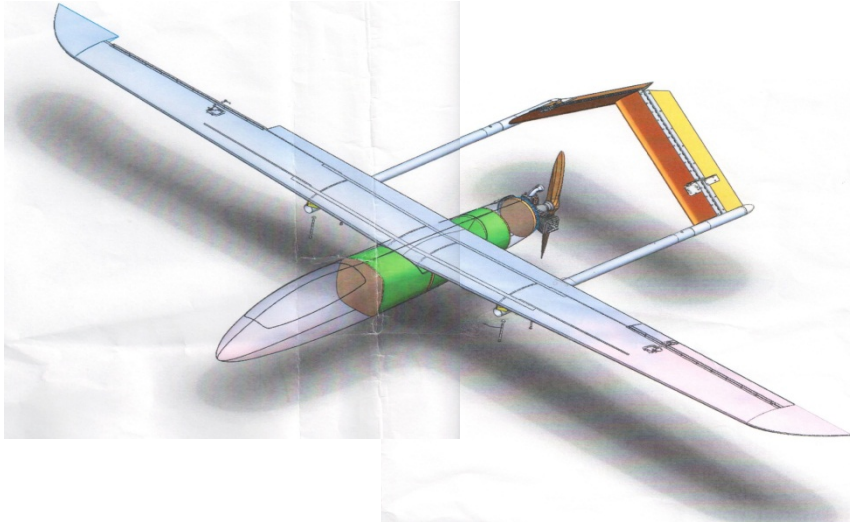


Systems Integration Research



Our group is focused on systems integration research with research activities related to two applications area of significant importance, one related to expanding wireless technology applications and the other related to cyber security.

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“Advancing system applications of wireless technologies.”



Wireless & System-Aware Cyber Security

Our focus on wireless technology applications relates to broadband wireless applications, where the intersection of using large data sets and the inherent limitations associated with wireless transmission create the need for new innovations that support important needs. Our research spans from exploring healthcare applications involving transmission of body sensor information for monitoring and responding to the needs of patients, to sensor-based monitoring of factory production lines to assess the performance and training of humans, as well as the quality of the design of manufacturing processes. The manufacturing activities involve collaboration with a Virginia-based consortium of manufacturing companies, including Rolls Royce, Siemens, and several others. These efforts are mainly conducted through the NSF-sponsored multi-university Industry/University Cooperative Research Center called WICAT (Wireless Internet Center for Advanced Technology), in which UVa is one of the partner Universities. WICAT is one of the largest I/UCRC's that NSF sponsors, involving a variety of companies in the systems development and wireless device businesses, and the partnership of UVa, NYU Poly, Virginia Tech, University of Texas, and Auburn University.

Cyber Security

Our other main area of research involves the development of what we refer to as System-Aware Cyber Security. This research activity is developing new security solutions that are embedded within the application layer of systems, complementing network and perimeter security solutions. Solution classes are expressed through design patterns, such as "physical configuration hopping: for a moving target solution, or "data consistency checking" that requires attackers who corrupt data to develop exploits that assure that a broad set of system data is kept internally consistent. Current efforts are looking into applying developed design patterns into specific systems, such as unmanned air vehicles or turbines. Insider and supply chain attacks that evade network and perimeter security measures are an important threat basis for suggested solutions. In addition to specific solution development and evaluation, decision support tools are under development for supporting systems engineers regarding the integration of a set of solutions into an overall cost-effective architecture that eliminates large asymmetries between attack solutions and defensive measures. The DoD and a set of companies including SAIC, Northrup Grumman and General Electric are engaged in supporting this research effort.

RECENT RESEARCH DEVELOPMENTS

- Experiments involving transmission of sensor data from ambulances to the UVa Hospital in potential emergency situations have led to development of operational protocols with supporting technology to aid emergency responders in deciding when to transmit their data. Time-to-transmit decisions must account for both quality of wireless service & time constraints regarding emergency room preparation for treating the patient.
- System Aware Cyber Security solutions have progressed to the initiation of a program involving live evaluations regarding protecting an autonomous surveillance systems on-board an UAV. Efforts are focused on advancing from simulation to actual system hardware/software in the loop emulation, while planning the following steps required to transition to protection of the live system in flight.

RECENT GRANTS

- DOD/SERC – Security Engineering
- NSF – Center on Rapidly Reconfigurable Mission Critical Wireless Systems
- NSF – Wireless Internet Center for Advanced Technology

SEAS Research Information

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