Meeting: 1001, Evanston, Illinois, SS 15A, Special Session on Mathematical Problems in Robotics

1001-68-290 **Jean A Ponce*** (ponce@cs.uiuc.edu), Beckman Institute, 405 N. Mathews Ave., Urbana, IL 61801. *Computer Vision Challenges: 3D Photography and Object Recognition.*

This talk addresses two fundamental computer vision problems: The first one is dubbed 3D photography, and it is concerned with the automated acquisition of three-dimensional object and scene models from multiple pictures. My group's work in this area has a clear (if perhaps shallow) mathematical flavor, and it involves elementary notions of projective and differential geometry. Concretely, I will discuss some qualitative properties of the image formation process for solids bounded by smooth surfaces, as well as their application to the construction of visual hull models from weakly calibrated images. I will also present a relative of Chasles' absolute conic, dubbed the absolute quadratic complex, and discuss its applications to the calibration of cameras with rectangular or square pixels without the use of calibration charts. I will conclude with a discussion of the second focus of our current research, namely 3D object recognition from photographs and video clips. This is probably the most challenging and exciting problem in computer vision, but–despite some exciting progress–it is perhaps the most poorly understood today. I will present some of our recent results and discuss a number of open issues. (Received August 30, 2004)