行政院國家科學委員會專題研究計畫　期中進度報告

圖-設計的研究(1/3)

計畫類別： 個別型計畫
計畫編號： NSC94-2115-M-009-017-
執行期間： 94 年 08 月 01 日至 95 年 07 月 31 日
執行單位： 國立交通大學應用數學系(所)

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報告類型： 精簡報告

處理方式： 本計畫可公開查詢

中　華　民　國 95 年 5 月 26 日

“圖-設計的研究”期中自評報告(第一年)　　傅恆霖

這是一個三年期的研究計劃，目前進行到第一年即將結束，以下是將近一年來計劃進行的狀況報告。

圖-設計(Geaph-designs)主要的概念是把一個大圖分解成互相同構的小圖；當大小圖都是完全圖時所得到的分解恰好對應到一個平衡不完全區組設計(Balanced Incomplete Block Design)。我們的研究在大圖方面多半選擇完全圖或是完全平衡多部圖；而小圖的部份則以圈、一因子(1-factor)或較小圖。除了理論上的建構之外，我們也探討圖-設計的應用。

另外，我們也探討圖-裝填(Graph-packings)，也就是在一個大圖無法恰好分解成同構子圖的時候，讓未分完的部份成爲殘留(Leave)，如何控制殘留的子圖也有很多文獻加以探討；總而言之，這方面的努力在 C. Colbourn 等人的努力之外，提供不少在其它領域的應用，包括網路的設計、群試理論的實驗設計等等。

以下我們提供這一年來所完成的一些成果：(附上 11 篇論文的 List，列在英文摘要之後。)

First Year Report of “A Study of Graph-designs”

This is a report of the first period of the three years research proposal: A study of graph-designs.

Graph-design is obtained by decomposing the host graph into several isomorphic subgraphs. It is well-known that a balanced incomplete block design (BIBD), $(v,k,1)$ -designs, is equivalent to decomposing a complete graph of order v, K_v, into complete subgraphs of order k. Therefore, the study is important in both graph theory and design theory.

Our research mainly focuses on decomposing K_v or $K_{m(n)}$ into isomorphic subgraphs: spanning trees, 1-factors or cycles. In case that the degree condition or size condition do not meet the necessary condition of such a decomposition, we also study the packings. It is worth of noting that there are quite a few applications of graph packings in both networks construction and group testings. We shall keep moving ahead in coming years. In what follows, a list of works which have been done is presented for reference.

References:

1. Multicolored parallelisms of isomorphic spanning trees (with S. Akbari, A. Alipour and Y. H. Lo), SIAM J. Discrete Math. , to appear. (*)
2. Packing of $D_v - P$ and $D_v \cup P$ with Mendelsohn triples (with Liqun Pu and H. Shen), Ars Combinatoria, to appear. (*)
3. Maximum Cyclic 4-cycle packings of the complete multipartite graph (with S. L. Wu), J. Combin. Optimization, to appear. (*)
4. Wide diameters of de Bruijn graphs (with J. M. Kuo), J. Combin. Optimization, to appear. (*)
5. A novel use of t-packings in constructing d-disjunct matrices (with F. K. Hwang), Discrete Applied Math., to appear. (*)
6. A new construction of $\overline{3}$-separable matrices (with F. K. Hwang), Discrete Optimization, revised.
7. Minimizing SONET ADMs in indirectional WDM rings with grooming ratio 7 (with Hui-Chuan Lu), Networks, revised.
8. 2-cyclically resolvable 4-cycle group divisible designs (with Shung-Liang Wu), in preprints.
9. On the existence of multicolored isomorphic spanning trees (with Y. H. Lo), in preprints.
10. Multicolored parallelism of Hamiltonian cycles (with Hui-Chuan), in preprints.
11. On minimum set of 1-factors covering a complete multipartite graphs (with D. Cariolaro), in preprints.