

Gaussian Probability Density for Forest Fire Detection Using Satellite Imagery

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Abstract : we present a method for early detection of forest fires from a thermal infrared satellite image, using the image matrix of the probability of belonging. The principle of the method is to compare a theoretical mathematical model to an experimental model. We considered that each line of the image matrix, as an embodiment of a non-stationary random process. Since the distribution of pixels in the satellite image is statistically dependent, we divided these lines into small stationary and ergodic intervals to characterize the image by an adequate mathematical model. A standard deviation was chosen to generate random variables, so each interval behaves naturally like white Gaussian noise. The latter has been selected as the mathematical model that represents a set of very majority pixels, which we can be considered as the image background. Before modeling the image, we made a few pretreatments, then the parameters of the theoretical Gaussian model were extracted from the modeled image, these settings will be used to calculate the probability of each interval of the modeled image to belong to the theoretical Gaussian model. The high intensities pixels are regarded as foreign elements to it, so they will have a low probability, and the pixels that belong to the background image will have a high probability. Finally, we did present the reverse of the matrix of probabilities of these intervals for a better fire detection.

Keywords : forest fire, forest fire detection, satellite image, normal distribution, theoretical gaussian model, thermal infrared matrix image

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