Accurate visual surveying for dynamical estimation of slender manipulators in extreme environments

Remote Applications in Challenging Requirements (RACE), Culham Centre for Fusion Energy, UK Atomic Energy Authority.

Roger Powell

Email: roger.powell@ukaea.uk

Future fusion reactors contain components which must be transported using remote maintenance systems with no human access. The components are so large that they and the manipulators deform significantly under their own weight. Flexible, light-weight manipulators are increasingly required in extreme environments including nuclear fusion and space due to geometric and weight constraints.

A prerequisite to the control of such flexible manipulators and their payloads is the acquisition of accurate and hence reliable estimates of time-varying position and velocity coordinates. One approach is to process and fuse data from visual sensors in order to determine estimates of position and velocity, taking into account the physics of the flexible systems. Control of these systems requires application of state-of-the-art control and modeling techniques.

This presentation will provide an overview of a range of RACE research that is relevant to state-estimation and control of flexibly deforming systems, techniques which are applicable to both nuclear and space manipulation tasks.

Short Bio:

Dr Powell obtained his PhD (part-time) from Durham in 1991 for work on state-estimation techniques for large-scale, non-linear systems used in monitoring and control. He has attracted grants and contracts totalling over £1 million. He was part of the GridCC project (http://www.gridcc.org/) and later was an active member of Grid for Particle Physics (GridPP). He was a member of Brunel University's Centre for Sensors and Instrumentation which was responsible for work at CERN and contributed to the development of particle-tracking methods for both the Compact Muon Solenoid (at CERN) and the Muon Ionisation Cooling Experiment at the Rutherford Appleton Laboratory. He created Brunel University's Robotics and Autonomous Systems group but left to join RACE (Remote Applications in Challenging Environments) at the Culham Centre for Fusion Energy (CCFE) where he has worked on the control of large non-rigid payloads using semi-flexible robotics actuators.