



istanbul matematiksel bilimler merkezi
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ORTHOGONAL PROJECTION ONTO RATIONAL SURFACES

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Abstract

I will present a new algebraic approach for computing the orthogonal projection of a point onto a rational algebraic surface embedded in the three dimensional projective space, which is a joint work with Nicolás Botbol, Laurent Busé and Marc Chardin. Our approach amounts to turn this problem into the computation of the finite fibers of a generically finite trivariate rational map whose source space is either bi-graded or trigraded and which has one dimensional base locus: the congruence of normal lines to the rational surface. This latter problem is solved by using certain syzygies associated to this rational map for building matrices that depend linearly in the variables of the three dimensional ambient space. In fact, these matrices have the property that their cokernels at a given point p in three dimensional space are related to the pre-images of the p via the rational map. Thus, they are also related to the orthogonal projections of p onto the rational surface. Then, the orthogonal projections of a point are approximately computed by means of eigenvalues and eigenvectors numerical computations. Here, we rely on numerical linear algebra in order to deal with floating-point data.

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Place: IMBM, Boğaziçi University South Campus