Why Should We Computer Scientists Learn More about Electrical Engineering

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I had been bothered by the difficulty in using the university e-mail system at home for a very long time.

I remember clearly that once I could not use it because some stupid domain name server went down.

When the web system was born, I asked many people the question: Why don’t you use the web-system to send e-mails?

Luckily, we do have this kind of systems. Now, I can read my e-mails anywhere in the world. I do not have to worry about where the domain name server is.

Then I had been bothered by the so-called IP-address problem. Several times, I was told that my IP-address was stolen.

This happened very frequently when I was in NTHU.

When I had to demonstrate some systems which must be linked to Internet in other universities, it happened many times that I just could not work because of some problems which I could never understand.

By the time the problems were solved, precious time had been wasted.

I was annoyed and I repeatedly told people that we should emulate the mobile phone system.

We can use our mobile phone anywhere without knowing anything about the stupid IP-address.

My idea was very simple: Use the SIM card idea in the mobile phone system.

Since the SIM card can uniquely identify the mobile phone, it can also uniquely identify the computer.

Why don’t we simply use SIM cards for computers?

Through this way, we can carry our computers and access the Internet anywhere.

Although I talked to many of my friends, including some important people in industry and government, none of them did anything.

Many of the computer scientists thought the IP-address is a sacred thing. We should and can never touch it. It will live forever.

Because no one in Taiwan listened to my idea, I began to think that I must be wrong and my idea can never be implemented.

I somehow lost confidence and gave up talking to people about this idea.

Several years ago, I visited mainland China. I stayed in a very remote area and the hostel was not connected to Internet. So, I was told that although there were computers, I could not access the Internet.

The person who accompanied me told me not to worry.

He took out a card and inserted it into his computer. He said that this card can be inserted into any computer.

Then his computer was immediately connected to Internet and I could read my e-mails without any difficulty.

So, I suddenly realized that my idea which was rejected and ignored in Taiwan, was realized in China.

From then on, I began to think that I am smart and those people who always reject my idea are stupid.

A joke, of course.

I understand that we are selling those cards made in China.

I can imagine that one day, our president would use this kind of cards made in China.

I can also imagine that one day, our weapons will be equipped with communication chips made in China.

I always wonder why people in Taiwan ignore my idea.

I guess it is because the computer scientists here do not know anything about communication and they don’t even want to know anything about communication.

Maybe it is a good time now for us to review our computer science education.

I strongly believe that our computer science students, in order to be more competitive, should know more about communication.

When I say communication, I mean physical layer of communication.

Our poor computer science students only have some knowledge about the protocol of communication. To me, it is a bunch of nonsense which is of no academic value.

Neither do our C.S. students have no analog concept.

To them, everything is digital.

Therefore, they can never understand the concept of QPSK which is widely used in communication systems.

It is absolutely impossible for our ignorant computer science students to understand how we can send two bits together.

They only know how bits are stored in computers without knowing how bits are sent.

Our students do not know the relationship between the pulse width and bandwidth.

In fact, they do not know that bit rate is not frequency.

Most of the C.S. students heard the term: RF (radio frequency). But almost no one knows why there is such a term.

We do not know because they have no idea about modulation which is key to communication.

We can now see why people in Taiwan rejected my idea.

To them, computers have nothing to do with communication.

We must know that these days, a modern CPU has communication mechanism built in it.

There is no way for us to avoid knowing more about communication.

My strong advice to our C.S. students: You must know :

Fourier transform, analog modulation, digital modulation, spread spectrum and so on.

In other words, they must have basic E.E. knowledge.

Do not pretend that you are an expert in wireless communication while you don’t know anything about Maxwell equations and modulation.

But there are so many C.S. communication courses which do not talk about Maxwell equations and modulation.

How can anyone talk about “wireless” communication without the knowledge of electromagnetic waves?

We should not hesitate to say that we must be knowledgeable in electrical engineering.

The old computer science courses should be reviewed and new ideas should be injected to them.

For instance, the old computer science courses do not touch the analog circuit design, thinking that it is sufficient to know digital circuit design.

Yet, every digital circuit is finally transformed into an analog circuit.

Many of the C.S. students work in the VLSI CAD field.

They usually get scared when they see transistors.

I have taught communication (in physical layer) and even analog circuit design to C.S. students.

This is why my students can usually get good jobs.

The latest statistics: 90% of my students work in fields related to communication and several of them even work in analog circuit design.

Let us start a new era.

Merge C.S. department with the E.E. department.

Do not think that old courses are sufficient.

They are not.

Sadly, I believe that you guys would politely applaud after my talk and then nothing happens.

I am sure that my idea will again be rejected.

Thank You.