

Fast algebraic solvers for computer vision problems

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Many problems in computer vision, but also in other field such as robotics or control design, can be formulated using systems of polynomial equations.

For computer vision problems, general algorithms for solving polynomial systems cannot be efficiently applied. The reasons are twofold - computer vision and robotic applications usually require real time solutions, or they often solve systems of polynomial equations for millions of different instances. Several approaches based on algebraic geometry have been recently proposed for the design of very efficient algorithms (solvers) that solve specific classes of systems of polynomial equations.

In this talk we will briefly discuss such method for creating efficient solvers of systems of polynomial equations. This method is based on Gröbner bases and it uses the structure of the system of polynomial equations representing a particular problem to design an efficient specific solver for this problem. We will discuss several approaches for improving the efficiency of the final solvers. We will also introduce the automatic generator of Gröbner basis solvers which could be used even by non-experts to efficiently solve problems resulting in systems of polynomial equations. Finally, we will demonstrate the usefulness of the approach by presenting new, efficient and numerical stable solutions to several important computer vision problems and problems from robotics.