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• **Supplementary File** •

A Memristive Neural Network Based Matrix Equation Solver with High Versatility and High Energy Efficiency

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Appendix A Simulation results of the updated weights

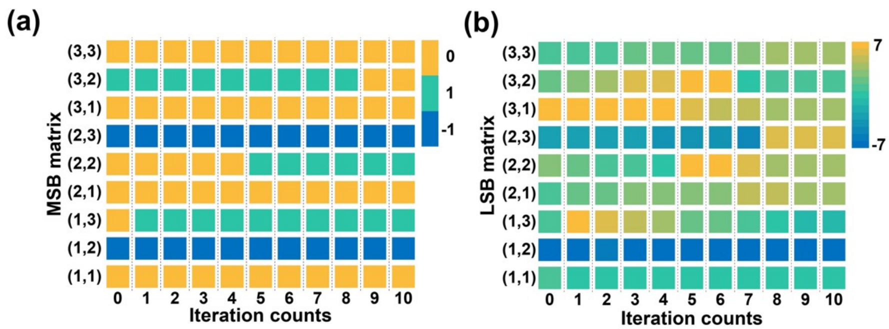

Figure A1 The recorded evolution of the quantized solution value for a 3 × 3 matrix inverse problem. (a) MSB array (b) LSB array. This result shows that the introduce of mixed-precision strategy can strongly reduce the frequency to reprogrammed the devices, which relieves the pressure of the solution operation on the endurance of the device.

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Appendix B Summary of numerical matrices utilized in simulation

Matrices/ Data set	Position	Remark
$\begin{bmatrix} 2 & 2 & 3.5 \\ -3.5 & 2.5 & 0.5 \\ 2 & -2.5 & 2 \end{bmatrix}$	**Figure 4 (a)** **Figure S1**	$k = 3.27$
$\begin{bmatrix} 4 & 2 & 2 \\ 1.5 & 2 & 1.5 \\ 3 & 2 & 3 \end{bmatrix}$	**Figure 4 (b)**	$k = 10.02$
$\begin{bmatrix} 4 & 3 & 4 \\ 3 & 3 & 3 \\ 4 & 3 & 6 \end{bmatrix}$	**Figure 4 (c)**	$k = 28.60$
$\begin{bmatrix} 2 & 1 & 1.5 \\ 2 & 1.5 & 1 \\ 1 & 0.5 & 1 \end{bmatrix}$	**Figure 4 (d)**	$k = 39.48$
$A = \begin{bmatrix} 3 & 1 & 2 \\ -1 & 1 & 2 \\ 2 & 3 & 6 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}$	**Figure 5**	Rank-deficient problem
$X = \begin{bmatrix} -2 & -1 & 0 & 1 & 2 \end{bmatrix}^T$ $Y = \begin{bmatrix} -0.1 & 0.1 & 0.4 & 0.9 & 1.6 \end{bmatrix}^T$	**Figure 6(a) (b)**	Overdetermined problem
$A = \begin{bmatrix} 6 & 7 & 8 & 3 \\ 3 & 5 & 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 7 \\ 8 \end{bmatrix}$	**Figure 6(c) (d)**	Underdetermined problem
$\underbrace{\begin{bmatrix} 3 & -1 & 0 & \cdots & 0 & 0 & 0 \\ -1 & 3 & -1 & \cdots & 0 & 0 & 0 \\ 0 & -1 & 3 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 3 & -1 & 0 \\ 0 & 0 & 0 & \cdots & -1 & 3 & -1 \\ 0 & 0 & 0 & \cdots & 0 & -1 & 3 \end{bmatrix}}_{\text{Dimension=n}}$	**Figure 7(a) (b)**	$k = 3.34$ $(n = 4)$ $k = 4.35$ $(n = 8)$ $k = 4.80$ $(n = 16)$ $k = 4.94$ $(n = 32)$ $k = 4.98$ $(n = 64)$ $k = 4.99$ $(n = 128)$