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USU College of Engineering, "Engineering Answers: Elegant Solutions Start with Simple Ideas | College of Engineering" (2015). *College of Engineering News*. 19.

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Solar-Powered Backpack

Courtney Richards was inspired to create her solar-powered backpack while working as a report writer for a paleontologist. While on long surveys both her camera and GPS would often run out of power making it impossible to do her job properly. She realized the problem could be solved with a portable power supply system which she created for her senior project.



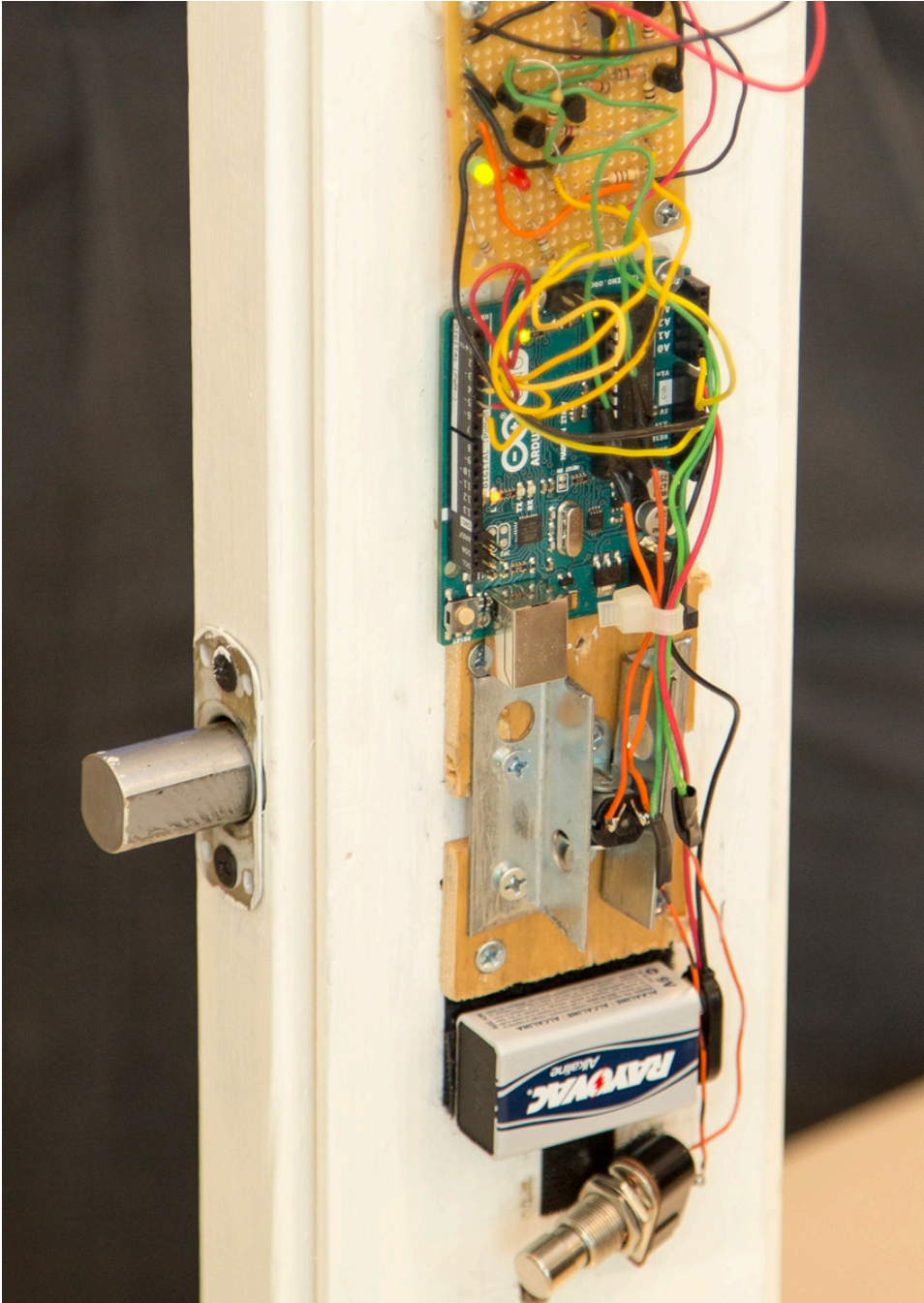
The backpack uses solar cells to convert sunlight to electrical DC power that charges an internal battery. It then converts the energy into a steady five volts delivered to a USB port. The system was also designed to boost and transform the five volt signal to power a 120-volt AC outlet.

Richards said the biggest challenge during the project was time. To meet the deadline she simplified her design and put the AC outlet on hold for a future iteration. She says she hopes to make the system produce the full 120 volts for the AC outlet, bringing her vision to life.

"I hope to better my design to make it a more reliable system," she said. "I have a few ideas I want to implement during the next year or so to make the Solar-Powered Backpack even better."

