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**K-Best Neighbors for Positioning Systems**

The K-Best Neighbors (K-Bet) algorithm estimates a mobile device's location using received signal strength (RSS) values. This report covers the K-Bet approach, its implementation, and how it determines the device's most likely position by comparing measured RSS values with reference data. The goal is to find the best-matching reference points to estimate the device's location accurately.

1. **Proposed solution:**

The K-Bet Neighbors algorithm is employed to find the K best reference points (cells) that most closely match the measured RSS vector of the mobile phone. The method follows three steps:

1. **Compute Similarity:** The Euclidean distance is calculated (compute\_similarity) between the mobile phone’s RSS vector and each reference RSS vector.
2. **Select Best Cells:** The K reference points with the smallest Euclidean distances are selected as the best matches (find\_best\_cells).
3. **Estimate Position:** The barycentric coordinate method (compute\_barycentric\_position) is applied to compute the estimated position using the selected reference points.
4. **Implementation Details:**

**2.1 Computing Similarity**

* The Euclidean distance between the mobile phone’s RSS vector and each reference vector is computed.
* Lower distance values indicate a better match.

**2.2 Finding Best Matching Cells**

* The K reference vectors with the smallest distances are selected.
* Their indices and corresponding distances are stored for further processing.

**2.3 Computing Barycentric Position**

* The inverse of the similarity metric is used as a weight.
* The estimated position is computed using a weighted sum of the positions of the selected reference cells.

**2.4 Visualization**

* A scatter plot is generated to show the positions of reference cells, best-matching cells, and the estimated position.
* Labels and colors distinguish different elements in the plot.

**3. Results and Analysis**

* The program estimates the mobile phone’s position using the provided reference data.
* The accuracy depends on the number of selected reference points and the reliability of RSS measurements.

1. **Conclusion** The K-Best Neighbors approach provides an effective way to estimate the position of a mobile device based on RSS values. The combination of Euclidean distance for similarity measurement and barycentric weighting for position estimation ensures a balance between computational efficiency and accuracy. Future enhancements could include optimizing the weighting function or integrating additional filtering techniques to improve precision.

**4. Code Overview** The implementation consists of Python functions structured as follows:

* compute\_similarity(): Calculates the Euclidean distance between RSS vectors.
* find\_best\_cells(): Selects the best matching reference cells.
* compute\_barycentric\_position(): Computes the estimated position using the best cells.
* plot\_map(): Visualizes the reference points, selected best cells, and estimated position.

**6. Diagrams and Figures**

Class diagram:

Une image contenant texte, capture d’écran, Police, ligne

Description générée automatiquement

Flow chart:

Une image contenant texte, diagramme, capture d’écran, Police

Description générée automatiquement