Algorithm for sensing explosive dust concentration

Portable and inexpensive real-time imaging technology accurately detects and notifies users of explosive dust concentration to prevent major industrial explosions.

Researchers at Purdue University have developed a method for sensing explosive dust concentration. Over 70% of the dust produced in industry is explosive, and the suspended dust concentration is one of the most important factors that leads to a major explosion. Dust clouds are mobile, rendering stationary equipment for measuring dust concentration insufficient. The Purdue researchers' solution is portable and inexpensive. The application requires selection of the type of dust (cornstarch, corn dust, or sawdust) and takes camera images/video of the dust. The app detects the intensity of light from the images and distance between the two targets and, using an algorithm, calculates the dust concentration and notifies the user if it is an explosive concentration. This app can be easily updated as correlations for other types of dust are determined.

Related Publications: Yumeng Zhao, R.P. Kingsly Ambrose, A real-time method for sensing suspended dust concentration from the light extinction coefficient, Journal of Loss Prevention in the Process Industries, Volume 67, 2020, https://doi.org/10.1016/j.jlp.2020.104242.

https://www.purdue.edu/newsroom/releases/2020/Q3/real-time-imaging-can-help-prevent-deadly-dust-explosions.html

Technology Validation: The researchers' sawdust and corn dust regression equations were within the 95% R2 limit, and the R2 value for the cornstarch regression equation was 93%.

Advantages

- Mobile, in-situ detection method

- Inexpensive

Technology ID
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Category
Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition
Robotics & Automation/Perception & Sensing

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- Rapid response time

- Large area detection

- Amenable to different types of dust

Applications

- Sensing suspended dust concentration

TRL: 5

Intellectual Property:

Keywords: explosive dust concentration sensing, dust cloud measurement, real-time dust detection, light extinction coefficient, mobile dust monitoring, in-situ dust sensing, industrial dust explosion prevention, portable dust concentration app, dust concentration algorithm, suspended dust measurement, Agriculture, App, Corn dust, Cornstarch, Dust, Explosive dust, Sawdust, sensor