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COMPUTER SCIENCE (COM)

COM 200301 BARTOLOME, Jose Ronello T. (MS Computer Science) A Poly Algorithm for Computing Resultants. 2003

It is well known that resultant computations are very important in computer algebra systems because of their contribution as essential tools to many applications. The resultant of two polynomials is a form in the coefficients of the same polynomials whose vanishing is a necessary and sufficient condition for these two polynomials to have common zeros. Several methods exist for computing the resultant of two multivariate polynomials with integer coefficients which includes Bezout's method and Collins' modular method. However no method exists for automatically choosing which resultant algorithm would give the best performance wit respect to actual computing time. This study describes a polyalgorithm for computing the resultant of two multivariate polynomials, that chooses the better method given a specified pair of polynomial inputs by inspecting the properties of the polynomials. These properties are the degree, the number of variables, the integer coefficient lengths, and the sparsity. Results revealed that the polyalgorithm is consistent enough in choosing the faster method.

COM 200002 BASA, Tristan M. (MS Computer Science) Recognition of Static Hand Gestures Using Support Vector Machines. 2000

Support Vector Machines (SVM) are a class of new learning algorithms that is currently gaining widespread attention in the field of machine learning and computer vision. Recent researches have concluded that SVM have significantly better performance in applications mostly dominated by other learning techniques.

In this paper, we investigate the performance of SVMs in the recognition of hand gestures, particularly that of static gestures of the American Sign Language. Experimental results show that the biggest factor affecting the performance of an appearance-based hand gesture recognition system using SVM without complicated feature extraction is the training method. For high recognition accuracies an enrollment system is suggested. We also examined the effects of image size, type of kernel used, and classification scheme on recognition accuracy, training speed, and recognition speed.

COM 199903 HO, Bae Il (MS Computer Science)
A Study on the Use of Neural Network and Fuzzy Logic for ATM Traffic Control. 1999

Nowadays, ATM is beginning to play as an important backbone in integrated network environments like B-ISDN. It supports various kinds of data such as ordinary data, image data and voice data. Forthcoming network environments will also have to support yet unknown services because our fast-changing information society demands such network environment and services. These new network environments require a different kind of traffic control mechanism in order to keep pace with the highly dynamic and complex nature of the data produced by the widely different services. The objective of controlling traffic in a network is changing from just aiming for better performance to striking a balance between performance and Quality of Service (QoS). Therefore, new approaches such as those using Neural Network or Fuzzy Logic are intensively being studied in this field. Studies are beginning to show that approaches employing Neural Network and Fuzzy Logic are promising compared to traditional models.

In this paper, we tried to assess the promise of combining Neural Network and Fuzzy Logic for ATM traffic control. We combined flexible and knowledge-based control of Fuzzy Logic and learning and generalization capabilities of the Neural Network. To examine the performance of this combined model, we compared the results of three

other models: the typical Two-Threshold ATM Model, Fuzzy Logic Model, Neurofuzzy with One-Time Learning ATM Model and Neurofuzzy with Continuous Learning ATM model. Within the range of our experiments, the Neurofuzzy with Continuous Learning ATM Model showed around 1% improvement compared to pure Neural Network and Fuzzy Logic ATM Models.

COM 200104 HO, Hans Riyono (MS Computer Science)
Routing and Sorting on the Graph *G(n,k)* of the Johnson Scheme. 2001

The graph *G(n,k)* of the Johnson Scheme which is also known as the "Slice of the Cube" is the undirected graph where the vertices are all the *k*-subsets of the fixed *n*-set. Two vertices *A* and *B* are adjacent if and only if $|A \cap B| = k - 1$.

This graph has been studied extensively and some properties have been found such as the hamiltonicity, diameter, connectivity and wide-diameter of the graph.

In this thesis, we shall determine some more properties besides proving the hamiltonicity of the graph *G(n,k)* in another way. We construct algorithms to determine the complexity of one-to-one permutations routing, gossiping, and sorting on the graph. The complexity we get are $O(nk^2)$, $O(min(k,n-k))$ and $O(N)$, respectively, where N is the number of vertices.

COM 200105 ORCULLO, Gemi P. (MS Computer Science)
A Stream Function Approach to Real-Time Path Planning for Mobile Robots. 2001

This paper suggests an alternative to the potential field method for solving real-time path planning problems. Motivated by fluid flow phenomenon, stream functions are used to generate paths that are not constrained by local minima problems inherent in potential field-based methods. The stream function defines the path of an ideal fluid particle in a laminar flow, that is, a streamline. In this study, the proposed algorithm is tested under different conditions to determine its performance on static and dynamic environments. Simulation results demonstrate the effectiveness of the proposed method and its applicability to real-time situations.

