SIMULATION OF SAWDUST PARTICLES IN CHAOTIC WALK USING ITS DISPERSIVE CHARACTERISTICS IN EUCLIDEAN SPACE OF THE SAWMILL ENVIRONMENT

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ABSTRACT

This paper presents the results of an investigation to study the distribution of sawdust particles in air during sawing/cutting operations in sawmill and its cluster formation and dispersion events. The main features of the proposed algorithm are: integrate the attractive features of logistic equation, Lyapunov exponent estimation and diffusive characteristic exponent in a chaotic walk in 3 different Euclidean spaces. The logistic equation control parameters ensured chaotic solution in a range, which was used to select next direction and next step size for the walk while simultaneously keeping record of distance traveled after the elapsed time step.

The diffusive characteristic exponent of the average distance traveled was estimated for all parameters and linked to Lyapunov exponent to provide evidence of chaoticness or otherwise. Results yielded 9.73% of the control parameter leading to chaoticness while the super dispersive characteristic exponents for all the cases lies between 0.754 and 1.026 with the lower limit greater than 0.5 supported by literature for random walk. It was shown that super-diffusive characteristic exponent supplements and contains chaotic behavior of sawdust particles in sawmill environments. The study helps to understand the pattern of movement of inhaled sawdust particles by sawmill workers so as to remove the effects of toxicity on the body. It is an improvement on previous literature report which was limited to radius elimination method.

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