EDISON

Electromagnetic Design of
flexIble SensOrs

FNP Team-Tech

Report 4 - SOAR, TOAR, SAPOR

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1.0	15.07.2018		created

1. Basis orthogonality algorithms: SOAR, TOAR and SAPOR

Basing on [1], coparison of SOAR (Second Order Arnoldi Procedure), TOAR (Two-level Orthogonal Arnoldi Procedure) and SAPOR (single-point second-order Arnoldi method for passive order reduction) have been made on few examples. The comparison applies to the following properties:

- orthogonality of base
- speed of algorithm
- reference error

Two problems defined differently have been taken into account:

- Butterfly gyroscope - $A(s)x = B$, presented in article [1]
- Wideband antenna - $A(s)x = sB$

Table : Comparison of simulation time for algorithms

	SOAR	SAPOR	TOAR
Gyroscope	4.2 s	9.8 s	5.7 s
Antenna	57 s	85 s	64 s

References

[1] Lu, Ding, Yangfeng Su, and Zhaojun Bai. *Stability analysis of the two-level orthogonal Arnoldi procedure.* SIAM Journal on Matrix Analysis and Applications 37.1 (2016): 195-214.

1.1. Butterfly gyroscope

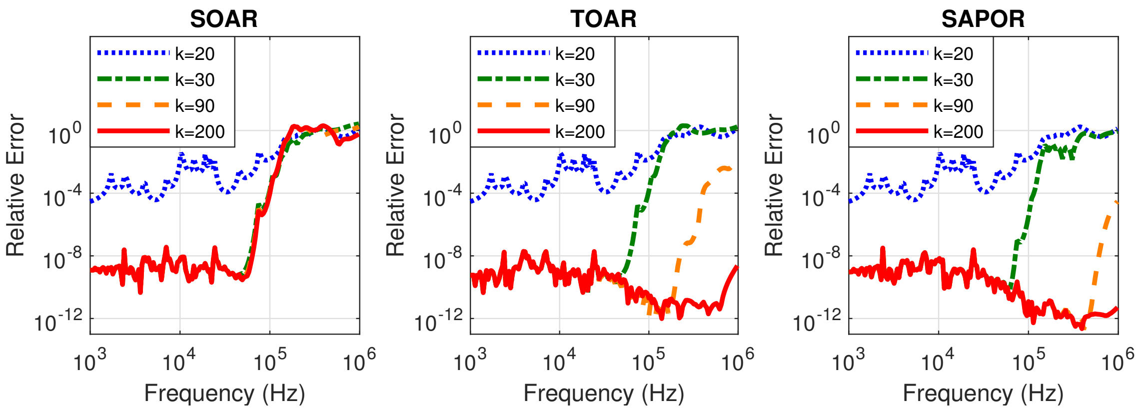

Figure 1: Comparison of real error for SOAR, TOAR and SAPOR algorithms.

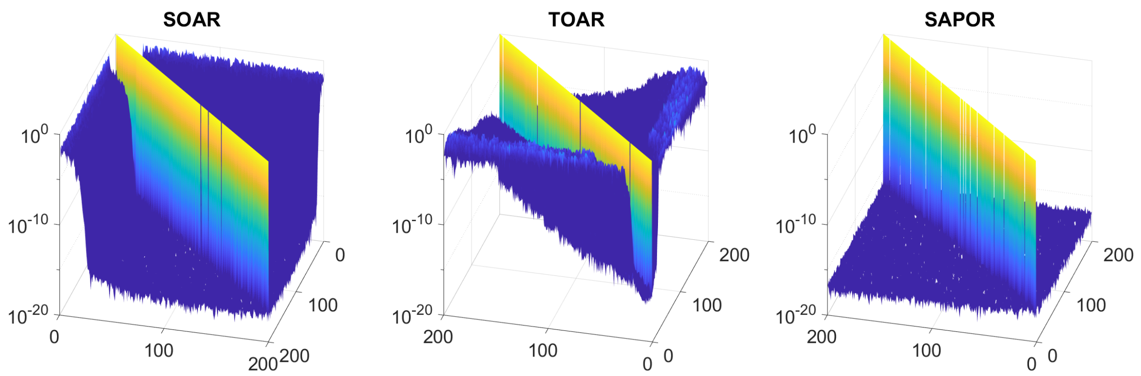

Figure 2: Basis orthogonality given by formula: |QT*Q|. Note that SOAR (x,y) axis is shown reverse.

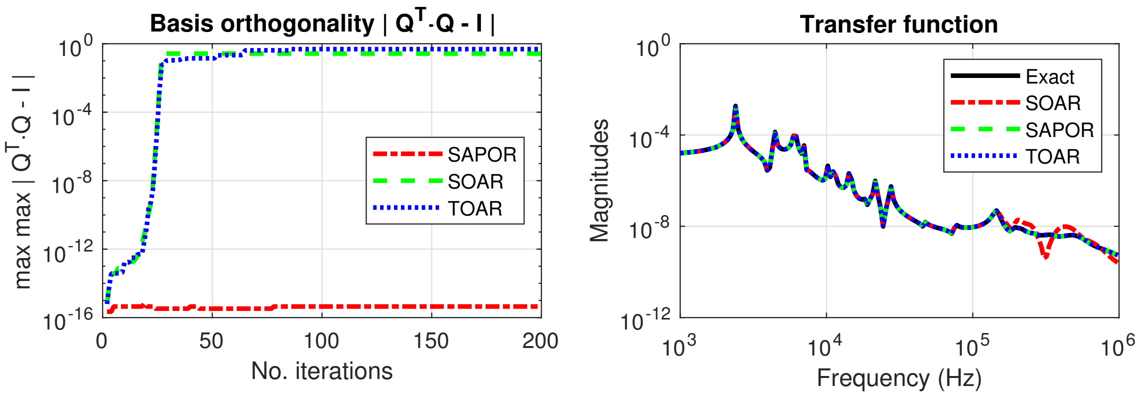

Figure 3: On the left: Basis orthogonality along No. Iterations given by formula: |QT*Q-I|. On the right: Transfer functions at No. moments=200.

