METHOD FOR REAL TIME MONITORING OF SUSPENDED DUST CONCENTRATIONS USING SURVEILLANCE CAMERA AND ARTIFICIAL INTELLIGENCE

Technology ID
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Category
Agriculture, Nutrition, & AgTech/Food Safety & Traceability
Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition
Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection

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The ExpDustNet hybrid deep learning model offers a reliable, real-time alternative to expensive particle counters for monitoring explosive dust concentrations in industrial environments, enhancing workplace safety.

The handling of particulate materials generates high concentrations of airborne particles, often exceeding the minimum explosive concentration limit. Suspended dust concentration can be predicted based on light extinction through a dust cloud. Researchers at Purdue University have developed and evaluated the performance of the explosive dust particle network (ExpDustNet), a hybrid deep learning model designed for real-time monitoring of suspended dust concentrations. This technology helps industries like grain, food, pharmaceuticals, and chemicals monitor dust concentrations, specifically the minimum explosive concentration (MEC), using existing surveillance or imaging systems. It offers an easy, reliable, and real-time alternative to expensive, time-consuming particle counters, ensuring a safer work environment.

Technology Validation:

For corn starch, ExpDustNet achieved the lowest mean absolute error (MAE) of 0.034 g/m^3 and the root mean square error (RMSE) of 0.058 g/m3, outperforming other published models in stability and consistency. Similarly, for grain dust, ExpDustNet obtained the lowest MAE (0.024 g/m^3) and RMSE (0.044 g/m^3) indicating robustness in handling variations in particle sizes, mass extinction efficiencies, and brightness levels.

Advantages:

Deep-learning model

Real-time monitoring

Applications:

Agricultural industry

Pharmaceutical industry

Food processing

Particulate material

TRL: 4

Intellectual Property:

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Keywords: Explosive Dust Particle Network, ExpDustNet, suspended dust concentration monitoring, minimum explosive concentration, MEC, deep learning model, real-time monitoring, particle counter alternative, dust safety, industrial monitoring, Agriculture, Chemistry and Chemical Analysis, Deep-learning model, Real-time determination, Suspended dust particle concentrations