TOULOUSE INP N7

Project report – Calcul scientifique

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1 Limitations of the power method

We test with matrices of the following shapes

1 $\begin{pmatrix} 1 & & & (0) \\ & 2 & & \\ & & 3 & \\ & & & \ddots \\ (0) & & & n \end{pmatrix}$

2 diag(`random(1e-10, 1)`)

3 $\text{diag}\left((10^5)^{-\frac{i-1}{n-1}}\right)_{i\in[\![1,n]\!]}$

4 $\text{diag}\left(1-(1-10^{-2})\frac{i-1}{n-1}\right)_{i\in[\![1,n]\!]}$

Type / Alg	1	2	3	4
`eig` (10)	20 ms	0 ms	10 ms	10 ms
`power` (11)	1.77 s	40 ms	60 ms	1.81 s
`power` (12)	0.9 s	60 ms	60 ms	0.93 s
`v0` (0)				

Table 1: Computation time comparisons

1.1 Main computing time drawback of the improved deflation method

`power_v12` is slower than `power_v11` on matrices of type **2** (diagonal matrices of random floating point values close to zero). It *is* twice as fast on matrices of type **1** or **4**.