Switching Optimisation in Huffman Code for Power  
Efficient Data Transmission

**Abstract**

Reliability of low powered devices is highly dependent on their power efficiency. In digital communication, a significant amount of power is dissipated in data transmission. Different technologies have been emerged to address the issues of power consumption. In CMOS technology, dynamic power accounts for 70%-90% of the total power dissipation and it depends on the representation of the data and increases linearly with switching activities (transition from logic level High to Low and vice versa). Therefore, an efficient representation of data can minimise power consumption by reducing switching activities. In this paper, we have extended the Huffman code, a widely used data compression technique, by using genetic algorithm to reduce switching activities in the transmitted message. The main objective of the proposed approach is to minimise the switching activities inside the codeword of each symbol as well as the switching activities between each pair of symbols. The approach starts its operation by generating an initial population, a set of Huffman trees, for all the input symbols. Afterwards, the genetic operators such as selection, crossover and mutation are applied to the initial population to improve the quality of the solutions. The performance of the approach is evaluated by applying it to a set of real biological datasets. The experiments yield that the proposed approach reduces the switching activity by 45.47% in the best case, by 36.33% in the average case and by 16.42% in the worst case.