Towards routine use of flexible, assistive robotics in hazardous environments

The objective of the Nuclear & Applied Robotics Group at U.T. Austin is to develop future engineering researchers with the requisite background and experience to bring advanced, flexible, assistive robotics into hazardous environments. In this context, flexible refers to systems designed for multi-user/multi-use with minimal to no workspace integration necessary. To meet our objective, the university has developed supporting programs with three key elements: (1) an interdisciplinary and highly customized curricula, (2) results-focused research projects that address fundamental engineering issues related to robotics in radiation and other hazardous environments, and (3) continual collaboration with domain experts/mentors for relevant applications. Our mission is to reduce the operator's burden when completing tasks involving hazardous materials and/or environments. The emphasis is on operational safety (radiation dosage, ergonomic, and other injuries) where robotic systems can augment the operator in the task space, complete tasks autonomously, or remotely via intuitive interfaces.

To minimize development time and accelerate deployment, we utilize proven, commercially available hardware. We focus our research efforts on reducing the operator's burden, so they are not responsible for managing low-level elements in the system. Systems must manage their own internal configuration to avoid collisions, joint limits, payload limits, applying excess contact force, etc. allowing the operator to focus on high-level task supervision. Finally, we must fully address safety concerns associated with the operator, task components and the environment. To meet these needs, our group is composed researchers integrating a broad set of robotic capabilities. Individual efforts thus focus on a wide range of research topics including mobility, navigation, control, vision, grasping, autonomy, partial autonomy, radiation characterization, and human-machine interfaces. This presentation will review our approach to research given our application focus, as well as some recent accomplishments related to inspection, mobile manipulation, glovebox manufacturing, and Non-Destructive Testing (NDT) applications.

Just some pictures if you want them.



The VaultBot dual-arm mobile systm (left) under the control of a USW (United Steel Worker) union operator using UT's hands-free, voice recognition interface (center) and a mobile inventory/inspection/survey vehicle with its new operators and employees of the Portsmouth Gasseous Diffusion Plant (right).

Short Bio

Dr. Pryor is a Senior Research Scientist at The University of Texas Austin whose research focuses on **increasing the autonomy of robotics and automated systems through advanced control, decision-making and sensor integration.** The emphasis is on tasks completed in uncertain, hazardous environments using proven, industrial hardware. Application areas have included nuclear material handling, autonomous remote inspection, manufacturing, energy production, and medical applications.

Specific research areas include contact/force control, redundancy resolution, grasping, mobile manipulation, tele-operation, autonomy, and human-machine interfaces.

Dr. Pryor co-founded the **Nuclear & Applied Robotics Group** in 2008 and the **Drilling Rig Automation Group** in 2011 which have combined to undertake over $19.5M in funded research projects. Both groups are collaborative, interdisciplinary programs where students complete selected coursework specific to their respective application domain. Students develop increasingly autonomous systems that reduce the burden on the operator and modernize the capabilities of our nation's workforce in critical industries. Dr. Pryor currently has over 120 publications. He currently serves as the Director of UT Austin's Robotics Center of Excellence (RCOE) which facilitate research into long-term autonomy and human-machine interfaces with the DoD's Army Futures Command.

Learn more at https://robotics.me.utexas.edu.