

Smarter Fire Alarm Earns Teen IEEE Presidents' Scholarship

Student's invention detects flames and aims to prevent devastating kitchen fires

By JOHN R. PLATT 18 August 2011

Sometimes a good new product is just waiting to be invented. That's the case with CookerSmart, a fire alarm designed for the kitchen, where conventional smoke detectors tend to go off when there is smoke but no fire. The alarm was invented by James Popper, recipient of this year's IEEE Presidents' Scholarship. He received the recognition at the Intel International Science and Engineering Fair (ISEF), held in May in San Jose, Calif. The 18-year-old Popper is a senior at Marlborough College in Marlborough, England.

Administered by IEEE Educational Activities, the US \$10 000 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. Popper also received a framed certificate and an engraved plaque.

Popper's CookerSmart invention earned him several other recognitions, including the ISEF Best of Category award for electrical and mechanical engineering and an invitation to the prestigious Stockholm International Youth Science Seminar, where he and 24 other young scientists and engineers are slated to meet during the Nobel Prize ceremonies in December.

RESPONDING TO A NEED

Popper set out to create CookerSmart after an elderly family friend survived a devastating kitchen fire.

"I wanted to devise a fire-detection system for the kitchen that would help the elderly and those with disabilities, who overwhelmingly are the groups most at risk from this recurrent danger," he says.

Conventional smoke detectors do not provide adequate protection in kitchens, because they're susceptible to what Popper calls "nuisance tripping"—they're set off by cooking fumes, high heat, steam, and other non-fire-related sources. Because of such issues, many people don't even bother to install an alarm in their kitchen, or they disable the detector there by removing its battery, Popper notes. But that leaves people exposed to the threat of a fire, he says.

The CookerSmart reacts not to smoke but to an actual fire, first by identifying the infrared flicker of a flame, then analyzing it and responding to the flicker's specific frequency bands. The device has both a visual and varying tone alarm, making it more likely to be recognized and heeded. By relying on its innovative IR-detection method, the system is not accidentally triggered by gas cookers, heating devices, body heat, or other IR sources—greatly reducing false alarms.

To build his detector, Popper first needed to learn about complex analog and digital circuitry, as well as the C programming language. He incorporated a combination of operational amplifier signal modification stages and a microcontroller unit, and he designed the accompanying software to identify the presence of fire. It took him a year to develop, test, and build a prototype.

At present, CookerSmart can be situated anywhere within a 3-meter radius of a stove or oven. Popper is developing its

capabilities to further reduce the effects of surrounding infrared noise and allow greater range and versatility.

"A major part of my testing included trying to establish if CookerSmart would be triggered by false alarms," he says. He conducted experiments to measure the device's response time when a fire was present. In 30 trials, the prototype was triggered on every occasion, responding to each fire in less than five seconds.

MARKETING OPPORTUNITIES

Popper has sought advice about marketing his device from fire and rescue services, the UK Fire Protection Association, and regional fire brigades. He is looking into launching a company to sell the CookerSmart and should have a market-ready product to promote in the next few months. He is in the process of obtaining a licensing agreement but is also considering selling the product himself, having already obtained quotes from potential manufacturers.

Popper says he intends to take a year off from his studies to concentrate on CookerSmart and then return to school to study electrical engineering.