1.2. Wideband Antenna

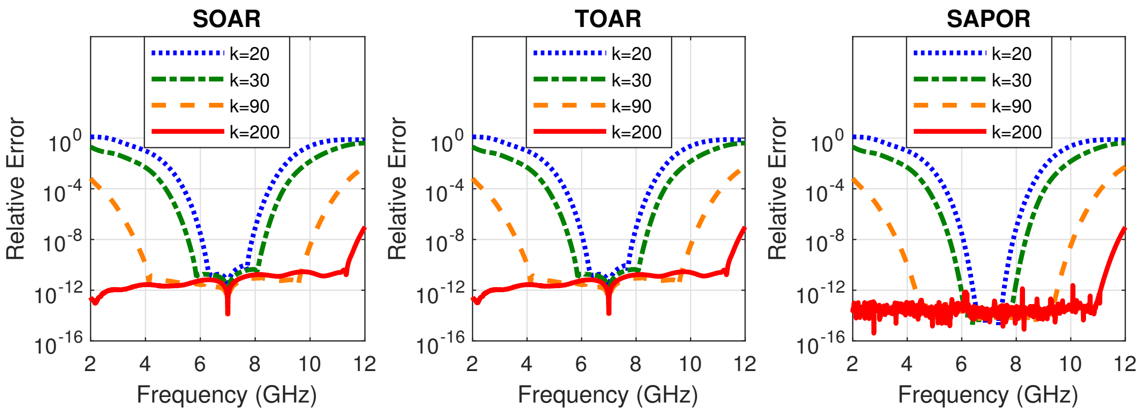

Figure 4: Comparison of real error for SOAR, TOAR and SAPOR algorithms.

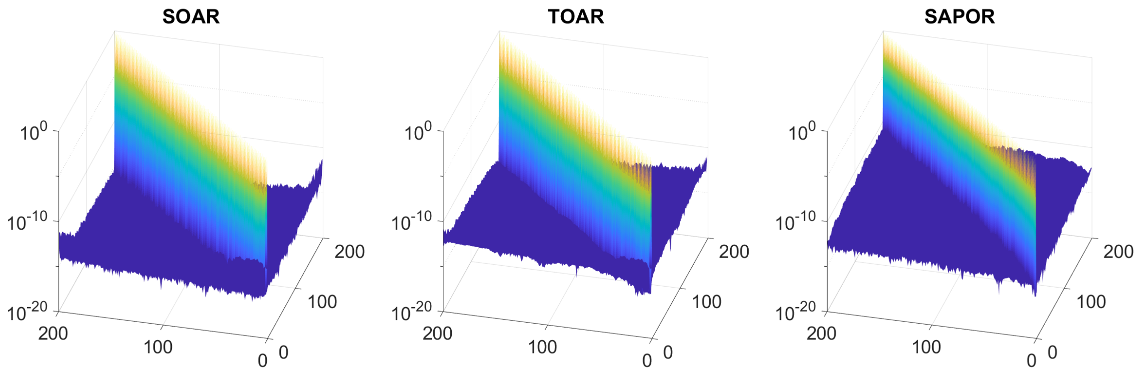

Figure 5: Basis orthogonality given by formula: |QT*Q|.

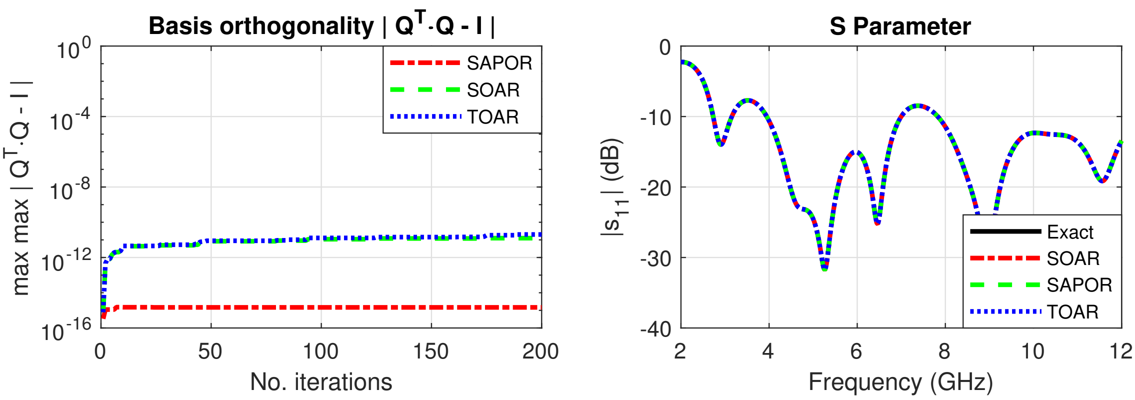

Figure 6: On the left: Basis orthogonality along No. Iterations given by formula: |QT*Q-I|. On the right: Transfer functions at No. moments=200.