Matrix Problems And Poset Representation Theory to Simulate Virus Infection-Detection

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Abstract

One of the most outstanding matrix problems is the biquadratic homogeneous matrix problem (BHP) which consist of finding a canonical form for rectangular matrices over a natural (G, G)-bimodule, $W = G \otimes G$ with respect to left elementary transformations of rows and right elementary transformations of columns over G. Under some restrictions this problem is equivalent to the pseudo-linear pencil problem introduced and solved by Sergeichuk [1][4].

An interesting version of the BHP is the classification of equipped posets introduced by A.G. Zavadskij and his doctoral student A.V. Zabarilo. As in the case of ordinary posets, the main tools to classify equipped posets are the algorithms of differentiation. Zavadskij defined algorithms I, VII-XVII which allow to classify equipped posets of tame representation type [2][3][5].

In this talk, we describe how we can use the algorithm of differentiation VII in order to model interactions between informatic worms and viruses. Actually, the process of integration defined also by Zavadskij is a way to interpret an infection stage of a computer network whereas the differentiation algorithm is a way to detect infected files in these kind of systems.

References

[1] V.V. Sergeichuk, *Pseudolinear matrix pencils and systems of linear differential equations with meromorphic coefficients*, Differ Uravneniya **25** (1989), 1721–1727 (in Russian); English transl., Differ. Equations **25** (1989), 1201–1206.

[2] A.G. Zavadskij, *Tame equipped posets*, Linear Algebra Appl. **365** (2003), 389–465.

[3] _____, *Equipped posets of finite growth*, Representations of Algebras and Related Topics, AMS, Fields Inst. Comm. Ser. **45** (2005), 363–396.

[4] _____, *On the Kronecker problem and related problems of linear algebra*, LAA **425** (2007), 26–62.

[5] _____, *Representations of generalized equipped posets and posets with automorphisms over Galois field extensions*, Journal of Algebra **332** (2011), 386-413.