Research on the Demand of Broadband Wireless Mobile Applications Based on User Behavior

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Abstract: Based on the different behaviors of multi-user group, this paper gives a method of demand analysis of broadband wireless mobile application. The analysis of broadband wireless mobile application, based on user behavior samples, can adopt the method of fuzzy cluster analysis to classify the user behavior by setting different clustering level, and build the model of each type of user behavior. The function of broadband wireless mobile application is designed by using the function description template based on class diagram, and the relationship between its function and user group behavior is analyzed by mapping matrix. At last, based on the application function and user behavior correlation analysis, the user behaviors are transformed into the key indicators and requirements of the application function.

1. Introduction
The demand analysis of broadband wireless mobile applications will be based on the different behaviors of multi-user groups, give full play to the combined advantages of technology implementation and personal experience, and integrate multiple research methods such as fuzzy clustering and structure analysis to form a demand demonstration model that integrates “user behavior analysis, behavioral process modeling, application function design, multi-party correlation analysis, and demand index construction”. They accurately grasp the characteristics of user behavior and scientifically design broadband mobile application functions, which can adapt to the new development of broadband wireless mobile application technologies and meet the needs of various users.

2. User behavior fuzzy clustering analysis
Long-term tracking of various user behavior habits, accumulation of a wealth of user behavior samples, and classification with the use of fuzzy clustering analysis methods, in order to form a feature-based user behavior classification.

The first step is the standardization of user behavior samples. In order to build a unified classification standard and eliminate dimensional inconsistencies, standardized user behavior samples first. The statistics of N user behavior samples with M characteristic criteria are listed in table 1.
### Table 1. User behavior sample statistics table.

| characteristic criteria | 1   | 2   | 3   | ... | m   |
|-------------------------|-----|-----|-----|-----|-----|
| user behavior sample    |     |     |     |     |     |
| 1                       | Y11 | Y12 | Y13 | ... | Y1m |
| 2                       | Y21 | Y22 | Y23 | ... | Y2m |
| ...                     | ... | ... | ... | ... | ... |
| n                       | Yn1 | Yn2 | Yn3 | ... | Ynm |

According to user behavior samples, normalization of characteristic criteria is carried out to provide basic data for mastering the proximity between users' behavior samples. The formula is shown below.

\[
A_j = \min_i \{y_{ij}\},
\]

\[
B_j = \max_i \{y_{ij}\},
\]

\[
X_{ij} = \frac{y_{ij} - A_j}{B_j - A_j}.
\]

The second step is to analyze the proximity between users' behavior samples and establish fuzzy compatibility relation. The proximity between users' behavior samples is the proximity or similarity between users' behavior samples. The formula is shown below.

\[
r_{ij} = \frac{\sum_{k=1}^{m} X_{ik} X_{jk}}{\sqrt{\sum_{k=1}^{m} X_{ik}^2 \sum_{k=1}^{m} X_{jk}^2}}, \quad i, j = 1, 2, \ldots, n
\]

By comparing the proximity between arbitrary two sample user behaviors, a multi-user behavior fuzzy compatibility relation is formed, that is \( R = [r_{ij}]_{n \times n} \).

The third step is to compound convert \( R_n \) \( \sim \) \( R_{n-m} \) the fuzzy compatibility relationship and form a fuzzy equivalence relation. By setting different clustering level \( \lambda \), the user behavior is classified and the types of user behavior of different regions, different ages and different levels are refined, and then analyze the characteristics of different behavior types, build new user behavior names and define contents.

3. **User behavior model building**

User behavior modeling is a key link in the demand analysis of broadband wireless mobile applications. It is an important interface between user behaviors and information activities, which can restrain the functional indexes of broadband wireless mobile applications and can directly serve the construction of broadband wireless mobile system. The user group behavior model, which is described by the IDEF0 or UML method, can detail the information flow between sub-activities within user behavior of different characteristics.

4. **Application function design**

The functional design of broadband wireless mobile application should clearly define the key elements such as mobile application system, mobile application function and application interface performance. It is a quantitative description of the functional requirements of broadband wireless mobile application, including the functional parameters of mobile application system and broadband wireless mobile application hardware/software, interface, communication details and functions. In general, a formalized representation of a functional description template based on class diagrams can be used. As shown.
5. Application function and user behavior association analysis

The associated analysis of the broadband wireless mobile application function with the user group behavior is to establish a bridge between function and action through the form of a mapping matrix, to constrain the movement functions required by user behavior, and to the user behavior that each function can support. In essence, this matrix determines how to use multiple functions to ensure the characteristics of multi-user behavior groups.

The elements described in this model mainly include both application functions and user behaviors, but these two types of demand elements are not created in this model but are derived from other demand demonstration models. Function is derived from the application function design, user behavior from user behavior fuzzy cluster analysis and user group of behavior model of all kinds of actions. In this model, there are no functions that are not designed to be used in the application function design, nor are there any user activities that are not defined in the user behavior model.

The application function and user behavior association analysis are generally described by matrix, and the description template of matrix form is shown in table 2. The model can also use an object-oriented model to define a new relationship meta-type "support", which is specifically used to describe the relationship between a user's behavior and function.

Table 2. Application function and user behavior association description

| Application function | C₁ | C₂ | C₃ | ...
|----------------------|----|----|----|---
| T₁                   | Δ  |    |    |   |
| T₂                   |    | Δ  | Δ  |   |
| T₃                   |    | Δ  |    |   |
| …                    |    |    |    |   |

The columns of the matrix represent lists of application functions, and rows in the matrix represent lists of user behaviors. In order to facilitate association and comparison, the user behavior and
application function in the matrix should be equal to the granularity of decomposition. A cell in the matrix represents a mapping relationship between function and behavior, and you can use numbers, words, or symbols to indicate whether the task in your row needs the function of the column. "Δ" symbol is adopted in table 2 to represent the support relationship between function and behavior. In order to describe the corresponding relationship between application function and behavior in more detail, it can also be described in the form of text in the cell.

6. Construction of key requirements indicators for mobile applications

Based on the application function and user behavior correlation analysis, the user behaviors are transformed into the key indicators and requirements of the application function. Key indicators are applied in the practical work of the function performance of the commonly used or general library, including all kinds of hardware and software system of quantity, quality, scope of operation, timely, effective and affordable index.

The importance of key indicators is also an important part of the demand indicators. It can be based on the demand analysis expert group, combined with the expected effect of functional tasks and index constraints, combined with the environmental impact and other factors to make a comprehensive judgment, and can also refer to the user behavior sampling value.

Table3. User behavior key indicator requirements

| User behavior | Application function | Indicator 1 | ... | Indicator n |
|---------------|----------------------|-------------|-----|------------|
| Behavior 1    | Behavior 1.1         | Importance  | Demand value | importance | Demand value |
| ...           | ...                  | ...         | ...          | ...        | ...         |
| Behavior n    | Behavior n.1         | ...         | ...          | ...        | ...         |
| ...           | ...                  | ...         | ...          | ...        | ...         |

7. Conclusion

In this paper, based on the different behaviors of multi-user group, this paper gives a method of demand analysis of broadband wireless mobile application. The function description template based on class diagram is used to design the function of broadband wireless mobile application, and the relationship between its function and user group behavior is analyzed by mapping matrix. Finally, based on the correlation analysis of application function and user behavior, the user behavior is transformed into the key indicators and requirements of application function.

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