Aerospace Visual Navigation Technology and Applications

Professor Qifeng Yu 于起峰

Academician of Chinese Academy of Sciences

National University of Defense Technology

Abstract

In the ever-evolving aerospace domain, aerospace visual navigation technology is pioneering a new era of autonomous operation and space exploration with its distinct advantages. In this presentation, we will discuss three main research topics of our group, namely aircraft visual navigation and localization, spacecraft pose estimation, and visual guidance for landing. Recent advancements and potential applications in the field will be comprehensively introduced.   1) Aircraft visual navigation and localization technology enables autonomous navigation and precise location through heterogeneous image matching and target recognition, facilitating the operation of aircraft in complex environments. 2) The technology for estimating the relative pose of space objects ensures the accuracy and reliability of space maneuvers by accurately calculating the relative position and orientation between the camera and the target. We will introduce its applications, including satellite docking, extravehicular activities of astronauts, and lunar sample collection. 3) The visual guidance technology for landing utilizes an onboard camera to achieve autonomous and automatic landing tasks for aircraft.

Qifeng Yu is an Academician of the Chinese Academy of Sciences. He received his B.Eng. degree in Department of Aircraft Engineering in Northwestern Polytechnical University and the M.Eng. Degree in College of Aerospace Science and Engineering from National University of Defense Technology, Ph.D. in Precision Photomechanics from the University of Bremen in Germany in 1981, 1984 and 1995 respectively. Since 1991, he has been a Full Professor at National University of Defense Technology. Currently, he serves as the Deputy Director of the Science and Technology Committee of the National University of Defense Technology. He currently holds positions such as Special Director of the Chinese Society of Theoretical and Applied Mechanics, Executive Director of the Chinese Society for Optical Engineering, Deputy Editor-in-Chief of Acta Mechanica Sinica (English Edition), and Director of the Hunan Provincial Key Laboratory of Image Measurement and Visual Navigation. Yu Qifeng has led and completed the National Defense 973 Project and several national major equipment development projects, achieving significant theoretical innovations and national defense applications. He pioneered the emerging interdisciplinary field of camera measurement in China and has accomplished several key equipment tests. He has received one second prize of the National

Technological Invention Award, the Hunan Provincial Natural Science First Prize, the Hunan Provincial Technological Invention First Prize, and ten other provincial and ministerial-level awards. Yu Qifeng has published three monographs, over 300 academic papers, and holds more than 80 invention patents.