Knock-Detecting Door Lock

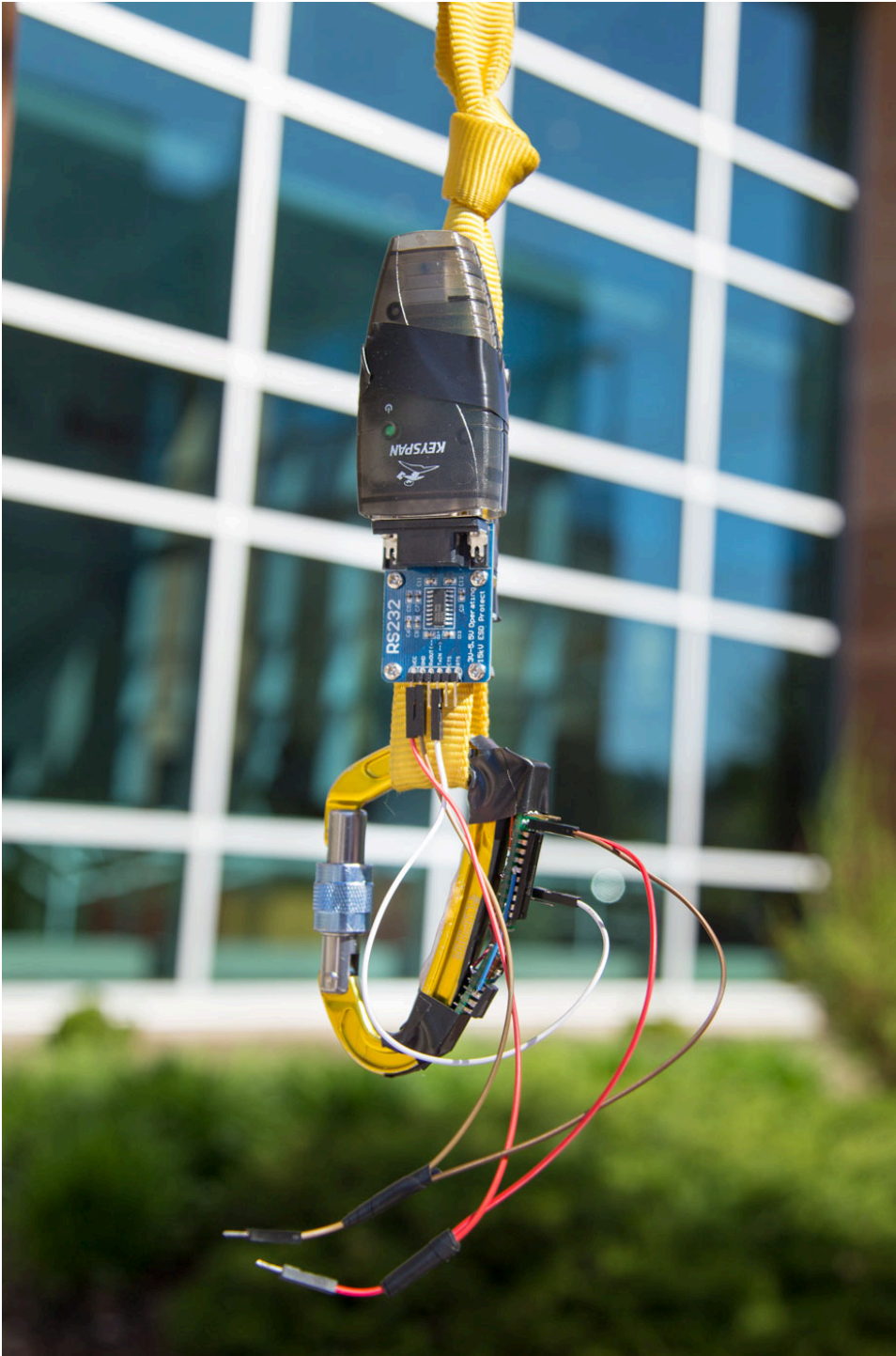
After years of being involved with his parents' door hardware business, Connor George was always fascinated with different locking systems. For his senior design project he created a door that unlocks with a knocking sequence. He calls it the Knock Detecting Lock System. It detects a correct knocking passcode to unlock the door's deadbolt.



The system is broken down into two parts: the software and hardware design. When an input is detected, the software times the intervals between knocks. If the correct pattern is detected, the door will unlock. The hardware is a circuit system that electrically opens the lock. George says the best part of his design is that unlike most locking systems, it requires no hardware on the door's exterior. This helps conceal the locking system from a potential intruder and makes it harder to break in whereas traditional locks can be picked and keypads can be removed or bypassed.

Aside from enhanced security, the system has a more aesthetic appeal since the lock mechanisms and electronics are inside the door. Though it was a success, George would like to add a user-controlled delay before the door locks itself, a variable sensitivity control and other modifications to make the system smaller.

Smart Carabiner: ECE students Jeff Lunt and Craig Manning created an electronic carabiner that tracks stats during a climb. The unit can be plugged into a computer afterward to display information about loads and more.



Robotic Hand:

Quinn Thomson had always wanted to build a robotic hand and Ryan Lamoreaux has always had an interest in image processing. Together with Amber McDougal and Chris Green, the team built the Visual Servo Robotic Hand. The four team members built a hand that can imitate a user's right hand in three ways: closed, open and a two finger point. The

device uses Microsoft's Kinect v2 to mimic hand motion. The team also programmed the robotic hand to "feel" and hold objects with force-sensing resistors on its fingertips. When the sensors detect a certain level of force it will stop the hand from closing.



The hand isn't the only part that moves. The wrist is able to move up to 90 degrees and the forearm can move at an angle from zero to 180 degrees. The hand was built with a 3D printer. Team members say the physical design proved to be the biggest challenge as most of them are electrical engineering students. Visual Servo is unique to other robotic hands because it is truly controlled visually. During their master's programs two of the team members plan to increase its abilities and plan to use it to learn more about control systems.