**Mobile Computuing Assignment Report**

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**1. Development Environment**

* **Hardware: Samsung Galaxy Note S20**
* **Operating System: Android 10.0**
* **Development Tools: Android Studio, Kotlin**
* **Testing Environment: Indoor space (Building 106, 1st and 2nd floors)**

**2. Problem Analysis**

**2.1 Noise from Various WiFi Signals**

* **The initial code collected and utilized signals from all surrounding WiFi APs.**
* **Analysis revealed that out of 1,898 data points, only 177 were from "WUNIST\_AAA\_5G" signals, while 1,349 were from other APs.**
* **The unpredictable variations in external WiFi signals due to environmental changes decreased positioning stability.**

**2.2 Position Estimation Limited to Specific Locations**

* **The positioning results were concentrated at specific coordinates.**
* **Root causes identified:**
* **Signal strength at certain points receiving disproportionately high weights**
* **Imbalanced weighting in similarity score calculations**
* **Excessive weight assigned to specific APs**

**2.3 Inefficient Data Collection**

* **The initial approach collected and stored information from all APs, resulting in unnecessary data.**
* **Too many reference coordinates created confusion for the algorithm.**

**3. Implementation Details**

**3.1 Filtering Logic Application**

val targetSSID = "WUNIST\_AAA\_5G"

val filteredResults = scanResults.filter { it.SSID == targetSSID }

**3.2 Weight Balancing**

val similarity = exp(-signalDiff / 25.0) \* freqMatchBonus \* signalStrengthWeight \* rarityBonus

val weight = score.pow(1.2)

if (bestLocationScore > 0.08) {

locationSimilarities.add(Triple(location, bestLocationScore, apMatchCount))

}  
  
**3.3 Position Diversity Enhancement**

significantMatches.take(10)

it.second >= topScore \* 0.30

**3.4 Data Quality Improvement**

val targetSSID = "WUNIST\_AAA\_5G"

val filteredAPs = record.accessPoints.filter { it.ssid == targetSSID }

**4. Data Analysis**

**4.1 Collected Data Overview**

* Data collection focused exclusively on the "WUNIST\_AAA\_5G" access points
* Total reference points: approximately 20 locations
* Signal strength range: -43dBm to -85dBm
* Each location contains multiple AP readings with varying BSSIDs

**4.2 Signal Strength Distribution**

* Strong signals (-43dBm to -55dBm) primarily detected in center areas
* Medium signals (-56dBm to -70dBm) found in intermediate areas
* Weak signals (-71dBm to -85dBm) detected at building periphery

**5. Experiment Results**

**5.1 Improved Positioning Accuracy**

* Reduced noise by using filtered data based on a single AP
* Enhanced position diversity through weight balancing
* Optimized performance using an appropriate number of coordinates (approximately 20)

**5.2 Enhanced System Stability**

* Prevented false detections by skipping positioning when target AP is unavailable
* Improved problem identification and resolution through enhanced debug logging

**6. Conclusion and Future Research Directions**

* Using specific trusted APs proves more effective for positioning accuracy and stability
* Appropriate number (about 20) and distribution of reference points is crucial
* Future improvements could include:
* Machine learning algorithm implementation
* Multi-sensor fusion (accelerometer, gyroscope)
* Dynamic adjustment of algorithm parameters based on environmental conditions

