Communication Device for Deaf and Blind Wins IEEE Presidents' Scholarship

Teenager's system uses a cellphone and glove embedded with vibrating sensors

By JOHN R. PLATT 14 August 2013

Photo: Lynn Bowlby/IEEE

In 1887, Anne Sullivan famously taught a young Helen Keller, who was deaf and blind, to communicate by tracing the shapes of letters in the girl's palm. A young man in San Jose, Costa Rica, accomplished something similar this year by using a cellphone and a glove embedded with vibrating electronics.

Isaac Christopher Portocarrero-Mora's project, "Development of a New Communication Method and Mechanism for Deaf-Blind People," earned the 17-year-old the 2013 IEEE Presidents' Scholarship. The honor, presented in May at the Intel Science and Engineering Fair (ISEF) in Phoenix, comes with a US $10 000 scholarship to be paid out over four years of undergraduate study. Administered by IEEE Educational Activities, the scholarship from the IEEE Foundation is awarded annually to a high school student who creates a project that demonstrates understanding of an IEEE area of interest. The amount is payable over four years of undergraduate study, and the scholarship includes complimentary IEEE student and society memberships during the four years. Portocarrero also received a framed certificate and an engraved plaque.

"This is the best thing that ever happened to me," says Portocarrero, a recent graduate of Colegio Vocacional Monseñor Sanabria, a technical school in Desamparados. "It is something I will never forget."

Portocarrero wasn't very interested in electronics until a few years ago, when, he says, one of his teachers taught a lesson about microcontrollers. Portocarrero used one to control some LEDs. That experience changed everything. "I fell in love with the way you could mix hardware with software," he says.

Several of that teacher's students had participated in previous Intel science fairs, which inspired Portocarrero to "search for a project that could win."

His teachers, however, were less interested in simply winning than in coming up with a device that could help the country's disabled. Portocarrero initially set out to create a communication device to help someone either blind or deaf. But he soon realized there was a great need for such a device by the estimated 77 000 people in Latin America who are both deaf *and* blind.

A PHONE CALL FROM MOM

Portocarrero decided to find a way to turn information into something that a blind and deaf person could interpret. A phone call from his mother provided the unexpected inspiration: His vibrating cellphone made him realize that vibrations could convey information. So he set out to build a system that would take voice or text from a cellphone or tablet computer and transmit it to a glove containing vibrating devices. He uses six little vibrators on the glove, each controlled by a capacitive sensor, similar to ones used on touchscreens. He calls it the Comunicador Universal.

He also developed an alphanumeric language for translating messages into vibrations, and fit it into an Android smartphone app. Five of the glove's six sensor-vibrators are on the top of each finger, near the first knuckle, while the other is near the wrist. Each vibratory combination of the six sensors represents a different letter or number. A vibration on the pinkie finger represents an "A," for example, while vibrations on the pointer, pinkie, and wrist correspond to the number nine. There is also a keypad on the palm so that a user who is not completely visually impaired could transmit information back to the sender in conversation.

IEEE Presidents' Scholarship recipient Isaac Christopher Mora describes in Spanish how his project "Development of a New Communication Method and Mechanism for Deaf-Blind People" works. www.youtube.com/watch?v=niA8dF87NFQ&feature=player_embedded

The quest to perfect his device became all-encompassing. Portocarrero worked every day in his high school lab struggling not only with technical aspects of his project but also with getting enough money to buy parts.

But he persevered. To raise money, he repaired computers and cellphones, and sold many of his possessions. He reached out for guidance to experts at Helen Keller International, in New York City. And he was able to test his device with a blind and deaf person and his family in Costa Rica. Over the course of six sessions, the young man learned to recognize six letters through the vibrations in the glove. It was enough to qualify Portocarrero to compete at the science fair.

AND THE WINNER IS

Portocarrero was shocked when the judges called his name. "Time stopped, and my emotions soared," he recalls. "I really thought it was my imagination. My heart stopped beating." He calls the award a remarkable recognition for his family, his school, and his country.

Portocarrero feels changed by the experience. "Relating to people with disabilities showed me there are no limits, everything is possible," he says. "And it made me a more sensitive person."

Although his dream is to study computer science at MIT, he has not yet applied to any colleges and is not yet sure how he will use the scholarship money. Mostly self-taught, he admits that his grades in school were not exceptional. But he hopes this is not going to hold him back.

"I learned that sacrifice is rewarded; it is one of the keys to being successful," he says. "I am very hungry to learn, and I am ambitious and inventive. People tell me I'm very stubborn, and it's true. I never accept 'no' for an answer."

Portocarrero is already working on making his device more robust. He plans to integrate the Google Translate app, allowing the device to work with different languages. Meanwhile, he intends to launch a Kickstarter crowdfunding campaign to create a new research lab at his school, in order to "open the door to new generations of budding engineers."

You can follow Portocarrero's progress with his device on Facebook.

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