Computing Sturm sequences with matrix triangularization

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Polynomial division is the classical way to compute Sturm sequences to be used, for example, in the isolation of the real roots of polynomials. However, as was indicated in the past by the first author [1], there is also Van Vleck's theorem of 1899, which computes *complete* Sturm sequences with matrix triangularization. We recently took another look at Van Vleck's theorem and --- with the help of the excellent computer algebra system Xcas --- it was discovered (by the last author) that its statement depends on the algorithm used to triangularize Sylvester's matrix.

In this talk we first present the same example used by Van Vleck ([2], p. 9) to demonstrate the algorithmic dependency of his proposition and then we state our own version of the theorem, which additionally deals with the case of pivots --- dealt with by the second author. Finally, we demonstrate our version of the theorem with various examples run on a program written by Ifigenia in Xcas.

1. Akritas, A. G.: A new method for computing polynomial greatest common divisors and polynomial remainder sequences. Numerische Mathematik 52, 119-127, 1988.

2. Van Vleck, E. B.: On the determination of a series of Sturm's functions by the calculation of a single determinant. The Annals of Mathematics, Second Series, Vol. 1, No. 1/4, 1-13, 1899 - 1900.