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FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

TITLE

– MIRPR report –

Team members
Name, specialisation, group, email

2020-2021

Abstract

Text of abstract. Short info about:

- project relevance/importance,
- inteligent methods used for solving,
- data involved in the numerical experiments;
- conclude by the the results obtained.

Please add a graphical abstract of your work.

Contents

List of Tables

List of Figures

List of Algorithms

Chapter 1

Introduction

1.1 What? Why? How?

Motivate and abstractly describe the problem you are addressing and how you are addressing it.

- What is the (scientific) problem?
- Why is it important?
- What is your basic approach?

A short discussion of how it fits into related work in the area is also desirable. Summarize the basic results and conclusions that you will present.

1.2 Paper structure and original contribution(s)

The research presented in this paper advances the theory, design, and implementation of several particular models.

The main contribution of this report is to present an intelligent algorithm for solving the problem of ....

The second contribution of this report consists of building an intuitive, easy-to-use and user friendly software application. Our aim is to build an algorithm that will help ....

The third contribution of this thesis consists of ....

The present work contains xyz bibliographical references and is structured in five chapters as follows.

The first chapter/section is a short introduction in ....

The second chapter/section describes ....

The chapter/section 4 details ....

Chapter 2

Scientific Problem

2.1 Problem definition

Give a description of the problem. Explain why it must be solved by an intelligent algorithm. Details the advantages and/or disadvantages of solving the problem by a (some) given method(s).

Precisely define the problem you are addressing (i.e. formally specify the inputs and outputs). Elaborate on why this is an interesting and important problem.

Chapter 3

State of the art/Related work

The theory of the methods utilised until now in order to solve the given problem.

Answer the following questions for each piece of related work that addresses the same or a similar problem.

- What is their problem and method?
- How is your problem and method different?
- Why is your problem and method better?

In order to cite a given work you can use a bib file (see the example) and the *cite* command: [2], [3], [1], [5], [4].

Chapter 4

Investigated approach

Describe your approach!

Describe in reasonable detail the algorithm you are using to address this problem. A psuedocode description of the algorithm you are using is frequently useful. Trace through a concrete example, showing how your algorithm processes this example. The example should be complex enough to illustrate all of the important aspects of the problem but simple enough to be easily understood. If possible, an intuitively meaningful example is better than one with meaningless symbols.

Chapter 5

Application (numerical validation)

Explain the experimental methodology and the numerical results obtained with your approach and the state of art approache(s).

Try to perform a comparison of several approaches.

Statistical validation of the results.

5.1 Methodology

- What are criteria you are using to evaluate your method?
- What specific hypotheses does your experiment test? Describe the experimental methodology that you used.
- What are the dependent and independent variables?
- What is the training/test data that was used, and why is it realistic or interesting? Exactly what performance data did you collect and how are you presenting and analyzing it? Comparisons to competing methods that address the same problem are particularly useful.

5.2 Data

Describe the used data.

5.3 Results

Present the quantitative results of your experiments. Graphical data presentation such as graphs and histograms are frequently better than tables. What are the basic differences revealed in the data. Are

they statistically significant?

5.4 Discussion

- Is your hypothesis supported?
- What conclusions do the results support about the strengths and weaknesses of your method compared to other methods?
- How can the results be explained in terms of the underlying properties of the algorithm and/or the data.

Chapter 6

Conclusion and future work

Try to emphasise the strengths and the weaknesses of your approach. What are the major shortcomings of your current method? For each shortcoming, propose additions or enhancements that would help overcome it.

Briefly summarize the important results and conclusions presented in the paper.

- What are the most important points illustrated by your work?
- How will your results improve future research and applications in the area?

Chapter 7

Latex examples

Item example:

- content of item1
- content of item2
- content of item3

Figure example

... (see Figure 7.1)

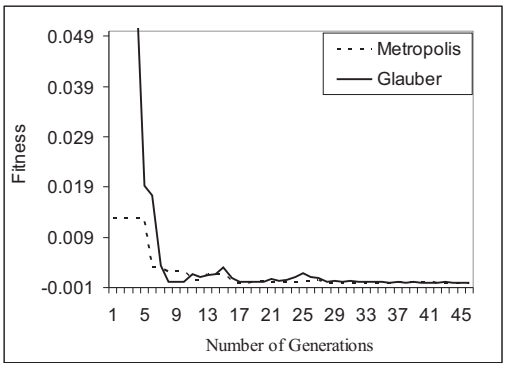

Figure 7.1: The evolution of the swarm size during the GA generations. This results were obtained for the f_2 test function with 5 dimensions.

Table example: (see Table 7.1)

Algorithm example

... (see Algorithm 1).

Table 7.1: The parameters of the PSO algorithm (the micro level algorithm) used to compute the fitness of a GA chromosome.

Parameter	**Value**
Number of generations	50
Number of function evaluations/generation	10
Number of dimensions of the function to be optimized	5
Learning factor c_1	2
Learning factor c_2	1.8
Inertia weight	$0.5 + \frac{rand()}{2}$

Algorithm 1 SGA - Spin based Genetic AQlgorithm

```
BEGIN
@ Randomly create the initial GA population.
@ Compute the fitness of each individual.
for i=1 TO NoOfGenerations do
  for j=1 TO PopulationSize do
    p ← RandomlySelectParticleFromGrid();
    n ← RandomlySelectParticleFromNeighbors(p);
    @ Crossover(p, n, off);
    @ Compute energy ΔH
    if ΔH satisfy the Ising condition then
      @ Replace(p,off);
    end if
  end for
end for
END
```

Bibliography

[1] E. Berlekamp, J. Conway, and J. Guy. *Winning Ways*. Academic Press Inc., London, 1982.

[2] J. Kennedy and R. C. Eberhart. Particle swarm optimization. In *International Conference on Neural Networks*, pages 1942–1948. IEEE, 1995.

[3] B. Koh, A. George, R. Haftka, and B. Fregly. Parallel asynchronous particle swarm optimization. *International Journal for Numerical Methods in Engineering*, 67(4):578–595, 2006.

[4] Mozilla. Firefox iOS application. link, 2018.

[5] Rainer Storn and Kenneth Price. Differential evolution - a simple and efficient adaptive scheme for global optimization over continuous spaces. Technical Report TR-95-012, International Computer Science Institute, Berkeley, CA, March 1995.