CS220 Computer Architecture
Digital Logic Design
Practical 9

The TkGate Logic Simulator under Linux is used to implement these practicals. Boot Linux, log in and launch the TkGate application.

In this practical, you must implement a simple arithmetic unit using some of the ALU components provided in the simulator library. Your circuit will be marked before the end of the session.

The arithmetic unit is to take two 8-bit operands and is to generate the result of a selected operation on those operands. The operands can be provided by two 8-bit dip switch components.

The operations to be provided by the arithmetic unit are addition, subtraction, multiplication and division. The desired operations are to be chosen by setting another dip switch component to have values between 0 and 3, one value designating each arithmetic operation.

The outputs of the four arithmetic operation components can be routed into four to one line multiplexers and displayed on a hexadecimal display. The function select dip switch will act as the select inputs to these multiplexers.

Notes:
An addition operation of two eight-bit operands may generate a carry into a ninth bit position.
Subtraction can be done using two's complement arithmetic.
Multiplication may generate a 16-bit result. (Assume positive operands)
Division generates two 8-bit results, a quotient and a remainder. (Assume positive operands)

When the simulation is running, you can alter the value of dip switches by double clicking on them and entering a value encoded in hexadecimal.

A possible design is given overleaf to assist you. You are required to implement the circuit (or your own variation of it) and Using phone/camera to reecord an 1 to 3 minutes video(720p or 1080p) to demonstrate its operation on a sample set of operands (2 of each operation) and upload on Moodle.

Operand A

fe

Operand B

ff

Subtract

V_{dd}

+ •

+ •

×

÷

8

Function

0

0

GND 1:7

0

ON
OFF

7

8

8

7:1

0

7:1

0

8

15:8
7:0

8

16

16

8

8

0   3

2   0   3

8

8

8

88

16

88

16