

# 行政院國家科學委員會專題研究計畫 成果報告

## 組合學的應用(3/3)

計畫類別：個別型計畫

計畫編號：NSC93-2115-M-009-002-

執行期間：93年08月01日至94年07月31日

執行單位：國立交通大學應用數學系(所)

計畫主持人：傅恆霖

報告類型：完整報告

報告附件：出席國際會議研究心得報告及發表論文

處理方式：本計畫可公開查詢

中 華 民 國 94 年 10 月 6 日

## 成果報告

這是一個三年期的計劃，到今年(2005)的七月底告一段落。計劃的主題是組合學的應用；整體而言，雖然我們仍然以組合設計與圖論的基礎研究為主，但是，在應用方面，也有不錯的成果。

從報告所附的參考目錄可以看出來，在這三年之間我們完成的研究工作 – 論文四十多篇，其中的半數均已被接受或刊出於國際期刊，可以說進展相當順利；美中不足的地方是因為受 SARS 的影響，未能按原訂計劃，前往日本與兩位學者 M. Jimbo 與 R. Fuji-Hara 共同研究及著手“組合學應用”專書的撰寫，希望能在不久的將來完成這個預期工作。

由於基礎研究是持續進行的工作，在此不多做說明，以下就應用方面的工作，作一簡述：

- (一) 在群式理論方面，我們利用圖分割的概念，完成了幾個工作，[4], [31], [32], [41]。
- (二) 在網路方面，我們利用著色理論及圖連通的概念，完成了[8], [14], [22], [42], [47], [48]。
- (三) 在資訊工程方面，以下的論文有直接的應用：[19], [23], [24], [33], [34], [46]。

我們將繼續努力，以期獲得更具影響力的研究成果。

著作目錄：

1. 1. Cyclically decomposing complete graph into cycles (with S. L. Wu), *Discrete Math.*, 282(2004), 267-273. (\*)
2. Decomposing  $K_n \cup P$  into triangles (with C. M. Fu and C. A. Rodger), *Discrete Math.* 284(2004), 131-136. (\*)
3. Embeddings of maximum packings of triple systems (with R. W. Su and H. Shen), *Discrete Math.* 284(2004), 235-245. (\*)
4. A resolvable  $r \times c$  grid-block packing and its application to DNA library screening (with Y. Mutoh and M. Jimbo), *Taiwanese J. of Math.*, Vol. 8, No. 4, 713-737 (2004). (\*)

5. The edge-coloring of graphs with small genus (with Hui-Lan Fan), *Ars Combinatoria*, 73(2004), 219-224. (\*)
6. Packing the Cartesian product of two complete graphs with hexagons (with M. H. Huang), *Utilitas Mathematica*, 67(2005), 129-140. (\*)
7. Balanced bipartite 4-cycle designs, *Australasian J. of Combin.*, 32(2005), 3-26.
8. On 3-stage Clos network with different nonblocking requirements on two types of calls (with Frank K. Hwang), *J. Combin. Optimization*, Vol. 9, no. 3, May 2005, 263-266. (\*)
9. All 2-regular leaves of partial 6-cycle system (with D. Ashe and C. A. Rodger), *Ars Combinatoria*, 76(2005), 129-150. (\*)
10. Packing  $\lambda$ -fold complete multipartite graphs with 4-cycles (with E. J. Billington and C. A. Rodger), *Graphs and Combin.*, 21(2005), 169-185. (\*)
11. Embeddings of maximum packings in triple systems with  $\lambda > 1$  (with R. W. Su and H. Shen), *Discrete Math.*, to appear. (\*)
12. Four cycle systems with leave which has maximum degree three (with C. M. Fu and C. A. Rodger), *Discrete Math.*, to appear. (\*)
13. Partition integral set into subsets with prescribed sums (with Fu-Long Chen, Yiju Wang and Jinquin Zhou), *Taiwanese J. of Math.*, to appear. (\*)
14. Maximal sets of hamiltonian cycles in  $K_{2p} - F$  (with S. L. Logan and C. A. Rodger), *Discrete Math.*, to appear. (\*)
15. New results on harmonious trees (with Hui-Chuan Lu), *Utilitas Math.*, to appear. (\*)
16. Cyclic  $m$ -cycle systems of the complete graph (with S. L. Wu), *JCD*, to appear. (\*)
17. Some results on 4-cycle packings, *Ars Combinatoria*, to appear. (\*)
18. Linear 3-arboricity of the balanced complete multipartite graph (with C. H. Yen), *J. Combin. Math. and Combin. Computing*, to appear.
19. Multicolored parallelisms of isomorphic spanning trees (with S. Akbari, A. Alipour and Y. H. Lo), *SIAM J. Discrete Math.*, to appear.
20. Packing of  $D_v - P$  and  $D_v \cup P$  with Mendelsohn triples (with Liquan Pu and H. Shen), *Ars Combinatoria*, to appear.
21. A note on cyclic  $m$ -cycle systems of  $K_{r(m)}$  (with Shung-Liang Wu), *Graphs and Combinatorics*, to appear.
22. Edge number of 3-connected diameter 3 graph (with M. C. Tsai), in preprints.
23. On Optimal pebbling of hypercubes (with K. C. Huang and Chin-Lin Shiue), in

