

Swarm approach to photography

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A new approach to cleaning up digital photos and other images has been developed by researchers in the UK and Jordan. The research, published recently in Inderscience's *International Journal of Innovative Computing and Applications* uses a computer algorithm known as a PSO (Particle Swarm Optimization) to intelligently boost contrast and detail in an image without distorting the underlying features.

Malik Braik and Alaa Sheta of the Department of Information Technology, at Al-Balqa Applied University, in Salt, Jordan, working with Aladdin Ayesh in the Division of Computer Engineering, at De Montfort University, Leicester, UK, explain that the Particle Swarm Optimization (PSO) algorithm represents an entirely new approach to solving all kinds of optimization problems. PSO has recently been used in computer science and electrical engineering.

The roots of the PSO algorithms lie in Swarm Intelligence paradigm which is inspired by models of living systems, artificial life (A-life) in general, and by theories of how and why birds flock, why schools of fish behave the way they do and in particular what controls swarming insects. Despite its potential it relies on only simple mathematics and does not need powerful computers to run, which means software applications based on PSO would not be limited only to academic researchers and those with access to supercomputers.

There have been several approaches to image enhancement developed by image manipulation software companies and others. However, none comes up to the standards of the kind of image enhancement often seen

in fiction, where a blurry distorted image on a screen is rendered pin-sharp at the click of a mouse. PSO, however, takes image enhancement a step closer to this ideal.

PSO is based on a mathematical model of the social interactions of swarms. The algorithm treats each version of an image as an individual member of the swarm and makes a single, small adjustment to contrast levels, edge sharpness, and other image parameters. The algorithm then determines whether the new members of the swarm are better or worse than the original according to an objective fitness criterion.

"The objective of the algorithm is to maximize the total number of pixels in the edges, thus being able to visualize more details in the images," explain the researchers. Such enhancement might be useful in improving snapshots of CCTV quality for identification of individuals or vehicle number plates, it might also have application in improving images produced with lower quality cameras, such as camera phones, that are required for use in publishing or TV where image quality standards are usually higher.

The process of enhancing step by step is repeated to create a swarm of images in computer memory which have been graded relative to each other, the fittest end up at the front of the swarm until a single individual that is the most effectively enhanced.

"The obtained results using grey scale images indicate that PSO is better than other approaches in terms of the computational time and both the objective evaluation and maximization of the number of pixels in the edges of the tested images," they add.

Source: Inderscience Publishers

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