

REVIEW 2 OF THE MANUSCRIPT: MS BJASt 31213. ON THE INVERTING OF A GENERAL HEPTADIAGONAL MATRIX

1. MINOR REMARKS

1. Page 2, line 8. Write: When at least one of g_i equals to 0,...
2. For a reference to Maple, replace [14] with
Maple software. website: <http://www.maplesoft.com/>
3. About Point 8, Review 1. Remove the parenthesis $|i - j| \leq 3$.
4. Abstract, line 2. Write: ..is $O(n^2)$ operations in $\mathbb{C}$.
You must say in the introduction that you work in the field of complex numbers $\mathbb{C}$.
5. Pages 3-4. Replace Lemma 2, Theorem 2.1 with
Theorem. H is invertible iff $X_{n+1} \neq 0$ and , for every i , $g_i \neq 0$.
More precisely, $\det(H) = -(\prod_{i=1}^{n-3} g_i)X_{n+1}$.
Remark. If, for every i such that $g_i = 0$, we put $g_i = t$ for a small $t \neq 0$, and if $H|_{t=0}$ is invertible, then $X_{n+1}(t) \neq 0$.
In particular, you must explicitly write that you put $g_i = t$ (Not only page 4, within the algorithm 3.2).
6. Page 4. In the formulae $C_n =, C_{n-1} =, C_{n-2} =,$ put only X_{n+1} and not Y_{n+2}, Z_{n+3} .
7. Page 7. From Step 5 to Step 6; see the last rows of the matrices ??
8. Page 8. The chapter "Conclusions" is useless.
9. Page 7, lines -1,-2 and Page 8, Table 1. The relative error MRE is off topic; indeed, the calculation gives the true value!

2. IMPORTANT REMARKS

10. Page 7-8. Example 4.3 and Table 1. Considering a special matrix is not a good idea; the reader might think that your algorithm is more efficient when applied to this type of matrix. Instead, choose random matrices. Moreover, your algo is interesting only for large values of n . I obtain the following means of the duration of the calculations. Note that I replace your line $eval(evalm(SS), x = 0)$ (which is very slow) with $x := 0 : res := SS :$ (which gives the result instantly). On the other hand, s is the number of zero g_i 's. The entries of the matrix are random integers in $[[-100, 100]]$.

$n = 500$. SIN: $s = 0 \implies 66''$, $s = 1 \implies 192''$, $s = 2 \implies 287''$.

Maple: 220''.

$n = 1000$. SIN: $s = 0 \implies 495''$, $s = 1 \implies 1840''$.

Maple: 2470''.

Conclusion. The case $s \geq 2$ has no interest; therefore, it must be removed from the paper. The case $s = 1$ is not very interesting; yet, if you wish, you can keep it. Only the case $s = 0$ is really interesting.

11. When one of the g_i is 0, you can consider H^T and have a look at the a_i . If they are non zero, then apply your algo to H^T ...

12. Page 8. Example 4.4 and Table 2. I'm not convinced by what you write. Indeed, with Maple, you can directly proceed as follows:

restart; with(LinearAlgebra); UseHardwareFloats; roll := rand(-100 .. 100);

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n := 1000; A := Matrix(n, n, proc (i, j) options operator, arrow; roll() end
proc, datatype = float[8]); for i to n do for j to n do if abs(i - j) > 3 then A[i, j]
:= 0 end if end do end do; A; t := time(); B := 1/A; time()-t; evalf(Norm(A.B-
IdentityMatrix(n)));
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The case $n = 1000$ is solved in 0"9 with the error $Norm(H.H_{inv} - I_n) \approx 10^{-11}$. Of course, when we choose a random matrix, then, in general, it is well conditioned.

13. About Point 5, Review 1. To do your calculations, you assume that $t \neq 0$; thus you cannot directly put $t = 0$, except if you use a continuity argument.