

## PERBANDINGAN METODE INTERPOLASI DAN REGRESI UNTUK MENAMBAH DATA PADA BASIS DATA TEKNIK FINGERPRINT DALAM PENENTUAN POSISI OBJEK DALAM RUANG

Oleh

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### INTISARI

*Indoor Positioning System* (IPS) telah menjadi topik penelitian yang menarik dalam kurun waktu 1 dekade terakhir. Pada IPS, teknik *fingerprint* diklaim memiliki performa lebih baik daripada metode *positioning* berbasis jarak (*distance-based*) karena mampu mengatasi efek *multipath interference*. Namun, beberapa masalah yang terkait dengan kebutuhan waktu dan biaya untuk membuat basis data dalam fase *offline* menjadi kelemahan dari metode ini. Penelitian ini dilakukan untuk mengetahui perbandingan hasil estimasi posisi target menggunakan basis data dengan penggantian dan penambahan data hasil interpolasi polinomial, regresi polinomial dan interpolasi bilinear. Beberapa data pada basis data hasil pengukuran digantikan dengan data hasil ketiga metode yang diajukan. Pada basis data pengukuran, dilakukan penambahan data RSSI menggunakan ketiga metode yang diajukan sehingga dapat memperkecil ukuran kisi basis data dari 1 m x 1 m menjadi 0,5 m x 0,5 m. Hasil penelitian menunjukkan bahwa, data hasil interpolasi bilinear dan regresi polinomial mampu menggantikan data hasil pengukuran karena nilai *average distance error* (ADE) hasil *positioning* target menggunakan basis data hasil regresi polinomial dan interpolasi bilinear lebih rendah dibandingkan menggunakan basis data hasil pengukuran. Sedangkan penggunaan basis data hasil interpolasi polinomial menghasilkan nilai ADE yang lebih tinggi daripada menggunakan basis data pengukuran. Pengecilan ukuran kisi menggunakan interpolasi bilinear dan regresi polinomial mampu mengurangi nilai ADE sebesar 0,27 m dan 0,16 m. Sedangkan, penggunaan interpolasi polinomial meningkatkan nilai ADE sebesar 0,02 m.

**Kata kunci:** *Indoor Positioning System*, *Fingerprint*, Interpolasi Polinomial, Regresi Polinomial, Interpolasi Bilinear

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## **COMPARISON OF INTERPOLATION AND REGRESSION METHODS FOR INCREASING DATA IN THE FINGERPRINTING TECHNIQUE DATABASE FOR INDOOR POSITIONING SYSTEM**

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### **ABSTRACT**

Indoor Positioning System (IPS) has caught the attention of many researchers around the world. In IPS, the fingerprint technique has been claimed to have a better performance than distance-based positioning due to it's abilities in overcoming the multipath interference effect. However, several problems that arise from time constraints and expenses in making data bases in offline phases make them key weaknesses of this method. This study was conducted to compare the results of the estimation of the target position using a database with the replacement and addition of data from polynomial interpolation, polynomial regression and bilinear interpolation. Parts of the in the measurement database was replaced with data from the results of the three methods proposed to evaluate the performance of the three techniques. Parts of the data in the measurement results database was replaced with data from the three proposed methods. In the measurement database, RSSI data was added using the three proposed methods to reduce the size of the database grid from 1 m x 1 m to 0.5 m x 0.5 m. The results showed that the data was made from bilinear interpolation and polynomial regression were able to replace the measured data because the average distance error (ADE) value of the target positioning results using the polynomial regression and bilinear interpolation database was lower than using the measurement results database. Meanwhile, the use of the polynomial interpolation database resulted in a higher ADE value than using the measurement database. The downsizing of the grid using bilinear interpolation and polynomial regression was able to reduce the ADE values by 0.27 m and 0.16 m, respectively. Meanwhile, the use of polynomial interpolation increases the ADE value by 0.02 m.

**Keywords:** Indoor Positioning System, Fingerprint, Polynomial Interpolation, Polynomial Regression, Bilinear Interpolation

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