High School Student Designs a 'Wheelchair' That Lets Users Stand Up

His technology wins him the IEEE Presidents' Scholarship
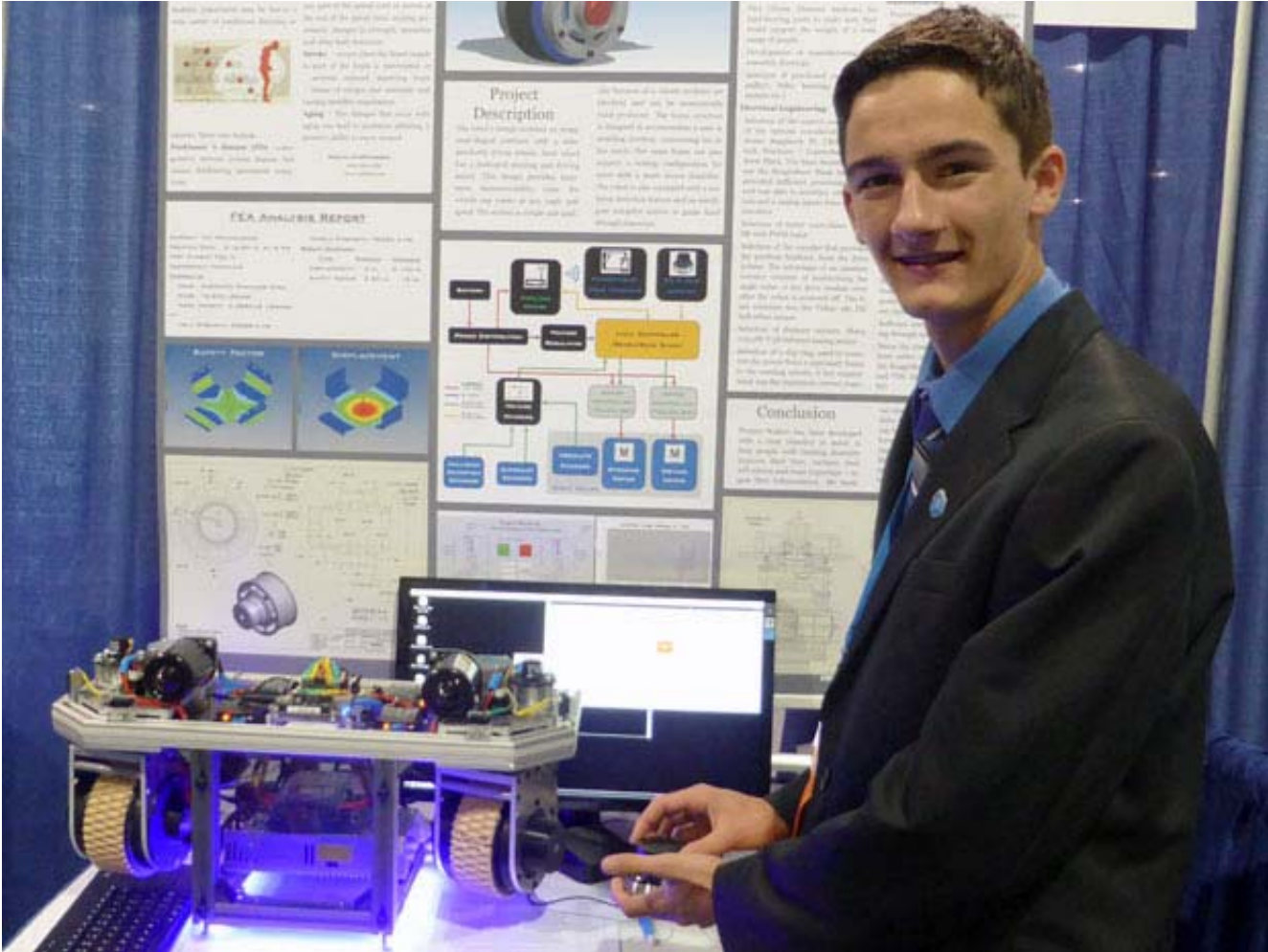
By JOHN R. PLATT 15 July 2015

Photo: Lynn Bowlby

Like many innovators, Alex Tacescu got his inspiration from a close relative. His grandfather was suffering from Parkinson's disease, and walking was a struggle. "I have a lot of memories before he got sick of going to the park with my grandfather, playing catch and having fun. I wanted to do something for him," says the 17-year-old, who enters his senior year in September at Clovis North High School, in Fresno, Calif.

