

Simple Digital Camera with Image Editor

Group 3

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Functionality

- A simple digital camera implementation
 - Colour/grayscale image
 - Switch, button user control
 - VGA screen display
- Image processing operations
 - Colour filters
 - Adjust brightness
 - Edge detection
 - Image rotation/reflection

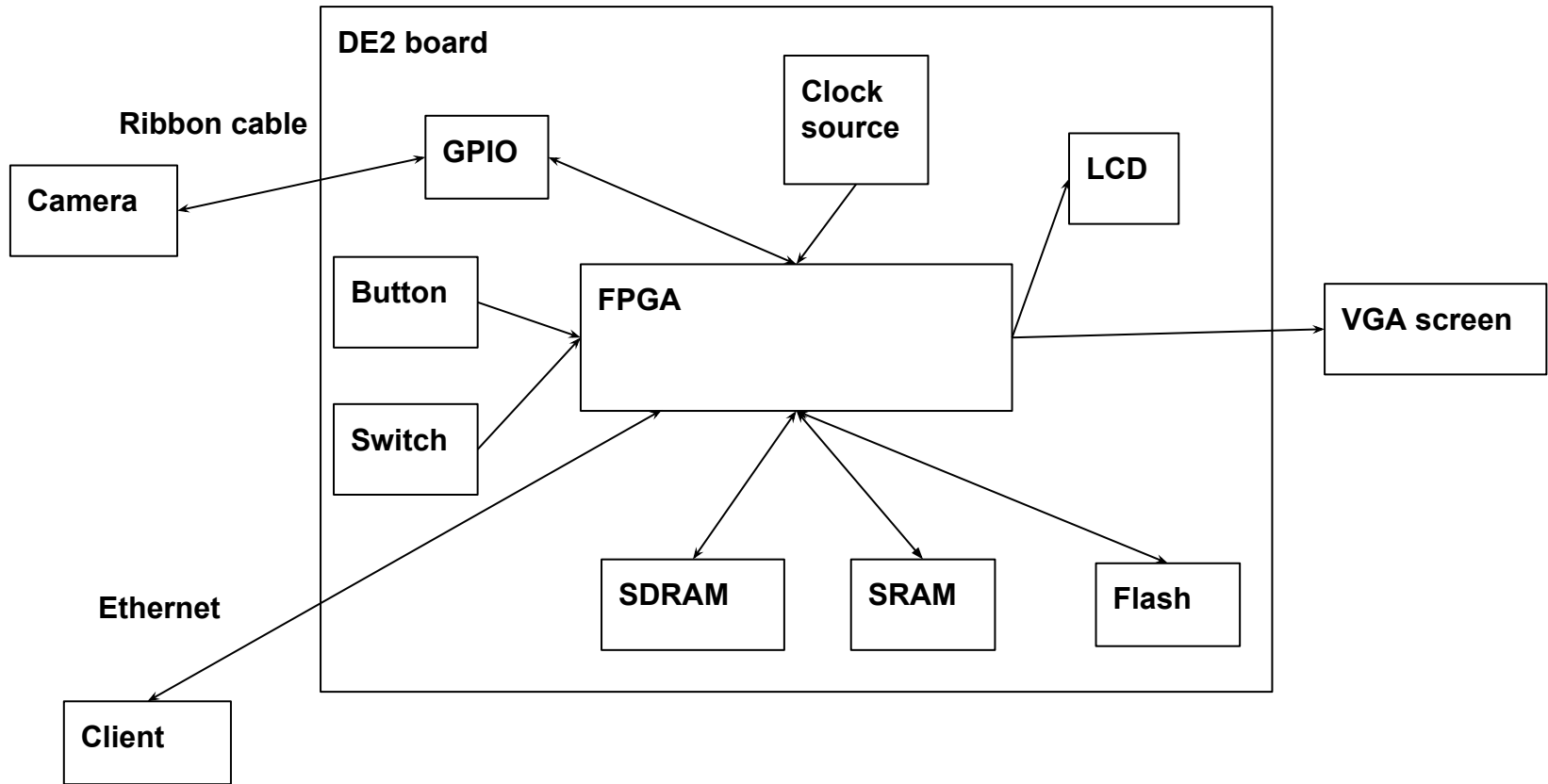
Functionality

- Web based editor mode
 - Server on DE2 board
 - Client on web browser
 - Transfer image via Ethernet
 - Better user interface
 - More detailed editor options

Motivation

- Image quality of smartphones not comparable to high-end cameras
- Limited editing options
- Exploit the hardware capability

