Wireless Security System

Noel Campbell
Vivek Shah
Raymond Tong

TA: Javier Castro
Video Surveillance Block Diagram

- Video Camera
- Video Capture
- Memory Matrix
- Video Encoder
- Memory (80x900)
- Wireless Transmitter
- VGA Monitor
- Video Display
- Memory
- Video Decoder
- Memory (Shift Register)
- Wireless Receiver

Lab Kit #1

Lab Kit #2

Ray Tong

Vivek Shah

Noel Campbell
Video Capture Overview

- Camera
  - Composite In
  - ADV7185
    - Clock_27MHz
  - NTSC Decoder
    - tv_clock
    - tv_in_ycrcb [19:0]
  - Async FIFO
    - ycrcb [29:0]
  - Memory Controller
    - Y isolator
      - Y [7:0]
    - X
    - ADDR
  - Dual-Port Block Memory
    - WE
    - writing_memory
  - YCrCb to RGB Converter
    - RGB
    - Z
  - Display
    - Syncing and blanking signals
  - VGA Controller
    - Async FIFO
    - RGB
Technical Considerations

- Synchronization of data
  - ADV7185 clock vs lab kit 27 MHz clock

- Displaying data in VGA
  - Acquire 240 x 240 real time video
    - Write data to block memory then continuously read from it

- Memory Controller
  - Write a frame worth of data into block memory for encoding and transmission
Video Compression

512 bits/block

Discrete Cosine Transform

56 bits/block

Inverse Discrete Cosine Transform
Video Encoder

Diagram showing the flow of data and control signals in a video encoder, including dual port block memories, DCT coefficients, multipliers, adders, finite state machine, and encoding line signals.
Wireless Transmission

- Data is sent serially from the labkit to the wireless kit.
- Data is assembled into packets and sent from camera-end to fixed-end via CC2420 radio.
- Data is then sent serially from receiver wireless kit to the receiver labkit.
Transmitter

from encoder

80 x 900 Dual Port BRAM

Transmitter Control Unit

Shift Register

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RS232 Sender

serial cable
to receiver

Radio Transmitter

FPGA

microcontroller

from encoder
Receiver

from transmitter

Radio Receiver

serial cable

Transmitter Control Unit

RS232 Receiver → Shift Register

80 x 900 Dual Port BRAM

to decoder

microcontroller

FPGA
Video Decoder

Diagram of Video Decoder with various blocks and connections.
Video Display Overview

* Only chrominance (Y) is important if displaying grayscale image