15-213: Introduction to Computer Systems
Written Assignment 9

This written homework covers Exceptional Control Flow.

Directions

Complete the question(s) on the following pages with single paragraph answers. These questions are not meant to be particularly long! Once you are done, submit this assignment on Canvas.

Below is an example question and answer.

Q: Please describe benefits of two's-complement signed integers versus other approaches.

A: Other representations of signed integers (ones-complement and sign-and-magnitude) have two representations of zero (+0 and -0), which makes testing for a zero result more difficult. Also, addition and subtraction of two's complement signed numbers are done exactly the same as addition and subtraction of unsigned numbers (with wraparound on overflow), which means a CPU can use the same hardware and machine instructions for both.

Grading

Each assignment will be graded in two parts:

1. Does this work indicate any effort? (e.g. it's not copied from a homework for another class or from the book)
2. Three peers will provide short, constructive feedback.

Due Date

This assignment is due on April 5, 2023 by 11:59pm Pittsburgh time (currently UTC-4). Remember to convert this time to the timezone you currently reside in.

Question 1

What is an exception? How does it relate to you as the programmer when designing your programs? Explain 1 case where you are responsible for an exception, and 1 case where you are not responsible for an exception.

An exception is a transfer of control to the OS kernel in response to some event. (Definition taken from lecture slides Exceptional Control Flow: Exceptions and Processes page 10).

It is related to us as the programmer because we may cause it to happen (intentionally or unintentionally), and it either aborts our program or continues it.

Exceptions come in different forms: asynchronous and synchronous. In asynchronous cases, the programmer may hit ctrl-c and that would be an interrupt, or a timer interrupt which may come from an external chip timer. In a synchronous case, a programmer may write some faulty code (example: division by 0 which would result in an abort), or set a trap (gdb breakpoint).

Question 2

```
int main()
{
        if(fork())
        {
                printf("513");
                waitpid(-1,NULL,0);
        }
        else
        {
                printf("is");
                exit(0);
        }
        printf("good");
        exit(0);
}
```

Assume that all system calls succeed and error checking has been omitted.
What are all the possible output sequences?

513isgood
Is513good