STUDY OF LOGICAL OPERATIONS IN VECTORS OF A CIRCUIT OF HYPERCUBE

Sandeep Shukla, Sunil Tiwari, Rakesh Kumar Katare

Department of Computer Science A.P.S. University, Rewa M.P. India

Abstract: Parallel structure and switching circuit have become a fundamental theme in the concern of Artificial Intelligence and interconnection network and also it is revealed to be critical when researching in high performance. This Study helps to the process of breaking down larger process into normal form and independent secondary module, which helps to perform operations with various properties such as atomicity, consistency; isolation and switching features. They also help for manage and tune processing during faults in architecture, the results of which are combined upon completion as part of an overall algorithm. In this paper firstly we select the independent small module of hypercube then represent into data structure and apply logical operations into vectors.

Keyword: Logical operations, Circuit analysis, Hypercube, Interconnection Network, Artificial Intelligence, parallel Computing

INTRODUCTION

In this chapter we studied the hyper cube – A special type of Interconnection Network. HC provide a wonderful opportunity for application with large computational requirements. Effective use of this interconnection network, though requires a keen understanding of topological properties of hypercube and how the connected and communicated. A hypercube is an n-dimensional analogue of a square (n = 2) and a cube (n = 3). It is a closed, compact, convex figure whose 1-skeleton consists of groups of opposite parallel line segments aligned in each of the space's dimensions, perpendicular to each other and of the same length [1].

In this paper we study the hypercube structural design from the circuit analysis and we regard those features which construct the hypercube architecture so efficient. Among other things, we propose a structural association of the hypercube as a circuit and show how to map various other architectures into a hypercube. A few machines based on the hypercube topology have been implemented by several groups. Of special interest are those relations and operations that are shows structural association finding or deriving relations after applying logical operations among processor is of great practical importance, and so is the problem of finding a smallest independent module in a interconnection[2]. Other topological properties of hypercube, such as degree, diameter, rank,nullity, many fold, chordal circuit etc… we are also studied and applied in structural during this work. The main purpose of this paper is to elaborate small independent module of hyper cube and find some structural relationship in same. These concepts such as circuit, logical operations and relations deals mainly with the nature of connectivity and communication pattern in architecture. The Connectivity matrix, which is local property of each module or circuit, will be shown to be related to the more global properties of the interconnection Network[3,5].

This paper dealt with a particular type of interconnection network called a Hypercube. Because of their wide applications, circuit form the most important topic in parallel computing and AI application. Different type of logical operations such as V, ^, implication, biimplication, CNF, DNF, WFF were used, together with their properties and application or concept.

Most of the content / concept in this paper is based on the classic work of Rakesh Kumar Katare in the early 2000[4,5].

IN 2015 Tiwari and et. El., showed that the connectivity matrix of a circuit graph was related to the number of vectors and communication path between two nodes of architecture [5].Many Variation of structural relationship have appeared. Tiwari et al. gives an excellent survey of Interconnection Network and shows how the nodes associated with interconnection network are connect and communicate and represent in different lemma possible [6,8].

VECTOR ANALYSIS

The last few decades have witnessed an upsurge of parallel computing and Artificial Intelligence [7,8]. Unprecedented growth in the research work being published in the related field. From 2000 there are many groups works consistently in the field of AI and Parallel computing. Now around 23 years more than 2000 research papers/articles or books are available. The switching devices used in digital system are generally two state devices, so it is natural to use binary number in system logics and other building blocks are used to design circuit and logical operations elaborate how to interconnect the building block to connect the input to the desired output. This paper elaborates relationship between input and output with mathematical model using polynomial expression[9,10]. This paper is concerned with parallel computing for solving large problem on parallel environment. During Research first we select Hypercube because of its awesome topological properties and application.

Robustness, minimum and constant degree & diameter [11, 12, 13], quad structure of circuit is main appealing feature for the study. Then select the front face circuit of hypercube.
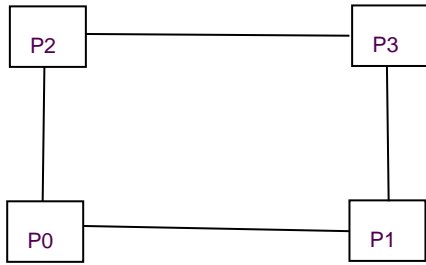
Figure1:Front face Circuit of Hypercube

Following steps are used to form above circuit:

- Choose p0(0000) as initial node and begin to find circuit.
- Select a link e1 which is leaving initial node, provided deleting that edge will not separate the model into two disconnected set of links.
- Add the link to circuit.
- Continue until circuit is formed.

Now we convert circuit into connectivity matrix. Every row of its matrix is regard as vector, because of its topological mathematical properties [12,13].

Lemma1: Pi implication Pj in vectors of connection matrix of hypercube circuit, the Pj vector consider as output.

Proof:

Let us consider the one circuit of hypercube with four processors P0, P1, P2, P3 and four Communication links (e1, e2, e3, e3). Our basic assumption is every processor is reachable to self and the topological properties, rank, nullity is remain unchanged in circuit. The communication link of hypercube is considered as bidirectional; therefore all links of circuit is also bidirectional. Above circuit is a linear combination of hypercube.

The connection matrix of circuit is shown as:

	P0	P1	P2	P3
P0	1	1	1	0
P1	1	1	0	1
P2	1	0	1	1
P3	0	1	1	1

Table 1: connection matrix of Circuit

Above table is two-dimensional plane of circuit in which row is represented by an ordered pair of value X. X can regarded as a vector. Emanating from 1110 to the P0. Similarly p1(1101),P2(1011), P3(0111).

Now, apply Logical operations between vectors of connection matrix of circuit.

(P0,P1)		Result(->)
1	1	1
1	1	1
1	0	0
0	1	1

(P0,P2)		Result(->)
1	1	1
1	0	0
1	1	1
0	1	1

(P0,P3)		Result(->)
1	0	0
1	1	1
1	1	1
0	1	1

(P1,P0)		Result(->)
1	1	1
1	1	1
0	1	1
1	0	0

(P1,P2)		Result(->)
1	1	1
1	0	0
0	1	1
1	1	1

Every vector is representing in four bit because of size of circuit. The degree of each node is three including self loop. Implication operation is consider as logical operation in above manipulation. Firstly p0 is considered as antecedent and all other reachable node of circuit is considered as consequent gradually. Then take p1 as antecedent and so on. In all cases we found the result is same as consequent term.

Hence prove consequent is regard as output and then is as identity value.

CONCLUSION

In this paper we elaborate one circuit of Hypercube. This investigation provide useful communication pattern in the design of new fault-tolerant, high speed switching networks.

The efforts have been made to found the involvement of links and nodes within the circuits of Hypercube. The robustness of architecture has been seen by calculating the node involvement in the circuits within Hypercube. Our main concern in this paper was with answering the various question about a hypercube. Which part of a separate model, when removed, breaks the hypercube apart? Find independent part of HC? Clearly, the answer to this question does specify a circuit in many aspect. In pursuit of the answer to the above question, we came across the concept of interconnection network,circuit, wff, cnf, chordol HC, CSP, connectivity and so on. We also derived some relationship which is representing in the form of lemma.

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