Picture in Picture
6.111 Final Project
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Project Overview

- Display two live video feeds on the screen at the same time.
- Perform some manipulation of one of the feeds.
- Converting from NTSC to VGA
- Using lots of RAM and needs way to manage communication
**Project Overview (continued)**

- **Source 1**
- **Source 2**

- Rescaling
- Translation
- Rotation
- Integration
Stage 1: Digitizing Video

- User controls choice of front and back signals
- Frame size is 320x240 = 6MHz
- Sync signals from GS4981 indicates sample start point
Stage 1: RAM management

- Passing frames (RAM) between stages
- Parallel processing leads to 28 RAMs
- Limited output pins on FPGA
- Need to manage handoffs transparent to the other stages
Stage 2: Digital Processing

- Read pixels from sample storage RAM
- CG Transforms can be split up into two 1-D problems
  - Perform a Vertical Transform on the frame columns (scaling, translation offset)
  - Store result in an intermediate RAM
  - Perform a Horizontal Transform on the frame rows
  - Store result in a final output RAM
Stage 2: Digital Processing

Diagram:
- **Stage 2**
- **Digital Processing**
- **Coeffs**
- **Trans_op**
- **Coeffs**
- **Param_val**
- **Counter**
- **Write_address**
- **Read_address**
- **Conversion**
- **Interchange**
- **Average**
- **Intermediate RAMs**
- **ADC Samples**
- **RAM Q**
- **Vertical Transform**
Stage 3: Output to VGA

- Combine two video feeds into one video stream
- Search foreground for blanking signal
- Generate sync signals for VGA monitor
Stage 3: Handling User Input

- User can control foreground image by pushing buttons and toggling switches
  - Scale
  - Angle
  - Movement
- Appropriate response for holding of button