IMPROVED LIGHT HASHING ALGORITHM FOR MURPHI MODEL CHECKER

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In model checking tools, high performance hash functions are one of the important components. The model checking process can generate an exponential number of states (exponential in the size of the model being verified). Each of these states will be hashed before insertion into the hash table. Without a highly performant hash function, the cost of hashing each state becomes prohibitive. With the help of an appropriate hash function, the verification process will become more tractable.

A recent hashing method called Light Hashing was invented by Dr. Freedman. It is an algorithm that takes a bit-string and hashes into a hash-table index with very low computational overhead. When using a light hashing algorithm in the Murphi model checker, there is a problem with light hashing, in particular multiple distinct states hash to the same hash value. This high probability of collisions during model checking process results in state omissions. This state omission can lead to unacceptable results in the model checking process. To address the state omission problem in light hashing algorithm, I propose an improved light hashing algorithm, which uses a bit-wise exclusive-or and bit shifting operation to reduce the probability of a collision when computing the hash value for each state in a model checking process.