Figure 4 shows the performances of the two methods under the same conditions as in Figure 3. The results demonstrate that the improvement of LRL1 over the original subspace method increases when the system to be identified becomes sparser.

\[
\begin{bmatrix}
    b_{1,1}^R \\
    b_{2,1}^R \\
    b_{1,2}^R \\
    b_{2,2}^R
\end{bmatrix} = \begin{bmatrix}
    0 & 0 & 1.2080 & 0 & -4.0361 \\
    0 & 0 & -2.7061 & 0 & 0 \\
    0 & 0.0526 & -0.0239 & 0 & 0 \\
    0 & 0 & 0 & 0.1585 & 0
\end{bmatrix}.
\]

Figure 4. Performance comparison (System 2)

5 Conclusion

A noise-robust algorithm for the identification of MIMO systems has been presented. The proposed method leverages reliable system order identification of subspace principle and exploits L1-norm optimization to achieve high effectiveness for identifying systems with sparse transfer function coefficients. While retaining good features of original subspace methods such as the convenience for multivariable systems, the proposed method is shown to be able to significantly improve estimation accuracy for sparse systems.

References


2. P Young, Recursive Estimation and Time-series Analysis: An Introduction (Springer-Verlag, 1984)
