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# A Proposal of Residual Reduction method with preconditioning based on IDR Theorem

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IDR( $s$ ) method [4] and extended variants of IDR( $s$ ) method [3] based on the IDR Theorem have been proposed one after another. The authors also proposed IDR( $s$ )-based iterative method with iteration matrix of SOR (Successive Over-Relaxation) method in order to accelerate its convergence [2]. In my talk, we propose an algorithm of IDR( $s$ )-based Residual Reduction method using precondition with Eisenstat trick [1]. We refer to IDR( $s$ )-R2 method. We present summary of performance of IDR( $s$ )-R2 method using some preconditions with Eisenstat trick in Table 1. We realize that preconditioned IDR( $s$ )-R2 method outperforms with the conventional iterative methods.

Table 1: Summary of performance of preconditioned IDR( $s$ )-R2 method.

method	precond.	no. of convergence	no. of nonconvergence	no. of fastest case	total (%)
IDR( $s$ )-R2	none	11/18	7/18	0/18	0
	Gauss-Seidel-L	<b>18</b>	0	8	<b>14</b> (61%)
	Eisenstat-L	<b>17</b>	1	1	
	Eisenstat-UL	<b>17</b>	1	5	
BiCGStab	ILU(0)	15	<b>3</b>	5	5(22%)
BiCGSafe	ILU(0)	15	<b>3</b>	4	4(17%)

## References

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