COM 200106 PUTONG, Arnold M. (MS Computer Science)
Lossless Audio Compression Based on a New Prediction Method and Golomb-Rice Coding. 2001

We present a scheme for compressing audio data losslessly. The compressor consists of two major parts: a new prediction method that runs in a linear time and a residual coder based on Golom-Rice coding. We show that the compression rations produced by this scheme is comparable to those of the best publicly available compressors.

COM 200107 REGMI, Regina (MS Computer Science)
Embedding of the Hypercube into the Generalized de Bruijn Graph $UG_B(2^{n-1},2^n)$. 2001

The generalized de Bruijn graph $UG_B(2^{n-1},2^n)$ having 2^n vertices labeled from 0,1,…, 2^n-1 is a regular graph with vertex degree 2^{n-1} and diameter 2. For any positive integer n≥2. It can be divided into two equal halves, H_1 and H_2, such that H_1 contains vertices [0, 2^{n-1}-1] and H_2 contains vertices [2^{n-1}, 2^n-1]. Two vertices *A* and *B* are adjacent if and only if they are of opposite parity from the same half, or they are of same parity from different halves.

The generalized de Bruijn graph has a promising feature as a network topology. This is because pf its high connectivity and small diameter. In this research paper, we will study the generalized de Bruijn graph $UG_B(2^{n-1},2^n)$ and show that the hypercube Q_n is a spanning subgraph of $UG_B(2^{n-1},2^n)$. We will also show some special properties of generalized de Bruijn graph $UG_B(2^{n-1},2^n)$ such as, the symmetry between H_1 and H_2, automorphism, and recursive mapping.

The embedding of hypercube Q_n indirectly shows the embedding of all network topologies, which can be embedded into Q_n, can also be embedded into the generalized de Bruijn graph of $UG_B(2^{n-1},2^n)$. Problems solvable by algorithms that can run on Q_n will therefore also run on $UG_B(2^{n-1},2^n)$, with potential improvements in running time. Its low diameter (2) makes $UG_B(2^{n-1},2^n)$ a much more powerful graph than Q_n in terms of data exchange, routing, and other communication intensive problems.

COM 200208 TRIPATHI, Pramila (MS Computer Science)
Combinatorial Properties of the Generalized n-Cubes. 2002

We define a generalized n-cube *Q(n.k)* as a graph whose vertices are the binary n-tuples denoted by $a_1a_2\ldots a_n$ such that two vertices are adjacent whenever they differ in exactly *k* coordinates. In this paper, we will show isomorphism between *Q(n,k)* and *Q(n,n-k)* for *n* even and *k* odd. This extends the result of Galliquez and Alipan. We also define a graph *S(n,k)* and show that the diameter of *S(n,k)* and *Q(n,k)* is at most *r* +1 when *n =rk +1.* Otherwise the diameter *S(n,k)* and *Q(n,k)* is at most $[\frac{n}{k}+1]$ for $\leq [\frac{n}{2}]$.

COM 20009 ZERATSION, Tedros Weldemicael (MS Computer Science)
The Diameter of the Generalized de Bruijn Graph $UG_B(n,m)$ where $n < m \leq n^3$ and *n* Divides *m.* 2000

The generalized de Bruijn digraph denoted by $G_B(n,m)$ is defined to be the digraph with *m* vertices labeled by 0,1,2, …, *m*-1 and with the adjacency defined as follows: If *i* is a vertex in $G_B(n,m)$ then *i* is connected to each vertex in the set E(*i*), where $E(i)=\{ni + \alpha \pmod m \mid \alpha \in [0, n-1]\}$, that is, $(i.,j) \in E(G_B(n,m))$ if and only if $i,j \in V(G_B(n,m))$ and $j=ni+\alpha \pmod m$, for some $\alpha \in [0, n-1]$, where [a,b] denotes the set of integers between *a* and *b* inclusive.

The generalized de Bruijn graph denoted by $UG_B(n,m)$ is defined to be the undirected version of $G_B(n,m)$ obtained by replacing each arc by an undirected edge and eliminating self-loops and multi-edges.

Du and Hwang[7] showed that the diameter of $G_B(n,m)$ does not exceed $[\log_n m]$, and that $G_B(n,m)$ is hamiltonian when $\gcd(n,m) > 1$, but it is not when $\gcd(n,m) = 1$ and $n=2$. Moreover $G_B(n,m)$ is hamiltonian when $\gcd(n.m)=1$ and $n>2$ as proved by Du, Hwang and Zhang [5].

Naturally, the question of diameter, hamiltonicity and wide-diameter is asked for the undirected version. Escuadro has shown that $UG_B(n,m)$ is $2(n-1)$- regular with diameter 2, when $m=n^2$, while Nochefranca and Sy[19] have shown that $UG_B(n,m)$ is $2(n-1)$- regular with diameter 3, when $m-n(n+1)$.

In this paper, we will show that the diameter of $UG_B(n,m)$ is 2 for any m in $[n+1, n^2]$ where n divides m and that the diameter is 3 for any m in $[n^2+1,n^3]$ where n divides m.