

INTISARI

Total Station saat ini banyak digunakan pada pemetaan topografi metode terestris, namun demikian pengukuran dengan *Total Station* memiliki berbagai sumber kesalahan, salah satunya yaitu kesalahan sistematik akibat prisma reflektor yang terpasang miring sehingga tidak benar-benar mengarah ke teropong *Total Station*. Kesalahan tersebut berpengaruh terhadap hasil ukuran jarak yang didapatkan. Penelitian sebelumnya mengkaji pengaruh arah prisma terhadap jarak hasil ukuran *Total Station* dengan hitung perataan kuadrat terkecil metode parameter. Nilai jarak pada ketelitian jarak $a + b \text{ ppm} * D \text{ mm}$ dianggap tidak memiliki kesalahan, padahal hasil pengukuran pasti mengandung kesalahan. Oleh karena itu, penelitian ini bertujuan mengkaji pengaruh arah prisma terhadap data jarak hasil pengukuran *Total Station* dengan hitung kuadrat terkecil metode parameter dan metode kombinasi untuk mendapatkan nilai simpangan baku jarak estimasi, nilai ketelitian jarak pengukuran, dan jarak maksimal yang masuk dalam toleransi.

Penelitian ini menggunakan data ukuran jarak dengan arah penyimpangan prisma 0° , 10° , dan 20° . Data yang digunakan merupakan data sekunder 42 data ukuran jarak pada tiap arah prisma yang dilaksanakan di wilayah *Boulevard* Universitas Gadjah Mada. Jarak yang diukur yaitu jarak antar titik dengan rentang jarak 20 m, 30 m, 40 m, 50 m, 60 m, dan 70 m. Hitung kuadrat terkecil metode parameter digunakan untuk mendapatkan nilai estimasi jarak dan simpangan baku jarak. Nilai ketelitian jarak pengukuran dilakukan dengan hitung kuadrat terkecil metode kombinasi. Evaluasi perbedaan antara masing-masing arah prisma dilakukan uji statistik. Pengujian statistik dilakukan dengan uji signifikansi parameter berpasangan dengan *T-Student*.

Hasil penelitian menunjukkan bahwa selisih nilai estimasi jarak antara arah prisma 10° dengan arah prisma 0° yaitu 0,0934 s.d. 0,4126 mm. Selisih nilai estimasi jarak antara prisma 20° dengan 0° sebesar 0,5439 s.d. 1,0522 mm. Perhitungan kuadrat terkecil metode kombinasi menghasilkan nilai ketelitian pengukuran jarak pada arah prisma 0° sebesar $\pm (0,3288 \text{ mm} + 0,3280 \text{ ppm} * D) \text{ mm}$, pada arah prisma 10° sebesar $\pm (0,5366 \text{ mm} + 0,5352 \text{ ppm} * D) \text{ mm}$, dan pada arah prisma 20° sebesar $\pm (0,9827 \text{ mm} + 0,9801 \text{ ppm} * D) \text{ mm}$. Hasil pengujian signifikansi menunjukkan jarak estimasi menunjukkan arah prisma 0° dan 10° tidak memiliki perbedaan yang signifikan, sementara arah prisma 0° dan 20° memiliki perbedaan yang signifikan. Besaran jarak, simpangan baku, dan ketelitian jarak dipengaruhi oleh arah prisma yang menyimpang.

Kata Kunci : Ketelitian Jarak, *Total Station*, Penyimpangan Prisma, Metode Kombinasi.

ABSTRACT

Total Station is currently widely used in terrestrial topographic mapping. However, measurements with Total Station have various sources of error, one of which is systematic error due to the reflector prism installed at an angle so that it does not lead to the Total Station binoculars. These errors affect the results of the distance measurements obtained. Previous research examined the influence of prism direction on the distance of the Total Station size result by calculating the smallest square alignment of the parameter method. The distance value on the accuracy of $a + b \text{ ppm} * D \text{ mm}$ is considered to have no error, even though the measurement results must contain errors. Therefore, this study aims to examine the influence of the prism direction on the distance data from the Total Station measurement results by calculating the least square of the parameter and the combination methods to obtain the standard deviation value of the estimated distance, the accuracy value of the measurement distance, and the maximum distance included in the tolerance.

This study used distance measurement data with prism tilt directions of 0° , 10° , and 20° . The data used is secondary data of 42 distance measurement data in each direction of the prism, which was carried out in the Boulevard area of Universitas Gadjah Mada. The distance measured is the distance between points with a range of 20 m, 30 m, 40 m, 50 m, 60 m, and 70 m. The least squares of the parameter method obtain the estimated value of the distance and the standard deviation of the distance. The measurement distance's accuracy value is calculated by the least square of the combination method. A statistical test was carried out to evaluate the difference between each direction of the prism. Statistical testing was carried out by testing the significance of parameters paired with T-Student.

The results showed that the difference in the estimated distance between the 10° and the 0° prism direction was 0.0934 to 0.4126 mm. The estimated distance between the 20° and 0° prism direction is 0.5439 to 1.0522 mm. The calculation of the smallest square of the combination method yielded a distance measurement accuracy value of $\pm (0.3288 \text{ mm} + 0.3280 \text{ ppm} * D) \text{ mm}$ in the direction of the 0° prism, in the direction of the 10° prism of $\pm (0.5366 \text{ mm} + 0.5352 \text{ ppm} * D) \text{ mm}$, and in the direction of the 20° prism of $\pm (0.9827 \text{ mm} + 0.9801 \text{ ppm} * D) \text{ mm}$. The significance test results showed that the estimated distance showed that the prism directions of 0° and 10° had no significant difference, while the prism directions of 0° and 20° had significant differences. The magnitude of the distance, the standard deviation, and the accuracy of the distance are affected by the direction of the divergent prism.

Keywords: Distance Accuracy, Total Station, Prism Slope, Combination Method.