December 3, 2012 **Remarks by Panos Antsaklis**
Universite de Lorraine **on accepting the Honorary Degree**

Madame Rector, Mr. President, Distinguished Members of the University Administration, Distinguished Colleagues, Distinguished Guests, Fellow Honorees, Students.

This is a great **honor indeed** and I would like to thank my colleagues for considering my accomplishments worth this great honor and the University for making it possible.

This is a true milestone in one's career and makes one look back, take stock. Certainly I did not accomplish this alone! There are many-many people who have helped and influenced me along the way, starting with my teachers and my students, and I would like to thank them all.

The **research** I do is in the area of (Automatic) Control and Automation. Also known as Systems and Control, it is closely related to Computers, Communication Networks, Information Technology. I use mathematics to describe systems I want to control, and then I design decision making systems to do exactly that.

Where do we find such control systems? In short, everywhere. In our car, ABS brakes, traction control, cruise (speed) control, Electronic Stability Controls, fuel injection, emission control and more recently ACC, lane maintaining control. Also when stabilizing the image in your hand held cam recorder. Also in automatic pilots in airplanes. In ships-cruise ships. In factories. In refineries. Inside our bodies.

Feedback control is everywhere, but it is hidden inside. We call control the **stealth technology**, the hidden technology.

Control methods are used whenever some quantity, such as temperature, altitude or speed, must be made to behave in some desirable way over

time. For example, control methods are used to make sure that the temperature in our homes stays within acceptable levels in both winter and summer; so that airplanes maintain desired heading, speed and altitude; and so automobile emissions meet specifications.

To control, one needs to know the effect of possible action on the system or process that is to be controlled, need to have a cause and effect kind of model, so when the process evolves in an undesirable way we may intervene and correct it. This is the reason we work with mathematical descriptions of the processes we want to influence.

Why is control important? Let me try to explain. We do know that electric power is important in our everyday life, but we tend to forget this fact or take it for granted. We really appreciate electricity's importance when there is an electric power interruption, a black out, even a short one, when we realize how much our lives are disrupted. To show clearly how important control is to us let's imagine that suddenly we do not have it!

This is bad news indeed. We are alive because important quantities in our body like blood pressure, heart beat rate, white and red cell concentrations are regulated automatically and so remain within certain levels. Pacemakers in fact are devices that correct abnormal heart beat rates when our body's automatic control system is not behaving normally. You can imagine what may happen without these controls by thinking about the consequences of a control failure; when for example blood pressure shoots up a stroke may occur, while when the pressure is too low loss of consciousness will occur.

The electric power grid maintains very tight control on the frequency of the AC voltage, and if that fails blackouts occur. Automatic pilots in airplanes are of course automatic control systems, and helicopters or military aircraft would not be able to fly at all without automatic controls.

In an automobile, the automatic speed control system detects the speed, calculates how much it is different from the desired speed and increases or decreases the fuel by adjusting the gas pedal. This is exactly how the driver behaves and the automatic controller imitates the actions of the

driver. It is envisioned that in the future sensors will detect that a pedestrian intends to cross the road and will slow down the car, or detect that children are playing with a ball close to the road and slow down the car, in the same way a careful driver would behave. Today, our cars run more efficiently and with cleaner emissions because of control algorithms in the “engine control module.” They are also much safer.

Control methods in biomedical applications make possible the use of electrical nerve signals to control prosthetics, and precision robots for cutting holes in bone for implanting artificial joints, resulting in much tighter fits than previously thought possible.

Feedback is used extensively to cope with uncertainties about the system and its environment. Hence the control law decision process is based not only on predictions about the plant behavior derived from the system model (as in open-loop control), but also on information about the actual system behavior (closed-loop feedback control).

Control system research is, by its nature, interdisciplinary - mathematics is the universal language. It benefits many areas, not only in Science and Engineering, such as Signal Processing, Communications, Chemical Engineering, Computer Engineering, Biomedical Engineering, Biology, but also Finance and Economics, Psychology, Political Science.

Automatic control Systems were first developed over two thousand years ago. The first feedback control device on record is thought to be the ancient water clock of Ktesibios in Alexandria Egypt around the third century B.C. It kept time by regulating the water level in a vessel and, therefore, the water flow from that vessel. In the 20th century, applications of control methodology have helped make possible space travel, communications and communication satellites, safer and more efficient aircraft, cleaner auto engines, cleaner and more efficient chemical processes, to mention but a few.

What does the future hold in Control? We are moving toward **autonomous** underwater, land, air and space vehicles; highly automated manufacturing; intelligent robots; highly efficient and fault tolerant voice and data networks;

reliable electric power generation and distribution; seismically tolerant structures; and highly efficient fuel control for a cleaner environment. Towards that end we have started working with Cyber-Physical Systems. We are moving towards close collaboration with a variety of other disciplines.

I would like to close with a personal note. I have been at Universities for a long time. **Teaching and research** keep me busy enough. But I also serve my profession and university in other ways, serving for instance as editor in chief of our leading journal and serving in many committees in my University and in professional societies. I am saying all this to point out the sacrifices my family has made over the years, **because all these activities (Teaching, Research, Service) take time**, **lots of time**.

I would like to thank my wife Melinda Reese-Antsaklis (a PhD from Brown in Russian literature/poetry) and my daughter Lily Antsaklis (a Psychologist). Without them, **providing balance in my life** and helping me set the right priorities, I would probably spend 24 hours a day (24/7) in the office - and I thank them for that. (My wife's family comes from Alsace emigrating to the US about 200 years ago for religious reasons (to avoid religious prosecution).)

I would like also **to recognize my family in Greece**-I went to the US as a graduate student. I still have there my mother Marina and my 2 brothers George and Aris, both medical doctors. I would like to thank my mother **for teaching me the importance of responsibility and of being a good student**.

My father, Ioannis Antsaklis, was a medical doctor a surgeon and he had his own clinic- 40 bed small hospital-in my hometown Kalamata a 50,000 town with a harbor in southern Greece. Although not originally from there, he spent his life serving the people of Kalamata. Because the clinic was serving also as an ER, due to lack of proper hospital in Kalamata, my father was obliged to spend very long hours at the clinic and also respond to calls in the middle of the night. In spite of being tired and not able to get home

any earlier than 10 –11 each night, after he got home he used to burn the midnight oil studying about new methods in surgery-so to use them and save the life of a patient. He taught himself foreign languages-French, English and some German-to read those books and papers as they were not being translated into Greek. He did all this because he believed that he had to. His **dedication** was a great lesson to me. The other lesson he taught me was **compassion**. He treated people who could not afford it for free-and they were many of them (He covered the clinic's expenses himself, not only he donated his personal services). And I must tell you that today over 35 years later when we visit Kalamata and the surrounding areas the children of those patients recognize the name and they tell us stories of kindness and compassion. This makes me proud and puts up a very high standard to follow. It was and still is a great lesson. My father passed way when I was a graduate student.

I would like to dedicate this recognition to my family for teaching me what is important and for giving love and providing balance.

Thank you! Thank you all.