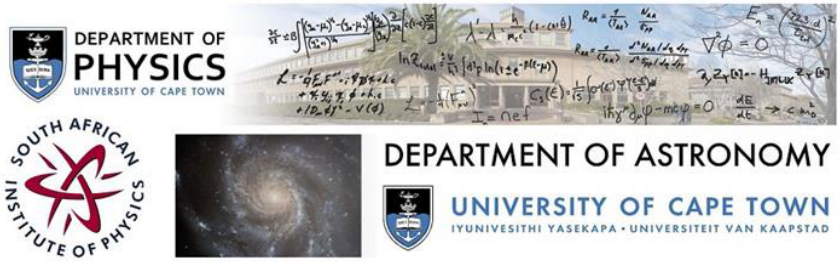

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A genetic algorithm approach to enhancing the performance of a PET detector array

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Abstract content
   (Max 300 words)
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The MinPET project aims to locate diamonds within kimberlite by activating carbon within kimberlite, then using Positron Emission Tomography (PET) to image carbon density. Distinguishing small diamonds from the background depends crucially on the accurate reconstruction of detector hit positions. This reconstruction is subject to two kinds of errors: local errors, where the position of a hit within a particular detector is not accurately reconstructed from the incoming photomultiplier tube signals, and global errors, where the internal parameters that describe the physical location and orientation of detector pixels do not accurately match reality.

Because of the large number of detectors in a full MinPET unit, there are too many parameters involved to feasibly adjust them by hand. We have therefore developed a custom genetic algorithm that iteratively evolves detector parameters in order to optimise the image quality. Results are presented from before and after the optimisation is performed, indicating that image accuracy and resolution are improved. This algorithm could be employed periodically in an industrial or medical setting to automatically correct for detector movements or calibration drift.

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