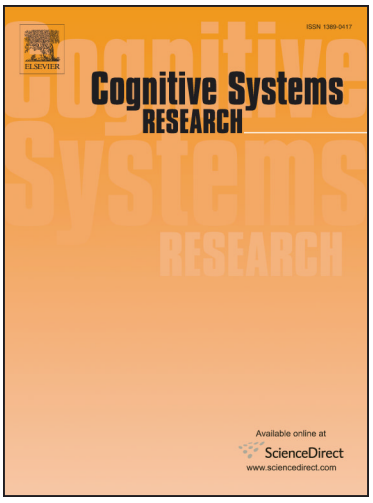


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# Management of expressway service area based on Integrated Optimization

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**Abstract:** In view of the imperfect construction and the widespread loss on domestic expressway service areas, simply relying on the capital and human resources investment cannot improve the economic benefits efficiently. The M-Expressway service area is one of the most representative service areas in the Shanghai-Nanjing region. In this optimization project, we optimized the main revenue item and allocated parking spaces based on profit contributions，finally optimized the parking layout. With profit as the core, we linked the scattered business in the service area and achieved the goal of sequential optimization and overall optimization.

**Keywords:** expressway service area; profit margin; parking spaces allocation

## 1. Introduction

With the increase of national consumption levels and the expansion of consumer demand, the construction of service areas has become the focus of government work. At present, study focuses on three major domains: design of logistics nodes in expressway service area; improve its function, design, service; operation management [1]. Germany led the technological development of highways in the 1920s and 1930s, followed by countries such as the United States, Britain, France and Japan. After 1980, Japan mainly provided technical standards for highway design and planning. Korean research highlights the importance of financial indicators, which suggest that evaluating the financial viability of a build-operate-transfer project for highway service areas (HSA BOT project) in South Korea is very important for the private sector [2].

At the same time, optimization based on demand is necessary, Antonio analyzed the seasonality of tourism demand in the UK region and provided an instrument to evaluate the marketing strategies [3]. We find that customers mainly have four basic needs: parking, toileting, dining, and shopping and three types of safety requirements: refueling, garaging, and rest. The vehicle types entering the service area can be divided into passenger cars, buses, and trucks.

The M service area is located at 105K+500 meters of the Shanghai-Nanjing Expressway (all 133KM). It covers an area of approximately 10,000 square meters and provides parking, maintenance, fueling, catering, shopping and other services. M service area serves more than 6,000 vehicles a day, above 18,000 passengers.

Along the Jiangsu section of Shanghai-Nanjing Expressway, there are 6 service areas including Huanglishu, Xianrenshan, Douzhuang, Fangmaoshan, Meicun, and Yangchuan Lake. It is the "golden bond" linking the five economically developed cities in southern Jiangsu. Since the Shanghai-Nanjing Expressway was opened and operated on September 15, 1996, it has improved the congestion of vehicles and drove the economic development in the Yangtze River Delta region, the Shanghai-Nanjing Expressway has developed extremely rapidly over the past 20 years.

M-service area is the largest service area with the highest traffic volume and the best service in Shanghai-Nanjing Expressway. It is of great significance for the comprehensive development and upgrading of service areas in China.

To compare the trade-off between city size and economic growth, the scale of domestic highways is not directly proportional to economic benefits [4]. The operating income of most service areas is slightly greater than the daily maintenance costs of the facilities. After deducting the depreciation of assets, most service areas appear to suffer losses. Cost management of highway engineering projects is an indispensable and important task, including resources and management costs [5, 6].

Based on the optimization which Australian managers classified recurring gains and losses of the firm as either operating or extraordinary items, we can find that optimizing around the main revenue items is able to increase the return on investment in the service area to a greater extent [7]. There is an existing expansion project. The M-service area needs to be rectified on the original basis. The first is the remodeling of the project, mainly focusing on restaurants, rest areas, and parking lots. The second is revenue management, which needs to be combined with the profit for pricing, parking space allocation, and layout optimization. Focusing on the second aspect, we have carried out statistics on the demand for passenger flow, models, purpose of parking, average number of seats, dining rate, and basic conditions of restaurants. Based on industry reports and highway engineering reports, we have mathematically modeled optimization methods and achieved the goal. Different from