

IV. SIMULATIONS RESULTS

Monte-Carlo simulations had been performed to evaluate the performance of the proposed AOA based CTLS location algorithm by compared with LS and WLS algorithms as well as Cramer-Rao lower bound (CRLB). For simplicity, we assumed that a ten-sensor geometry was employed with the sensors locating at $[-42, -12]$, $[-26, 30]$, $[-8, 40]$, $[16, 18]$, $[36, 6]$, $[24, -36]$, $[-12, -24]$, $[-20, 0]$, $[15, -15]$, and $[-30, -40]$ m in the presence of zero-mean and additive Gaussian noises in the AOA measurements. The source location was $[x_s, y_s] = [0, 0]$ m. All results were averages of 10000 independent runs.

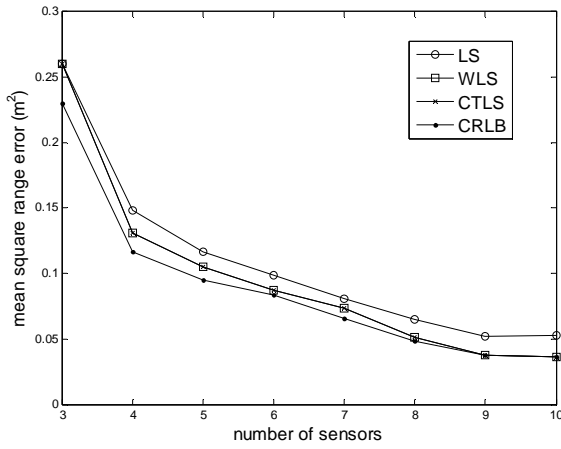


Fig. 2 Mean square range error versus number of sensors under -40 dBrad^2 angle error variance

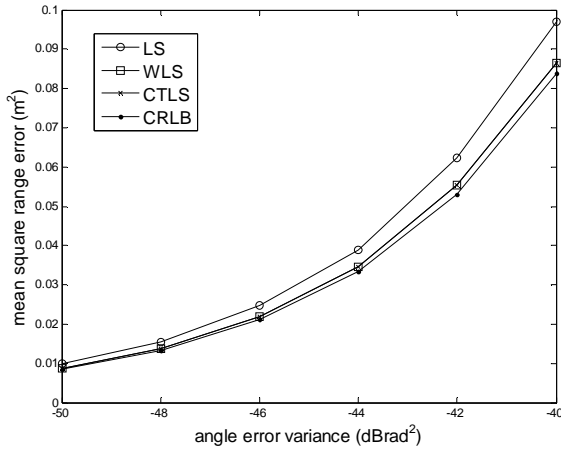


Fig. 3 Mean square range error for 6-sensor geometry

Figures 2 and 3 compare the mean square range errors (MSREs) of the AOA based LS, WLS and CTLS algorithms as well as CRLB. The MSRE was defined as $E[(x_s - \hat{x}_s)^2 + (y_s - \hat{y}_s)^2]$, and its unit was m^2 . In Fig. 2, the minimum sensor number was 3, and the sensors were added successively. It is observed that the MSRE generally decreases as the sensor number increases in Fig. 2 and MSRE grows as the angle error variance increases in Fig. 3. Both Figs. 2 and 3 show that the proposed CTLS algorithm possesses the same performance as WLS and they both outperform LS. However, it is noticed that WLS requires a priori knowledge of the angle errors, which is usually not available or hard to be obtained in practical applications. Hence, CTLS algorithm is more suitable for practical location applications.

V. CONCLUSIONS

The AOA based CTLS location algorithm, which does not require a priori knowledge of the angle errors, has been proposed. Simulation results demonstrate that the performance of CTLS algorithm is close to the CRLB and CTLS algorithm is preferred compared with WLS algorithm in practical scenarios.

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