

Project Proposal

Idea:

Create a basic arithmetic calculator that takes inputs from a selection of switches and gives the outputs to an LCD Display. The user will be able to add, multiply, subtract, and divide numbers, as well as clear and backspace their input.

Peripherals:

1. 17 Switches (Digits 0-9, +, -, /, *, clear, backspace, enter)
2. 2x16 LCD Display

Software Design:

The software for communicating with the buttons is quite simple. Since there are so many we will have to use multiplexing to take inputs. This means we will only need about 5 pins for input to the multiplexer and about 4 pins to scan the individual lines. Interfacing with the LCD display is slightly more complicated. The LCD display we are using is the HD44780, which takes approximately 11 inputs (R/W, RS, D0-D9, E) to interface with. This means in total we will need to use approximately 20 GPIO pins (well below the 42 GPIO pins on the 1115). There is also timing and sequencing demands for the display. These should be easily met though as they are quite lenient. Most of the software code is responsible for parsing the input and creating the correct output. For this, we will first tokenize our input with a finite state machine. This should be quite trivial for the most part. We will use the shunting yard method for turning our tokenized input into an abstract syntax tree. From here, we can simply recursively work our way down the tree and turn the input into an output and convert into what is readable by the display.

Goals:

1. Calculate very basic expressions
2. Show the user their input in real time on the display
3. Show the user their output on the display
4. Allow users to modify their expression with clear and backspace

Group Responsibilities:

Steven's Responsibilities:

1. Interface with LCD display
2. Create multiplexing for buttons

Colin's Responsibilities:

1. Create the parser

Groups Responsibilities:

1. Assemble physical part of project