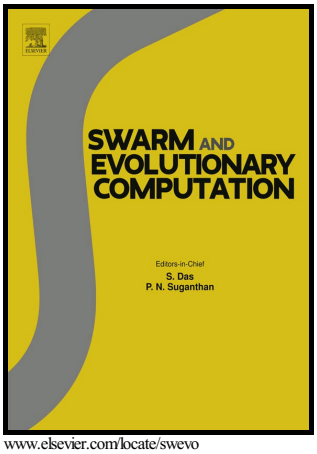

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Voxelisation in the 3-D Fly Algorithm for PET

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Abstract

The Fly Algorithm was initially developed for 3-D robot vision applications. It consists in solving the inverse problem of shape reconstruction from projections by evolving a population of 3-D points in space (the 'flies'), using an evolutionary optimisation strategy. Here, in its version dedicated to tomographic reconstruction in medical imaging, the flies are mimicking radioactive photon sources. Evolution is controlled using a fitness function based on the discrepancy of the projections simulated by the flies with the actual pattern received by the sensors. The reconstructed radioactive concentration is derived from the population of flies, i.e. a collection of points in the 3-D Euclidean space, after convergence. 'Good' flies were previously binned into voxels. In this paper, we study which flies to include in the final solution and how this information can be sampled to provide more accurate datasets in a reduced computation time. We investigate the use of density fields, based on Metaballs and on Gaussian functions respectively, to obtain a realistic output. The spread of each Gaussian kernel is modulated in function of the corresponding fly

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