

# A UNIFICATION OF UNITARY SIMILARITY TRANSFORMS TO COMPRESSED REPRESENTATIONS

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A new framework for transforming arbitrary matrices to compressed representations is presented. The framework provides a generic way of transforming a matrix via unitary similarity transformations to e.g. Hessenberg, Hessenberg-like and combinations of both. The new algorithms are deduced, based on the  $QR$ -factorization of the original matrix. Based on manipulations with Givens transformations, all the algorithms consist of eliminating the correct set of Givens transformations, resulting in a matrix obeying the desired structural constraints.

Starting from this new reduction procedure we investigate further correspondences such as irreducibility, unicity of the reduction procedure and the link with (rational) Krylov methods.

The unitary similarity transform to Hessenberg-like form as presented here, differs significantly from the one presented in earlier works [1, 2]. Not only does it use less Givens transformations to obtain the desired structure, but also the convergence to rational Ritz values is not observed in the standard way.

## References

- [1] R. Bevilacqua, G. M. Del Corso, *Structural properties of matrix unitary reduction to semiseparable form*. *Calcolo*, Vol. 41 (4), (2004) pp. 177–202
- [2] M. Van Barel, R. Vandebril, and N. Mastronardi, *An orthogonal similarity reduction of a matrix into semiseparable form*, *SIAM Journal on Matrix Analysis and Applications*, Vol. 27 (1), (2005) pp. 176–197