

## REDESIGNING SUBGROUPS IN A PERSONNEL NETWORK BASED ON DNA COMPUTING

IKNO KIM, DON JYH-FU JENG AND JUNZO WATADA

Graduate School of Information, Production and Systems  
Waseda University  
2-7 Hibikino, Wakamatsu-ku, Kitakyushu-shi, Fukuoka 808-0135, Japan  
octoberkim@akane.waseda.jp; jeng@fuji.waseda.jp; watada@waseda.jp

Received July 2005; revised November 2005

**ABSTRACT.** *Employees' tasks have been changing according to the current times by technical development and reform in complicated human relationships, and their capabilities and abilities are also continuing to improve. Therefore, the necessity for a competent rating to qualitatively understand relations between employees arises. In this paper, we select a model of a workplace where employees are sharing information from a variety of workplaces, and we suppose a personnel network which contains their relations in terms of mutual understanding. Some subgroups are sure to exist in this employee personnel network, and the personnel network can be improved by redesigning all the cliques of subgroup networks. However, with a huge number of employees it becomes extremely hard to find the maximum clique in the personnel network, meaning this problem is NP-hard. All cohesive subgroups can be found by making the best use of DNA-based computing, also known as molecular computation, which is a new approach to massively parallel computation. DNA computing is drawing attention from many researchers around the world. The goal of this paper is to propose a way to apply DNA computing, one of the new biotechnologies, to human resource management that is a part of the management engineering field, and to measure the efficiency of DNA computing in redesigning subgroups to support work rotation.*

**Keywords:** Subgroup, Personnel network, Work rotation, Clique, DNA computing

**1. Introduction.** Routine tasks that are very specialized, such as assembly-line positions, hold limited appeal in advanced industrial societies. Rarely do these routine tasks offer opportunities for achievement, recognition, psychological growth, or other sources of satisfaction. To enhance the quality of work life for those who hold such responsibilities, human resource managers can use a variety of methods to improve tasks. The most widely practiced technique includes work rotation [1,2]. Work rotation moves employees from task to task. Tasks themselves are not actually changed a lot, only the employees are rotated. Rotation breaks the monotony of highly specialized work by calling on different skills and abilities. The organization benefits because employees become competent in several tasks rather than only one. Knowing a variety of tasks improves the employee's self-image, provides personal growth, and makes the employee more valuable to the organization.

The most important point is to note all the subgroups [3] in the personnel network to execute work rotation. The most important reason is that the personnel network might