This is the full text of the interview of Panos Antsaklis conducted for the textbook: ***Structure and Interpretation of Signals and Systems*, by Edward A. Lee and Pravin Varaiya, Addison Wesley, 2003.** The interview appeared on pages 83-84 of the book and a pdf file of the scanned document has been included in the website.

Note that the full text of the interview appears below. The parts in italics within brackets were not included in the 2-page version published in the textbook.

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INTERVIEW

1. How did you decide to study Electrical Engineering?

I have been interested in how things worked since an early age! I disassembled and assembled everything I was allowed to get my hands on -bicycles, clocks, electric appliances - to the amusement of my father and to the worry of my mother who was afraid that I may not be able to put them back together on time or at all. I guess the reason behind all this was not only to learn how and why things worked, but also to try to make them work better or even use ideas to design new devices!

[I recall that my older cousin, a chemical engineer was surprised once when I was about 11 that I had constructed a steering system for a toy car that was very similar to actual steering systems used- personally I did not think what I had done was a big deal, but I must say that it worked rather nicely! I should mention that I did not have access to books describing such systems, but since I was able to drive at that age (my father had taught me) I had taken a peek under the car. Although I said so to my cousin, he still thought that it was remarkable for an 11 year old!

The drive to be an engineer was quite strong from early age in my case. Electrical engineering, more than other engineering disciplines seemed to combine strong scientific and mathematical insight (so to understand the natural processes) with the ability to build systems that did very exciting things, such as computing. In addition, the fact that I was a very good student particularly in the sciences and mathematics and that Electrical Engineering in Greece was a prestigious discipline and it was very difficult to be accepted in the Department of Electrical Engineering of the National Technical University of Athens was the final reason for opting for electrical engineering.

I should mention that since the time I was in elementary school I used to spend a lot of my free time at my father's clinic - my father was a doctor, a highly regarded surgeon whose professional reputation and humanism is still being remembered not only by his many patients but also by the children of his patients. I had watched-from a distance of course- many operations as a child. Everyone thought that I would become a medical doctor but since my two older brothers were already in the medical school I decided to pursue my other interests, engineering.]

2. What was your first job in the Electrical and/or Computer Engineering industry?

My first job was as an undergraduate spending a summer in Bern, Switzerland working at a small company making small electric appliances. The next summer I worked at a research center in Greece programming control algorithms. I found the research work in controls much more exciting and challenging. In fact I did my graduate work in the systems and control area.

[After my PhD I taught at Imperial in London - and at Brown and at Rice - before I joined the University of Notre Dame. After I made a name for myself in the linear systems area, on the feedback of linear control systems, I decided to look at control systems with much greater capabilities, at systems coined Intelligent Control Systems and I spent a summer at the Jet Propulsion Laboratory exploring the idea. It became clear quite early that in order to design and build systems that can act autonomously for extended periods of time, such systems must have properties such as adaptation and learning and have the ability to self-diagnose and perhaps self-repair, and plan sequences of appropriate actions to achieve desired goals. For all this to happen it was clear that one needed to combine concepts from several disciplines, including control systems, planning and learning systems, machine intelligence. It also became clear that in these intelligent control systems there are continuous and discrete dynamical systems- and signals- interacting and influencing one another. This fact then led me to the study of hybrid dynamical systems the behavior of which is determined by interactions between analog and digital subsystems.]

3. Which person in the field has inspired you most? In what ways?

I certainly admire the contributions, the dedication and the insight of several engineers and scientists.

[However I will resist the temptation to mention recent names, since I believe that we must admire first and foremost the people whose contributions have truly withstood the test of time.]

Here I will mention just two names from long ago. The first one is Ktesibios of Alexandria (the third century BC), an engineer and inventor of the ancient water clock, the first feedback control mechanism on record.

[Here we have someone who harnessed the physical laws and designed a mechanism that kept the water flow steady to produce something that kept accurate time and was very useful.]

The second one is James C. Maxwell. In the 1860s he captured the basic laws of electricity in mathematical form in his famous Maxwell equations, and also predicted the existence of the radio waves.

[(he predicted that radiation of electromagnetic energy would occur in a form that later became known as radio waves). A lesser known result is that Maxwell also used equations to describe the behavior of a regulation device used in steam engines, the Watts fly-ball governor, and so explained the undesirable oscillations that were occurring in the device at the time. Maxwell drove home the point that mathematical models and the resulting understanding of the processes they describe are indispensable in any serious attempt in science and technology.]

His contributions signaled the beginning of a new era where mathematics and experimental sciences work side by side and depend on one another for truly remarkable advances.

[(using experiments and also mathematical models via which existing observations are explained and new results are derived which in turn are verified experimentally; if not successful the process is repeated.)]

4. Do you have any advice for students studying Electrical and Computer Engineering?

As an engineer you have to have your feet firmly on the ground, but at the same time your eyes should be on the horizon. Use your scientific and mathematical expertise to make sure that you are correct, but let your imagination ride on your intuition to make the next great leap forward. Great innovations do not come by very often and so make sure you are well versed in the fundamentals so to be prepared to recognize them.

[5. How will EE, CE, and CS students benefit from learning signals and systems early on in the curriculum?

Having been exposed to these concepts early there will be far more educational options open to you, a greater variety of elective courses available for you to take later in the course of studies.]

6. What is your vision for the future of electrical and computer engineering?

The area of electrical and computer engineering has been the driving force of a great part of our technological civilization today, and I expect this to continue for many years to come. Methodologies that have emerged in our discipline have played a leading role in many of the advances in a great variety of areas - from the medical field and instrumentation, to finance and analysis tools, to lasers, to MEMS and nanotechnology, from communication networks to car electronics, to aircraft avionics and to automatic controls. It is truly remarkable how successful our discipline has been. I can only see more amazing contributions in the future. It cannot be any other way!

7. Are there any special projects you are currently working on that you'd like to tell students about?

Imagine a cluster of mini-satellites that communicate with each other so to coordinate their actions; or a cluster of MEMS; or a million individual segments in the lens of a space telescope that periodically need to be adjusted individually to compensate for temperature changes, aging or failures.

These are examples of systems that consist of many subsystems distributed over space, which interact with each other via communication channels that may be wireless. Such system of systems can change dynamically with time as units come in and out of the network and typically interact with the real world and so they must meet hard and soft time constraints, as they are real time systems. Each individual unit is an information processor, a computer and it is also a node in a network. We have been interested in designing such systems using concepts and methodologies from the areas of hybrid systems and controls, communication networks, and computer science.

[8. What would you say have been the greatest advances of the last decade in electrical and computer engineering?

If I am to focus on the significant advances of the last decade or so I must choose first the communications area, which really exploded and produced devices for everyday use like cell phones that have certainly changed our lives.

We have played a significant role of course in the development and widespread use of the internet that has brought almost the whole planet within easy reach.

We have made significant progress in computer processor speed and memory capacity, and all this while reducing the unit prices dramatically. In this way we almost have placed a supercomputer at each desk! We have been able to reduce the size and the price while increasing the computing power so to be able to have with us our portable computers almost everywhere we go.

We have seen the development of MEMS and their possible use in medicine and biology among other areas. While these are the most visible changes in the last decade there have been quiet revolutions in areas such as the signals and systems area that has brought the analog and digital worlds closer together. The book you are holding witnesses this fact.]