Smart Smoke Alarm

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Technology Summary

ORNL researchers have developed a new smoke detector technology that allows fires to be detected faster while decreasing the number of false positives or nuisance alarms. This invention exploits the linear discriminant analysis (LDA) technology used in advanced chemical detection systems for military and civilian systems and applies it to inexpensive microcontrollers used in many standard smoke alarms to improve sensitivity and specificity.

The majority of fire alarms are nuisance alarms, which cause people to disable their smoke detectors rendering them useless in the case of an actual fire. According to a 2009 survey, more than 50% of Americans admitted to having silenced a false alarm by removing the smoke detector from the wall or taking out the batteries. Additionally, construction methods and materials have increased fire growth rates and decreased the time required for safe egress from 17 minutes in 1975 to an average of 3 minutes in 2008.

There has been a recent consumer trend towards higher quality smoke detectors. Many local laws now require that homes have a photoelectric smoke detector, and the National Fire Protection Agency recommends that homeowners install dual sensor alarms that are even more expensive. This suggests that there is a market need for a cost competitive smoke detector with proven performance superiority.

ORNL has shown that using LDA with only a conventional photoelectric sensor can improve the alerting to smoldering fires by an average of 20 minutes compared to a conventional photoelectric alarm. When LDA was implemented in a smoke detector using three sensors (photoelectric, temperature, and carbon monoxide), the smoke detector responded to smoldering fires an average of more than 14 minutes faster than a conventional dual sensor alarm, and the number of nuisance alarms was reduced by more than 50%.

Advantages

- Faster fire detection
- Fewer nuisance alarms
- Competitive cost

Potential Applications

- Residential smoke detector
- Commercial fire alarm system integration

Patents

Robert J. Warmack, Dennis A. Wolf, and Steven Shane Frank. *Smart Smoke Alarm,* US Patent Application 61/756,131, filed January 24, 2013.

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