

國立聯合大學

經營管理學系碩士班

碩士論文

規劃軸輻系統最適週期時間以解決外送平台
經營虧損與交通問題－以 foodpanda 為例

Planning the optimal cycle time for a hub-and-spoke
system to solve operational loss and traffic problems of
the delivery platform－Taking foodpanda as an example

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中華民國 111 年 4 月

摘要

近年懶人經濟興起與新冠疫情爆發，改變消費者訂購食物的方式，導致外送平台快速崛起。外送平台雖可讓餐飲店家省下可觀店面租金，使外送員獲取工作機會，為顧客帶來便利服務，卻也產生「經營虧損」與「交通紊亂」兩項重大營運問題。本研究旨在提出軸輻運送系統解決外送平台在運送業務的經營虧損與交通事故問題。由於「週期時間」為本問題的關鍵決策變數，因此，先決定週期時間之上下界值，接著以列舉法搜尋最適週期時間。在求解程序上，先建立各週期時間的外送平台基本數據，並決定軸輻運送系統涵蓋地區範圍，爾後應用重心法建置轉運中心與各集貨站設置地點，再利用掃描法及模擬退火法，進行各集貨站途程計畫。上述求解過程皆以 VBA 程式撰寫規劃，並比較各週期時間下軸輻系統「整合多目標值」，以決定最適週期時間。

本研究比較「軸輻運送系統」與「直接運送模式」兩者關鍵績效指標(KPI)之差異。其結果：軸輻運送每筆訂單「運送成本」較直接運送減少 42.95%；「運送車次」較直接運送減少 68.33%。據此得知軸輻運送可達成併貨運送，不但使運送成本與外送車次大幅下降，並舒緩交通壅塞，有效解決外送平台經營虧損與交通問題。

關鍵詞：軸輻運送系統、週期時間、模擬退火法、車輛途程問題、多目標規劃

ABSTRACT

In recent years, the rise of the lazy economy and the COVID-19 outbreak have changed the way consumers order food, leading to the rapid rise of delivery platforms. The food delivery platforms can bring that restaurants save a considerable store rent, young people easily acquire job opportunities, and customers obtain convenient service; however, it also causes two major crisis problems: congestion operating loss and road traffic. In this paper, we propose a hub-and-spoke system to solve the problems of operational loss and traffic accidents for the delivery platforms. Since the "cycle time" is the critical decision variable for this problem, the upper and lower bounds of the cycle time are determined firstly. Then, the optimal cycle time is searched by the enumeration method. In the problem-solving process, the basic data of the delivery platform for each cycle time is established, and then the coverage of the hub-and-spoke system is determined. Next, the locations of the distribution center (Hub) and collection stations (Spoke) are established through the center of gravity method. Finally, the scanning method and the simulated annealing algorithm are used to develop the vehicle routing plan for each collection station. The VBA software was used to plan the above solving process. The "integrated multi-objective value" of the hub-and-spoke system at each cycle time was compared to determine the optimal cycle time.

In this study, we also compare the key performance indicators (KPIs) between the hub-and-spoke system and the direct delivery mode. As a result, the distribution cost of the hub-and-spoke system was 42.95% lower than the direct delivery mode, and the number of motorcycle deliveries is also reduced by 68.33%. Because the hub-and-spoke system can achieve joint delivery, which not only greatly reduces the distribution cost and the number of deliveries, but also relieves the traffic congestion, so as to the operational loss and traffic problems of the delivery platform are effectively solved.

Keyword : Hub-and-Spoke System, Cycle Time, Simulated Annealing, Vehicle Routing Problem, Multi-Objective Planning