Commercial Location Model Based on Accessibility and Pythagorean Fuzzy Sets

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Introduction

The commercial location, one of the complex and challenging decision factors faced by investors, plays a decisive role in operating profits. The distribution of business entities is also a focus of urban development planning. This study establishes an uncertain decision model for selecting investment locations based on spatial accessibility and consumers’ emotional analysis by considering their convenience and actual needs.

Table

Table 1. Accessibility of different evaluation

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Spatial</th>
<th>OCR</th>
<th>Accessibility ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>A2</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>A3</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>A4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Mathematical Formulas

\[ PFPWA_{\mu}(a_1, a_2, \ldots, a_n) = \left( \prod_{k=1}^{m} (1 - a_k^2)^{\omega_k} \prod_{k=1}^{n} \frac{1}{1 - a_k^2} \right)^{1/\sum_{k=1}^{m} \omega_k} \]

\[ PFIWA(b_1, b_2, \ldots, b_n) = \left( \prod_{j=1}^{j=m} (1 - b_j^2)^{\omega_j} \prod_{j=1}^{j=n} \frac{1}{1 - b_j^2} \right)^{1/\sum_{j=1}^{j=m} \omega_j} \]

\[ S = \mu_i^2 - \nabla_i^2 \]

Conclusion

Taking four representative business districts in D city as the research object, each business district’s advantages and disadvantages in terms of accessibility are obtained through the established investment location model. The results of the illustrative example show that the designed method can assist the decision-making of investment location to a certain extent.

The competitive relationship between multiple business districts in the same jurisdiction has not been involved, and future research will introduce the competitive relationship into the evaluation of business location.