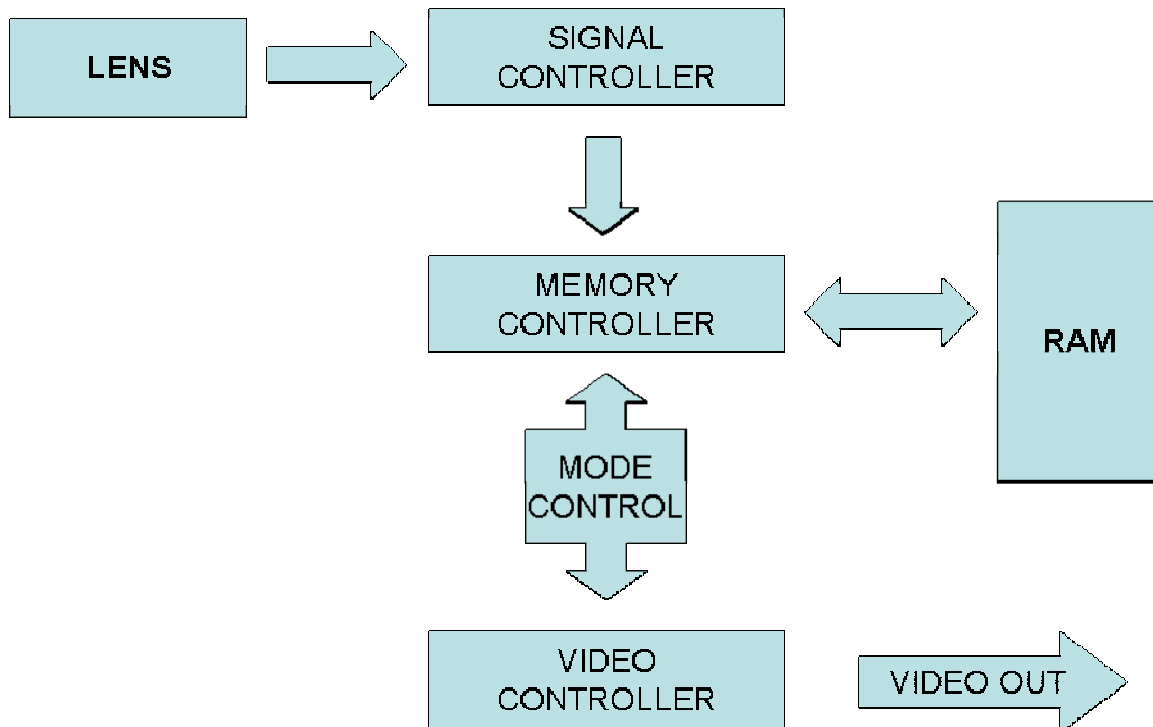
Digital Camera

Introduction:

Given an FPGA and a 1.3 mega pixel lens, the project is to convert these items into a digital camera that outputs the image to a monitor. Also, there are constraints placed on the project due to the materials themselves. The image will have to be configured to fit the monitor in such a manner that it is displayed properly. This involves C code on top of the hardware to resize and clear up the image (as it is not very clear on an initial connection).

Typical digital cameras use some form of external memory to store the image, i.e. memory stick, miniSD card, etc. For this purpose, we will be using the on board RAM as a storage location for a given amount of photographs. This requires that the image be resized correctly so that they will fit into the RAM.

Hardware Design:



This is a diagram of the hardware design. As shown, the lens will be connected to the FPGA via an IDE cable. Lens will transfer the image of the lens to a signal controller. Signal controller will handle image resizing/color conversion. This signal will then be

transferred to the memory controller, which has two outputs and two inputs. The memory controller, given the state from mode control, will either read the information from the signal controller or the ram. If the camera is in a state where it is going to take an image, it will read from the signal controller, display the image to be stored on the monitor, and, provided the user pressed a button to take a shot, the memory controller will then send that image to the RAM for storage. If the camera is set to display what is in storage, then the memory controller will read the information from the RAM and display the image in the current RAM location to the monitor. The user will then be given the opportunity to cycle through the RAM with the press of a button to display all the images they have taken.

The state of the camera, whether it was picture or memory state, will be controlled by a switch on the FPGA. Also, the digital camera will have 4 buttons for use: one will control the camera mode e.g. picture/memory mode, one will take the shot, given the camera is in the picture state, and the other two, given that the camera is in the memory state, will cycle backwards and forwards through the memory to display all the images.

Software:

As stated earlier, the digital camera will also be required to have C code to serve two main purposes: signal processing and memory management. For signal processing, the image will naturally be saturated with white lines and other ambiguities, i.e. a lot of noise. The C code will have to read in the image and begin removing as much of the ambiguities as possible, so that the image is clear for the user to see. Once this image is clear on the display, the user will press the button and then the memory management code will take affect. This part of the code will have to take the given image and resize the image before it can then be stored on the FPGA's RAM.