Chapter 7

Closure

7.1 Conclusions

The studies performed herein, as well as work previously performed by other workers, reveals the potential of the gradient free PSOA for a wide variety of problems. This includes neural network training, discrete optimization, and the tracking of an optimum of which the position changes with time. In addition, this study demonstrates the suitability of the PSOA for the global programming problem, and constrained sizing design of truss structures.

7.2 Recommendations

It is proposed that either the constriction variant or the dynamic inertia and maximum velocity reduction variants are used in global or structural optimization. For the constriction variant, it is proposed that cognitive and social parameters of 2.8 and 1.3 respectively, should be used. While the dynamic inertia and maximum velocity variant is shown to be relatively insensitive to the cognitive and social parameters, it is recommended that c_1 and c_2 both be set to 2.0, as originally proposed by Eberhart and Kennedy. The dynamic delay period h should be approximately 10, with the velocity and inertia reduction parameters (α and β) both between values of 0.990 and 0.999, preferably 0.99. A swarm population of 20 particles delivers satisfactory results for both the constriction and dynamic variants in terms of cost and reliability.

7.3 Directions for future studies

Although the PSOA is now an accepted algorithm receiving wide acknowledgment, the algorithm is still in it's infancy. As such there is still scope for improvement. A number of topics that deserve attention in the near future include the following:

1. The stopping criteria used herein are very basic. In order to minimize undue expense in function evaluations (without invoking premature convergence in global searches), a detailed investigation of suitable stopping criteria is required.

2. Hybridizing with other methods has recently been proposed, in an effort to combine the good global search capabilities of the PSOA with the refined search capability of gradient based methods. This promises to be a fruitful line of research, in particular for structural applications, where cost efficiency is extremely important.

3. Since the structure of the PSOA allows for easy parallelization, it is proposed that the algorithm be implemented on the existing Beowulf cluster at the University of Pretoria.

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