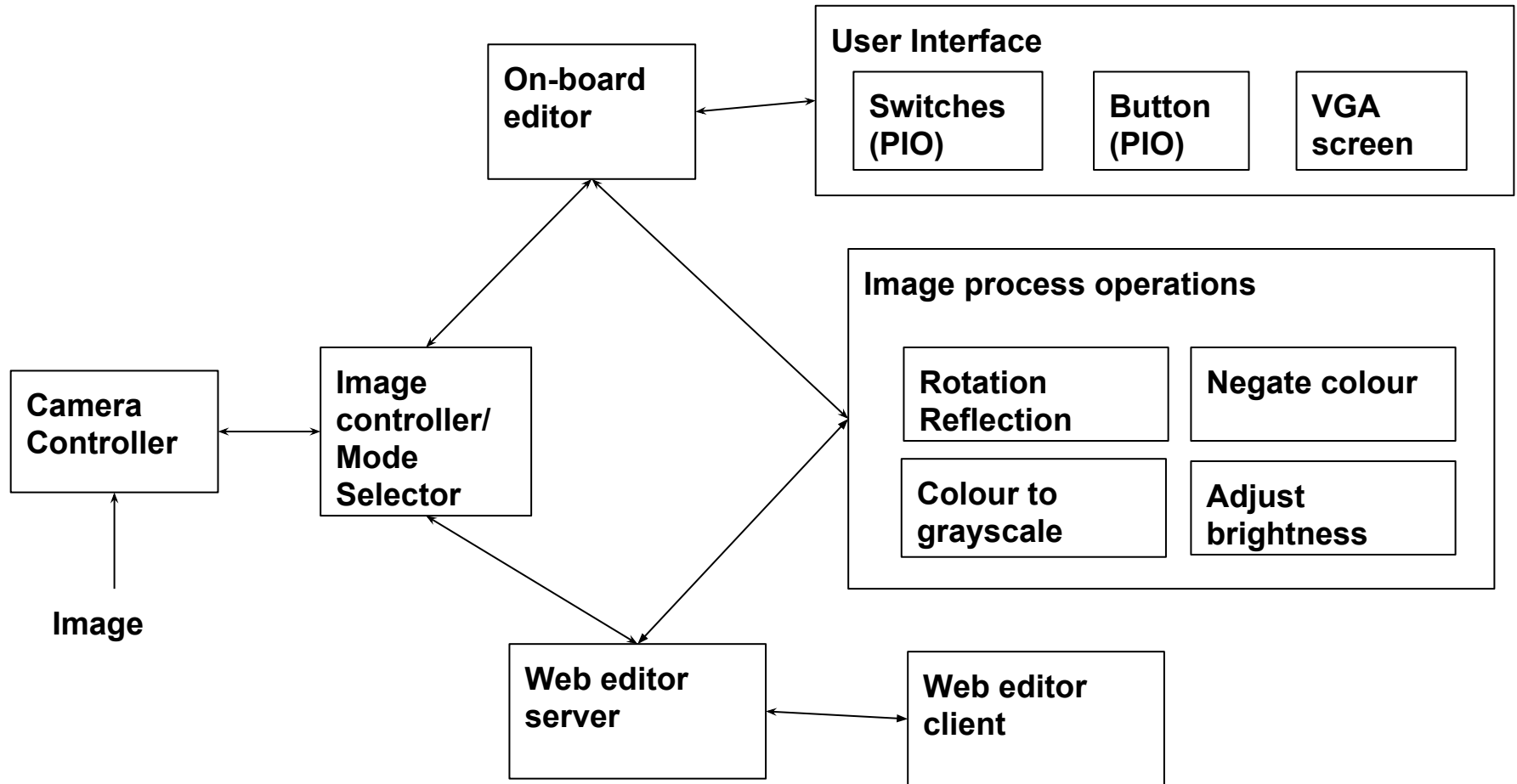
Hardware Design



FPGA Components

- On-board/off-board hardware controllers
- Memory controllers
- Image operation hardware accelerators in FPGA
 - Colour filters and brightness adjustment
 - Colour to grayscale conversion and edge detection
 - Image rotation/reflection

Software Design



Challenges

- Interfacing serial UART camera
- Displaying graphics on VGA monitor
- Manipulating of pixel information of different image formats
- Increasing processing speed, image transfer speed

Test Plan

- Unit Testing

- Verify UART connection
- Transfer images taken from camera to DE2 board
- Test image operation algorithm
- Display images to VGA monitor
- Interface between web server and client

- Integration Testing

- Display modified images to VGA monitor
- Display modified images to website

Code Example and App Note

```
int sw = OSQPend(SWQ, 0, &err);
if (sw == SW_WRITE) {
    alt_up_rs232_disable_read_interrupt(rs232_dev);

    if (enter == 0) {
        data_W8 = 'A';
        enter = 1;
    } else if (enter == 1) {
        data_W8 = '\n';
        enter = 0;
    }
    write_FIFO_space = alt_up_rs232_get_available_space_in_write_FIFO(
        rs232_dev);
    if (write_FIFO_space >= WRITE_FIFO_EMPTY) {
        alt_up_rs232_write_data(rs232_dev, data_W8);
        alt_printf("write %c to RS232 UART\n", data_W8);
    }
    OSTimeDlyHMSM(0, 0, 1, 0);
    alt_up_rs232_enable_read_interrupt(rs232_dev);
}
```

Optional Features to Add

- More editor functions
 - Noise deduction
 - More interesting filters
- Choose resolution and output format of camera
- On-board editor GUI

Question?