- preprints.
24. A study of total relative displacement of permutations (with K. C. Cheng, N. P. Chiang and C. K. Tzeng), in preprints.
  25. Packing balanced complete multipartite graphs with pentagons (with Chin-Mei Fu and M. H. Huang), in preprints.
  26. Existence of 1-rotational cycle systems of  $2K_v$  (with S. L. Wu), in preprints.
  27. Packing the Cartesian product of two complete graphs with pentagons (with M. H. Huang), in preprints.
  28. A prime labeling of the amalgamation of wheels (with Jyh-Mim Kuo), in preprints.
  29. Linear 3-arboricity of  $K_{n,n}$  and  $K_n$  (with K. C. Huang and C. H. Yen), in preprints.
  30. Covering graphs with three odd subgraphs (with C. F. Chan), in preprints.
  31. A new construction of  $\bar{3}$ -separable matrices (with F. K. Hwang), in preprints.
  32. A novel use of t-packings in constructing d-disjunct matrices (with F. K. Hwang), in preprints.
  33. Near automorphisms of cycles (with C. F. Chang and B. L. Chen), in preprints.
  34. Near automorphisms of trees with small displacements (with C. F. Chang), in preprints.
  35.  $\alpha$ -labelling number of trees (with C. L. Shiue), in preprints.
  36. Existence of small prime trees (with J. M. Kuo), in preprints.
  37. Maximum Cyclic 4-cycle packings of the complete multipartite graph (with S. L. Wu), in preprints.
  38. Graphs with isomorphic neighbor-subgraphs (with D. A. Hoffman and Chao-Fang Li), in preprints.
  39. Near relative prime number in a sequence of positive integers (with Jyh-Min Kuo), in preprints.
  40. Directed  $C_3$ -decompositions of  $D_v - P$  and  $D_v \cup P$  (with Liqun Pu and H. Shen), in preprints.
  41. The minimum number of e-vertex-covers among hypergraphs with e edges of given ranks (with F. H. Chang, F. K. Hwang and B. C. Lin), in preprints.
  42. Wide diameters of deBruijn Graphs (with J. M. Kuo), in preprints.
  43. Directed  $C_4$ -decompositions of  $D_v - P$  and  $D_v \cup P$  (with Liqun Pu and H. Shen), in preprints.
  44. 2-cyclically resolvable 4-cycle group divisible designs (with Shung-Liang Wu),

in preprints.

45. The complete solution of determining  $la_2(K_n)$  (with C. H. Yen), in preprints.
46. On the existence of multicolored isomorphic spanning trees (with Y. H. Lo), in preprints.
47. Maximal sets of Hamiltonian cycles in  $D_n$  (with Liquan Pu and Hao Shen), in preprints.
48. Minimizing SONET ADMs in indirectional WDM rings with grooming ratio 7 (with Hui-Chuan Lu), in preprints.

## Report

This is a 3-year term project which we mainly work on the applications of Combinatorial Theory. In general, we have done a decent job in both the theoretical part and application object. More than 40 papers are written in this period of research. Unfortunately due to the SARS effect, we are not able to start the draft of a lecture note on Applied Combinatorics, we'll keep working on it in the near future.

The main results we have obtained in past three years are related to (1) Combinatorial designs (2) Group Testings (3) Networks and (4) Information sciences. A complete list is attached following the report.