Karnaugh map

Technology, Information Technology

Karnaugh Map and Grey s Karnaugh map provides a method for simplifying the Boolean algebraic equations. The map reduces the necessity of extensive calculations by exploiting human ability to recognize patterns. This permits rapid elimination and identification of possible race conditions. In the Karnaugh map, the input variables combine in 16 dissimilar ways, so the map has 16 positions arranged in a four by four grid. The dual digits in the map signify output functions for any combination of inputs. Therefore, the number (0) appears in the left corner of the map. As a result, function (f) = (0) when positions (A, B, C and D) have (0) value. In addition, the bottom right is marked (10) because positions A= 1, B= 0, C= 1 and D= 0, giving (f) a value of 10. After the construction, of the Karnaugh map, the minimum terms used in the final expression are sought. They are reached by circling groups of (1) in the map. These groups should be rectangular and have an area with a power of a prime numbers (Saxena, & Arora, 2009).

Karnaugh maps help in detection and elimination of race hazards, which become easy to detect using the Karnaugh map. A race condition exists when moving between adjacent pairs. For instance, when (C) = 1 and (D) = 0 in the map, (A) = 1 and (B) changes to 0. As a result, the output does not change, but potential for a glitch exists. Minimum logical functions have crucial applications in designing logical circuits. Finding the minimum logical function is solved by using different methods, most of which are not suitable for computer implementation. Laws of Boolean algebra simplified by the Karnaugh map have a wide application in minimization of the logical functions. The map represents an efficient tool for minimizing logical functions with less than six variables (Seda, 2008).

The Gray Code or the reflected binary code represents a binary numbering system in which two consecutive values vary in only a single bit. This code is non-weighted. The invention of the code served to prevent spurious electromechanical switches output. Currently the Gray Codes have a wide application in facilitation of error collection and digital communication. In the Gray code numbering system, the device utilizes natural binary codes. In this case, the positions may be close to one another. Disadvantages of the gray code lie with the real switches, which do not change state in synchrony. Transitions between the two states are preceded by a change in all the switches. As the switch change, at one point, they read a spurious position. The Gray Code numbering system assigns a bordering set of integers to members in a circular list. This means that the adjacent codes differ by a single symbol (Seda, 2008).

In Karnaugh maps, gray codes label the axes. In the map, the principles of the Gray Code apply in transferring and ordering Boolean variables. The Gray Codes facilitate the changing of one variable between adjacent squares. The Gray Code also facilitates the generation of the table and transcription of the outputs. In the Karnaugh map, the values are planned, in a Gray Code, to facilitate the changing of a single variable between the adjacent cells (Saxena, & Arora, 2009).

Digital circuits utilize digital gates in their construction. When designing the digital circuits, minimization of the gates is a crucial activity that reduces the cost and size of the system, improving its performance. Established methods exist for this minimization, but the Karnaugh map represents the best method. The Karnaugh map and its relationship with the Gray Codes provide an efficient means for minimizing the digital circuits (Markovic, & Oklobzija, 2002).

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