Tacescu, a robotics enthusiast, set out in July 2014 to build a mobility vehicle to help his grandfather and others with similar disabilities. He knew that two- and four-wheeled mobility walkers were slow and cumbersome and required a lot of effort to get around. Wheelchairs, meanwhile, have problems in tight spaces, can't turn well, and can allow users' leg muscles to atrophy. They also force disabled people to sit in a world that is otherwise standing. He thought he could overcome the shortcomings of these devices by combining them.

And though his design, which he calls **Project Maverick (http://pmaverick.weebly.com/)**, is not yet completely built, he showed enough of it at the **Intel International Science and Engineering Fair (https://student.societyforscience.org/intel-isef)** in Pittsburgh in May to win the US $10,000 **IEEE Presidents' Scholarship (http://www.ieee.org/education_careers/education/preuniversity/scholarship.html)**. Tacescu's project will let users stand upright while moving around on a wheeled, motorized, 0.6- by 0.6-meter platform. Its top speed would be about 5 kilometers per hour, comparable to preferred walking speed. As conceived, it's akin to a Segway but more stable, with four wheels instead of two, and each powered by two independently controlled motors, for steering and driving.

In addition to an electronic joystick that lets the user control the vehicle, Tacescu also incorporates a Linux-based controller that enables features such as collision detection and autopiloting through tight spaces. Technologies similar to these are now becoming available in today's automobiles.

Although his grandfather passed away last year, Tacescu kept working on his design. His efforts paid off with the award. Administered by **IEEE Educational Activities (http://www.ieee.org/education_careers/education/eab/DF_IEEE_MIG_MCT_19173)**, the annual scholarship is given by the **IEEE Foundation (http://www.ieeefoundation.org/)** to a high school student who creates a project that demonstrates an understanding of electrical and electronics engineering, computer science, or another IEEE area of interest. The award, payable over four years of undergraduate study, includes complimentary IEEE student and student society memberships during the four years of college. The winning student also receives a framed certificate and an engraved plaque.

EVEN MAVERICKS FACE CHALLENGES

Project Maverick faced a few challenges along the way to the Intel science fair. The biggest was financial. "I didn't have a finished project at any of the two other science fairs I entered because I didn't have the money to build them," says Tacescu. This was also the case in May. Instead of a complete project, Tacescu brought to the fair two working wheel assemblies as well as the navigation controller and diagrams of what he hoped to build.

But "Alex's device is much more complete than the devices we usually see," says Lynn Bowlby, project administrator for **IEEE Educational Activities (http://www.ieee.org/education_careers/education/eab/DF_IEEE_MIG_MCT_19173)** in Piscataway, N.J. "More often than not, students present a device in prototype form, perhaps just one piece of a larger project. Or they are in their first phase of the project. It is not common to see a completed device, ready for manufacture."

Another challenge was technical. The mechanical aspects of Project Maverick came relatively easily to Tacescu: He has been learning about robotics since he was 10 years old and has been the lead engineer of his local FIRST Robotics team for the past three years. But he still needed to improve his Java programming skills. "I knew Java, but I didn't really know how to implement it," he says. He turned to Internet forums for tutorials and assistance. "People were willing to help me without even knowing what my project was, just out of the goodness of their hearts.

Tacescu also had another important supporter. One of his best friends at school is George Morgan—winner of the 2014 **IEEE Presidents' Scholarship (http://www.ieee.org/education_careers/education/preuniversity/scholarship.html)**. "George encouraged me to enter

science fairs. He's a great person and a great friend."

TO COMPLETION

Tacescu says he will spend the next few months raising money to build a fully featured prototype while also applying to universities with strong robotics programs. "I want a program that combines the mechanical and design aspects of robotics, along with programming," he says. He anticipates pursuing a double major: robotics engineering and business. "Ultimately, I'd like to run my own company or be the CEO of a company," he says. "A major in business can really help me focus on that."

Once Project Maverick moves far enough along, Tacescu says he may seek to hand it off to a company that can bring it to market, especially since he won't have as much time in college to devote to the project.

Tacescu encourages others to get involved in science fairs, but notes that competing should not be about monetary rewards. "A good project, whether in life or a science fair, doesn't come from doing it for money," he says. "A good project comes from your passion."

For Tacescu, his passion has only been enhanced by the recognition he received from IEEE. "An incredible honor," he calls it. It tells me that this is the right career choice for me and brings me to a whole new level." He looks forward to applying renewed passion to his studies and his work to come, and hopes his project will soon help improve people's lives.

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