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Final Project Report

Overview

This project is the compilation of functions used to convert from one number system to another. The number systems used are decimal, binary, hexadecimal, and IEEE 32-bit floating point numbers. Functions are categorized by the starting input number system and the output ending number system. These functions are also named accordingly. For example, the function "dec2bin" takes in an input decimal number and outputs the corresponding binary number. In addition to the code structure listed above, helper functions are also used to create a smoother implementation.

Decimal Functions

The first functions present in the code are the "dec2bin" and "bin2dec" functions. The dec2bin function takes in a signed integer and outputs a binary string. This binary string is the conversion from the inputted decimal value to binary. The bin2dec function takes in a signed binary string and outputs the converted number in signed decimal as an integer. To complete both of these functions using signed values, a helped function "twosComplement" is used. This function takes in a binary string and completes both One's Complement and Two's Complement before outputting the modified string.

Hexadecimal Functions

The next 4 functions are "dec2hex", "hex2dec", "bin2hex", and "hex2bin. Function dec2hex takes in a signed decimal number as an integer and outputs a signed hexadecimal number as a string. Function hex2dec takes in a signed hex number as a string and outputs a signed decimal number as an integer. Function bin2hex takes in a signed binary string and outputs a signed hexadecimal string. Function hex2bin does the opposite, taking in a signed hex string and outputting a signed binary string. The binary functions complete their respective tasks by segmenting the binary string into chunks of 4 digits and then converting these chunks to hex.

Float Functions

The final 3 functions for implementation are "dec2float", "bin2float", and "float2dec". The dec2float function takes in a signed decimal number and coverts it to its 32-bit signed binary representation. The bin2float function takes in a signed binary number and coverts it to its 32-bit signed binary representation. Lastly, the float2dec function takes in a signed 32-bit floating number and coverts it to a signed decimal representation. Note that the float functions work with non-integer numbers up to a certain degree. As there are only 8 bits to represent an exponent in floating point numbers, some output floating point numbers will be very close approximations, but not exact.

Testing

To prove proper implementation of the previously mentioned methods, a text file with a line for each function is provided. Each line contains a vector of 20 possible test cases. These cases range from

common uses to edge testing. The "try_case" method is called with specific parameters for each line in the test file. These parameters vary based on which function is being tested.