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AUB research team plants cedar tree into wireless devices

Beirut, Lebanon- 29/03/2012 -A research team at the American University of Beirut has discovered that the cedar tree is not just a symbol of national pride, but it is also an ideal and innovative design for antennas intended for wireless devices.

“The design of antennas that are inspired by forms available in nature, are receiving more interest from the antenna research community. Other researchers have worked on insect-inspired antennas. We consider the cedar antenna as our first step on this track of nature-inspired antennas,” said Mohammed Hussein, a member of The Electromagnetics and Radio Frequency Research Group at the Electrical and Computer Engineering Department.

The team found that the geometry of the cedar, based on repetitive triangular parts, allows a cedar-shaped antenna to operate at multiple frequencies, which makes it suitable for many types of wireless devices such as mobile phones.

“The prototype we designed is suitable for 3G wireless communications and wireless Internet. We can easily change the design to target other applications, but the cedar antenna cannot be used for TV transmission, which requires much more power than this type of antennas can withstand,” said Hussein.

Karim Kabalan, professor and chairman of the Department of Electrical and Computer Engineering, was the mastermind behind the design, after two years of searching for an antenna that would be easy and inexpensive to fabricate and innovative, veering away from the usual rectangular and circular shapes.

Kabalan says, “This is the nature of research. If you don’t think differently from others, you won’t come up with anything new. You have to try new ideas.”

Mervat Madi, PhD candidate in Electrical and Computer Engineering, was determined to make it work for a special project course as her first real encounter with antenna design. She designed the antenna using special computer simulation software, going through many versions to see the effect of each change on the antenna’s performance before coming up with the final design.

One of the difficulties was designing without having equations to rely on, but this is nothing new, as only the basic antenna shapes have these equations, and even those are just approximations. Therefore, there was much trial and error in her attempt to keep the shape as close to a real cedar while getting a working antenna.

"I have gone through an arduous job in getting the antenna functional with a shape that looks like the cedar tree. At one point we thought we'd reached a working design, but it turned out the antenna gain was negative (which means the antenna was not a good radiator of signals). At that point, I had to make substantial changes to the design, which ultimately solved the problem," explained Mervat.

Once it was ready, the final design was fabricated in the ECE labs, using the prototyping machine, with the help of manager, Khaled Joujou.

"Having the prototype fabricated, I did the actual testing of the antenna, by measuring its frequency responses," said Hussein.

There is much planned for the future of the cedar-shaped antenna. The group published a paper on the design in the Progress in Electromagnetics Research Journal, in January 2012 and they consider it just the beginning. They are planning to produce a large version of the antenna, and design the circuit required to control the frequencies switching components on the antenna.

"Our ultimate goal is to see the antenna used in a real-life application," agreed the team.

One thing is certain: The cedar tree shape is bound to start appearing in places other than on the national flag.

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Note to Editors

About AUB

Founded in 1866, the American University of Beirut bases its educational philosophy, standards, and practices on the American liberal arts model of higher education. A teaching-centered research university, AUB has more than 600 full-time faculty members and a student body of about 8,000 students. AUB currently offers more than 100 programs leading to the bachelor's, master's, MD, and PhD degrees. It provides medical education and training to students from throughout the region at its Medical Center that includes a full service 420-bed hospital.

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