

PRESS RELEASE

From the University of Illinois Information Trust
Institute and the Department of Industrial &
Enterprise Systems Engineering



Illinois Students Win “Student of the Year” Honors from Boeing

University of Illinois doctoral student Juan S. Mejia has won the second-place award in the Boeing Company’s prestigious Engineering Student of the Year Award competition, and two other Illinois students received Honorable Mention honors.

Mejia, who is pursuing his doctorate under the guidance of Professor Dušan Stipanović in the Information Trust Institute and the Department of Industrial & Enterprise Systems Engineering at Illinois, was honored for his ongoing work in trustworthy distributed control and coordination of autonomous vehicles. Coincidentally, the research for which he won the award is funded by Boeing, through a project entitled “Trustworthy Collision Avoidance Over Information Links” in the Boeing Trusted Software Center in the Information Trust Institute.

Mejia’s adviser offered high praise of his student’s abilities. “Juan is an excellent researcher, but also extremely knowledgeable and skillful in implementing his results. He does extremely well as an individual, as a team member, and as a team leader,” said Stipanović. “He is a role model for his peers in every sense of this expression.”



Juan S. Mejia of the University of Illinois, 2nd place winner in the Boeing 2008 Engineering Student of the Year competition

Most of Mejia’s graduate work has concentrated on “model predictive control” techniques for distributed control and coordination of multiple autonomous vehicles, such as mobile robots and airplanes. Model predictive control, also known as “receding time horizon control,” is an optimization-based control approach used for stabilizing dynamic systems and controlling complex systems. It is valued for its ability to achieve system performance goals while simultaneously handling system constraints.

As Mejia explained, “The main goal of my thesis work is control and coordination of multiple vehicles with nonlinear dynamics performing multiple tasks, such as pursuing desired targets and trajectory tracking or path following, while also satisfying vehicle safety conditions by guaranteeing that there won’t be any collisions between vehicles or with static objects. Within that framework, the use of receding horizon control as a tool for achieving desired objectives is advantageous, in its ability to handle new and unexpected events, such as potential conflicts with vehicles and objects that appear, or changes in strategy that result from new goals.”

Portions of Mejia’s work have already been implemented in Boeing’s Swarm testbed, and other portions will soon be implemented in a newly completed mobile robotic testbed in the Robotics Laboratory at the University of Illinois, where he is the student team leader.

Ultimately, his work could lead to improvements in a wide variety of real-world applications, with

transportation technologies, particularly air traffic management, being the most likely beneficiaries. Specifically, the research can be expected to improve the safety of such systems. For example, Mejia explains, an airplane could incorporate a safety verification system (on top of current systems in use) to provide detection and suggest re-planning in the case of potential conflicts overlooked by a central air traffic manager. The same technology could also be generalized to underwater vehicles, ground vehicles, motorboats, and other forms of transportation in assisting safety and coordination.

In addition to first-place and second-place winners, Boeing recognized four Honorable Mention recipients, two of whom are graduate students at Illinois. Manu Sharma, who is pursuing a Ph.D. in Aerospace Engineering with Professor Joanna M. Austin, was acknowledged for his work on experimental investigation of hypervelocity flow environments, with specific emphasis upon high-temperature effects, using a newly constructed expansion tube that he helped to design and construct. Anirban Basu, who is a Ph.D. student in Electrical & Computer Engineering under the guidance of Professor Ilesanmi Adesida, was honored in recognition of his work on advanced design and fabrication techniques of gallium nitride-based power amplifiers for harsh environment applications, such as airplanes and satellites.

Boeing's annual international competition is now in its third year. It attracted a record number of entries in 2008, and drew applications from nations around the globe, including Australia, India, Singapore, South Africa, and the United Kingdom, among others. The contest is intended to encourage students to pursue careers in aerospace engineering. According to Boeing, the winners are selected based on the extent to which their work is judged "likely to impact the future of aerospace engineering in areas such as new or enhanced capabilities, systems, processes, or tools; new levels of performance; and improved life cycle costs." The first-place winner for 2008 was Agnes Blom of Delft University in The Netherlands.

About the Department of Industrial & Enterprise Systems Engineering (IESE)

The twenty-first-century workplace demands employees with technical literacy and an understanding of business. The Department of Industrial and Enterprise Systems Engineering (IESE), one of the newest departments in the University of Illinois College of Engineering, answers this need emphatically. Created to lead an emerging discipline that unites business with systems engineering, IESE offers the tech-focused education that students need in order to thrive in an enterprise-oriented world. For more information, visit www.iese.uiuc.edu.

About the Information Trust Institute (ITI)

The Information Trust Institute is a multidisciplinary cross-campus research unit housed in the College of Engineering at the University of Illinois at Urbana-Champaign. It is an international leader combining research and education with industrial outreach in trustworthy and secure information systems. ITI brings together over 90 faculty, many senior and graduate student researchers, and industry partners to conduct foundational and applied research to enable the creation of critical applications and cyber infrastructures. In doing so, ITI is creating computer systems, software, and networks that society can depend on to be trustworthy, that is, secure, dependable (reliable and available), correct, safe, private, and survivable. Instead of concentrating on narrow and focused technical solutions, ITI aims to create a new paradigm for designing trustworthy systems from the ground up and validating systems that are intended to be trustworthy. www.iti.uiuc.edu

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Released September 24, 2008



University of Illinois at Urbana-Champaign