Application of Web Scraping and Google API Service to Optimize Convenience Stores' Distribution

Thai Quang LE, Davar PISHVA◆
Ritsumeikan Asia Pacific University (APU), Beppu, Japan
quanle11@apu.ac.jp, dpishva@apu.ac.jp

***Abstract*— In the current competitive market, offering a relatively cheaper price for the commodity plays an important role in obtaining a greater share of the market for a corporate entity as it encourages more customers to purchase from its product. Convenience stores are becoming indispensable for the Japanese society, there are presently 54,008 retail stores throughout Japan and their number continues to increase. The reasons behind such popularity are convenient locations, attractive products and long trading hours. Their price, however, are more expensive than regular supermarkets and groceries stores mainly due to their numerous overhead cost, the major of which is their requirement for refurbishment of goods several times per day. In this study, a practical approach that utilizes computer techniques to find an optimal vehicle routing scheme for goods and service delivery to multiple convenience stores is investigated. Although many scholars have already investigated the location problem of supply chain facilities and centers under different conditions, this study takes a programming approach using Web Scraping and Excel VBA and hope to turn it into a cheap but powerful Excel add-in module or real-time navigation function. A mathematical 'network flow model' is initially developed to examine the problem. Geographical data of convenience stores, their associated warehouses, garbage dumpsites and gas stations are subsequently retrieved through programming with the 'web scraping' technique. A computer program that utilizes Google API service is then developed to solve the optimal networking problem. Validity of obtained results is also examined by other known method to justify its optimality and fast performance.**

***Keyword*— Supply Chain, Maximal Covering, Assignment, Modeling, Optimization, Web Scraping, Google API Service**

Thai Quang LE was born in Khanh Hoa Province, Vietnam in 1993. He is presently pursuing his studies at Ritsumeikan Asia Pacific University (APU) in the field of Business Administration focusing on Strategic Management and candidate for graduation. He has received numerous scholarships including, APU Tuition Reduction Scholarship from 2011-2015, JASSO (Japan Student Services Organization) Scholarship from 2011-2012, and Oita Prefecture Scholarship in 2012-2013, 2014-2015. His research interests include applied programming in business, modeling for decision-making and machine learning, on which he has carried out a few presentations. The theme of his thesis is retail activity optimization and he has become an IEEE member since 2014.

Davar Pishva is a professor in ICT at the College of Asia Pacific Studies, Ritsumeikan Asia Pacific University (APU) Japan and presently serves as the Dean of both College and Graduate School of Asia Pacific Studies. In teaching, he has been focusing on information security, technology management, VBA for modelers, structured decision making and carries out his lectures in an applied manner. In research, his current interests include biometrics; e-learning, environmentally sound and ICT enhanced technologies. Dr. Pishva received his PhD degree in System Engineering from Mie University, Japan. He is Secretary General of IAAPS (International Association for Asia Pacific Studies), Senior Member of IEEE, and a member of IEICE (Institute of Electronics Information & Communication Engineers), IAAPS and University & College Management Association.

◆*Corresponding Author: E-mail: dpishva@apu.ac.jp, Fax: +81-977-78-1001, Tel: +81-977-78-1000,*
Address: Ritsumeikan Asia Pacific University 1-1 Jumonjibaru, Beppu, Oita 874-8577 Japan