出國報告（出國類別：國際會議）

赴越南(河內)參加第六屆電腦研究與發展國際研討會出國報告

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出國期間：**103 年 2 月 26 日至 103 年 3 月 2 日**
報告日期：**103 年 3 月 31 日**

摘要

　　此次承蒙校務基金(國科會計畫結餘款與國科會計畫管理費結餘款)補助至越南(河內)參加 2014 年 2 月 27 日至 2 月 28 日第六屆電腦研究與發展國際研討會(The 6th International Conference on Computer Research and Development)。此次會議為國際電腦研究與發展領域之國際會議，會中除了包括 Prof. Phuoc Vinh Tran 與 Prof. Pham The Bao 等資訊相關領域的知名學者演講外，亦有眾多的學術論文發表。此次會議的收穫，除了與來自世界各國之參加學者學術交流外，亦更加了解各相關研究領域的研究進展。

目次

本文

1. 目的

　　至越南(河內)參加 2014 年 2 月 27 日至 2 月 28 日第六屆電腦研究與發展國際研討會(The 6th International Conference on Computer Research and Development)。

2. 過程

　　2014 第六屆電腦研究與發展國際研討會(The 6th International Conference on Computer Research and Development)由 SCIEI 協會籌劃，越南國立大學(Vietnam National University)、Vietnam Academic of Science and Technology 等共同主辦，於 2014 年 2 月 27 日至 2 月 28 日在越南河內之 Muong Thanh Hanoi Hotel 舉行，會中有來自世界各國家的學者專家與會並發表資訊相關論文。2 月 27 日早上先至會議飯店報到並領取會議議程等相關資料，此研討會之 Keynote Speakers 為知名學者：Prof. Phuoc Vinh Tran，講題為「The approach of data visualization for the systems warning natural disaster」、Prof. Pham The Bao，講題為「An overview of medical image processing」。

　　研討會議共分成四個 Sessions 進行，筆者此次被接受的論文為「An application of immune algorithm for the periodic delivery planning of vending machines」，安排於 2 月 28 日 Rosemary 會議廳 16:00p.m-18:30p.m 場次，同場次的論文發表作者均親自到場報告，分別來自法國、日本、韓國、菲律賓、緬甸、馬來西亞等。除此之外，此次會議參加之學者亦有來自沙烏地阿拉伯、美國、越南等國家。此次會議為國際資訊研究領域之中小型國際會議，論文錄取率根據接受函通知為 below 36%，此會議不同於過去大拜拜型之會議形式，各論文均事先經篩選過，故不像一些大型會議，有論文水準不一之缺點。會議過程除了不同領域的最新研究成果發表外，筆者亦利用空檔時間與各國之學者交換意見，獲益良多。

3. 心得及建議

　　此次的心得與見聞整理如下數點，供參考：

(1) 研討會每天有多個分項議程(Sessions)同時研討，主題多元涵蓋各領域，包括：
　　Computer Research and Development, Intelligent and Automation Systems, Information

Security and Artificial Intelligence 等，此研討會之主題與筆者之教學與研究領域密切相關，因此獲益不少。

(2) 國內學者應該踴躍參加國際會議，提高台灣的學術地位，進而建立與國外學界良好的學術互動管道，以增進學界的關係，創造更多研究的議題。除此之外，國內應更加積極獎勵及補助國內學者參加國際會議，以提升研究品質與擴大視野。

(3) 會中每一個 Session 時間約二個小時多，每個 Session 約有 10 篇文章發表。Session 主持人分配每一篇文章的研討時間約 15-20 分鐘，研討的方式是由文章的作者發表著作並進行問答，發表及問答通常會交錯進行，參加的人員可以自由向作者提問，或逕行互相討論。因為與會的主席和參與者都有充分的準備，會中的討論都非常踴躍，頗值得國內學術會議效法。

(4) 此次會議除了各國之主要學者雲集外，亦有多國眾多博士班研究生(主要為韓國)亦參與此國際研討會，國內應更加積極獎勵及補助國內研究生參加國際會議。

4. 攜回會議資料

(1) 會議 Final Program：內容主要為會議議程的介紹。
(2) 會議論文集光碟片。
(3) 未來相關研討會宣傳資料。

An Application of Immune Algorithm for the Periodic Delivery Planning of Vending Machines

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Abstract—**This paper investigates the periodic delivery planning of vending machine problem (PDPVMP). The problem is a periodic vehicle routing problem (PVRP), which is also an extension of the typical vehicle routing problem (VRP). The considered PDPVMP contains multiple vending machines with periodic demands. For each vending machine, its replenishment frequency is either once per two days or twice per two days, i.e., once per day. In the PDPVMP, there are multiple vehicles to deliver goods for vending machines. The objective of the considered problem is to minimize the total length of routes for all vehicles during the time horizon such that all demands for vending machines are delivered. In this paper, based upon a new coding procedure, we apply an immune based algorithm to solve the PDPVMP. A case of Taoyuan county in Taiwan is considered and solved. Numerical results show that the studied immune algorithm can effectively solve this PDPVMP.**

Index Terms—**periodic vehicle routing problem, immune algorithm, vending machine**

I. INTRODUCTION

With the rapid economic development, the number of convenience stores increases drastically during the past years. However, it usually requires considerable funds and a suitable location for a new convenience store. Thus, more and more vending machines appear on most of the streets in cities. In the early 19th century, the first vending machine appeared in Japan. But vending machines became popular after World War II. In 2003, The annual report of the Japan Vending Machine Manufacturers Association shows that there are more than 5.5 million vending machines to serve 126 million people in Japan. Japan has the highest density of vending machine in the world. As known, most vending machines sell beverages (47.3%), cigarettes (11.3%) and foods (2.2%). For the beverage, most vending machines sell soft drinks (83.7%), while the others sell milk (7.0%), coffee and chocolate drink (6.1%), and alcoholic beverages (3.2%) ([1]).

Vending machine is a non-store business machine without time and space constraints and can operate twenty-four hours per day. Moreover, it does not require the store space and the salesperson costs. In addition, its set-up costs and operating costs are relatively low. Unlike the convenience stores, the vending machines sell few types of goods, such as beverage and biscuits etc. Convenience stores have warehouses for inventory, however, vending machines have no warehouses. Thus, vending machines require replenishment frequently to insure that customers can buy products at any time. As known, the routing cost is the main part of replenishment cost for vending machine industry. Thus, reducing the cost of replenishment is equivalent to finding a good delivery route of replenishment for vending machines.

In this paper, we consider the periodic delivery planning of vending machine problem (PDPVMP) which contains multiple vehicles to deliver goods for vending machines. In addition, it is assumed that the replenishment frequency of each vending machine is either once per two days or twice per two days (i.e., once per day). Note that we use "day" as a general time unit throughout this paper. The objective of the PDPVMP is to minimize the total length of routes for all vehicles such that all periodic demands of goods for vending machine are delivered. In this paper, based upon a new coding procedure, we develop an immune based algorithm to solve the PDPVMP. A case of Taoyuan county in Taiwan is considered and solved. Numerical results show that the studied immune algorithm can effectively solve this PDPVMP.

II. PERIOD VEHICLE ROUTING PROBLEM

A. Typical Period Vehicle Routing Problem

The PVRP was introduced by Beltrami and Bodin in 1974 and has several exciting variants and applications arising in recent years. The PVRP is a generalization of the classic vehicle routing problem (VRP) in which vehicle routes must be constructed over multiple days.