CIS554 HW6 Report

Circuit Class

input_length

This variable is used to store the length of circuit input, in order to compare with other circuits.

output_length

This variable is used to store the length of circuit output, in order to compare with other circuits.

data (vector<shared_ptr<pair<vector<int>, vector<int>>>>)

This variable is used to store the truth table of the circuit.
The truth table is saved in this form by storing the input part of each truth table row into the first vector of the pair, and storing the output part of each truth table row into the second vector of the pair. Therefore, each pair represents a row of the truth table.

Hash Function

Implementation

The hash function works by hashing the sum of all the digits in circuit's output.

Design

The reason I only hashing the sum of output part of the circuit is that the sum of input part is fixed. The input part of a circuit's truth table is a full mutation combination, thus the sum of all its digits won't change.

Equal_to Function

Implementation

The equal_to function works in three steps.
- Check whether the two input circuits have the same length of input and output. return false if not.
- Sum up each row and column of the circuit truth table's output part, record the number of times each sum total occurs, then check whether two circuits have the same distribution of row sum and column sum. return false if not.

- Sum up each entire row of the circuit truth table, record the number of times each sum total occurs, then check whether two circuits have the same distribution of row sum. return false if not

Design

After experiencing several ways to encode circuits, I decided to use the distribution of row sum and column sum to distinguish circuits as this is the most solid method I figured out.

Database (unordered_map<Circuit, vector<string>, myHashEqualClass, myHashEqualClass>)

Implementation

My database is an unordered_map with circuit object as key and its truth table as value. The truth table is stored in the form of a vector, and each element of the vector is a string representing a row of the truth table. The hash function and 'equal_to' function are wrote inside myHashEqualClass class.

myFind

Implementation

This function is implemented in the similar way with the 'equal_to' function. I basically record the 'equal _to' function in the operator '==' overloading for the circuit class. Then I iterate through the DB using '==' to check whether the specific circuit exists in the DB.

Declaration

I did not discuss with other people regarding how to solve the problem for HW6.