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Twenty Second Century Artificial Intelligence

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PREFACE

In 20th and 21st Centuries the global optimization algorithms were created by taking inspiration from birds (Particle Swarm Optimization), ants (Ant Colony Optimization), chromosomes (Genetic Algorithms) etc. In "Twenty Second Century Artificial Intelligence" book global optimization algorithms are created by taking inspiration from Humans, Souls, Gods, Satisfied Beings, Mothers, Children, Particular Human Beings and Stories.

In 20th and 21st Centuries research scientists focused mainly on Brain Inspired Computing. In "Twenty Second Century Artificial Intelligence" book a new path is shown where algorithms are created by taking inspiration from both heart and brain.

In 20th and 21st Centuries the path of "Artificial Intelligence" is the main focus of research. In "Twenty Second Century Artificial Intelligence" book we defined "Artificial Satisfaction".

In 20th and 21st Centuries researchers created many algorithms by taking inspiration from Nature (Nature Inspired Computing). In "Twenty Second Century Artificial Intelligence" book we created "Nature Plus Plus Inspired Computing".

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Twenty Second Century Artificial Intelligence

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ABSTRACT

The book defines various new paths as nine different chapters. First, second and third chapters deal with “Artificial Human Optimization”, “Artificial Soul Optimization” and “Artificial God Optimization” respectively.
Three new branches titled “Artificial Satisfaction”, “Deep Loving” and “Nature Plus Plus Inspired Computing” are shown in fourth, fifth and sixth chapters respectively.
The seventh chapter describes “Artificial Heart Neural Networks” where algorithms are created by taking inspiration from both Heart and Brain.
Two new branches “Artificial Excellence” and “Stories Inspired Optimization Algorithms” are created in last two chapters of this book.

Keywords: Artificial intelligence; twenty second century; global optimization techniques; artificial satisfaction; nature plus plus inspired computing; heart and brain inspired computing.

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Chapter 1
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Artificial Human Optimization

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ABSTRACT

The term "Artificial Human Optimization" was first created by the corresponding author of this paper in December 2016, when he published a paper titled "Entrepreneur : Artificial Human Optimization" in Transactions on Machine Learning and Artificial Intelligence (TMLAI) Volume 4, No 6 in December 2016. (December 2016). The Artificial Human Optimization Field is described as the collection of all optimization methods suggested based on Artificial Humans, according to a paper released in 2016. In the real world, we (Humans) are responsible for resolving issues. Artificial Humans imitate real Humans in the search space and solve optimization issues in the same way. The basic entities in the solution space of Particle Swarm Optimization (PSO) are Artificial Birds, whereas the basic entities in the search space of Artificial Human Optimization are Artificial Humans. Each Artificial Human is associated with a certain location in the solution space. The following are ten strategies for Artificial Human Optimization :"Human Bhagavad Gita Particle Swarm Optimization (HBGPSO)", "Human Poverty Particle Swarm Optimization (HPPSO)", "Human Dedication Particle Swarm Optimization (HuDePSO)", "Human Selection Particle Swarm Optimization (HuSePSO)", "Human Safety Particle Swarm Optimization (HuSaPSO)", "Human Kindness Particle Swarm Optimization (HKPSO)", "Human Relaxation Particle Swarm Optimization (HRPSO)", "Multiple Strategy Human Particle Swarm Optimization (MSHPSO)", "Human Thinking Particle Swarm Optimization (HTPSO)", "Human Disease Particle Swarm Optimization (HDPSO)". The results of applying ten Artificial Human Optimization methods to various benchmark functions are presented in this paper.

Keywords: Computational intelligence; evolutionary computing; artificial humans; artificial human optimization; particle swarm optimization; genetic algorithms; hybrid algorithms; global optimization techniques; nature inspired computing; bio-inspired computing; artificial intelligence; machine learning.

Highlights:

1) World's First Hybrid PSO algorithm based on Human Bhagavad Gita is designed in this work.
2) World's First Hybrid PSO algorithm based on Human Poverty is designed in this work.
3) World's First Hybrid PSO algorithm based on Human Dedication is designed in this work.
4) World's First Hybrid PSO algorithm based on Human Selection is designed in this work.
5) The concept of Money is introduced into Particle Swarm Optimization algorithm for the first time in research industry history to create a new Hybrid PSO algorithm which comes under Artificial Human Optimization Field.
6) Ten Hybrid PSO algorithms which come under Artificial Human Optimization Field are shown in this work.

1. INTRODUCTION

The purpose of 'Human Optimization' is to improve the performance of real humans using a variety of techniques. However, as indicated in the abstract of this research, "Artificial Human Optimization" is a new subject that was founded in December 2016. This new field is a sub-field of Evolutionary

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Computing, which is itself a sub-field of the study of Computational Intelligence. As a result, "Human Optimization (Real Human Optimization)" differs from "Artificial Human Optimization" (AHO).

The following is a review collected in 2013 from an expert for a project in the AHO Field. The whole text of the review is presented below in double quotes: "The motivation of the paper is interesting. But the paper does not present any evaluation of the proposed algorithm. So we have an idea but we are not able to assess it on the basis of the paper. Next, there seems to be a difference between birds, fishes, ants, bacteria, bees etc. on one side, and human beings on the other side. Birds, fishes, ants, bacteria, bees etc. are more or less the same. People are different. I dare say that taxi drivers are different from politicians, or preschool teachers for example. Some people prefer money or power than love. It is not so difficult to guess which way ants will go but it is not so obvious when we consider people behavior. In my opinion the paper is a very first step to build the algorithm assumed but still lots of work is needed to achieve the goal."

The algorithms under Artificial Human Optimization Field (AHO Field) were proposed in literature starting from year 2003. But from the above review it is clear that the expert felt there are no algorithms under Artificial Human Optimization Field as on 2013 and corresponding author's work is the very first step. Experts are very familiar with Genetic Algorithms, Particle Swarm Optimization, Ant Colony Optimization etc but according to corresponding author's observation many experts are unaware of the fact that there are algorithms under AHO Field before 2013. Even corresponding author of this work felt that his work submitted for review in 2013 is the beginning of Artificial Human Optimization Field Algorithms. But this was a mistake and it was corrected in later papers. It is also clear from above review shown in double quotes that imitating Humans and creating Evolutionary Computing algorithms is not as easy as imitating beings Birds, fishes, ants, bacteria, bees etc and creating algorithms under Evolutionary Computation domain.

In this work the focus is on creating new AHO Field algorithms by modifying Particle Swarm Optimization (PSO) algorithm. Articles [1-7] give an overview of existing PSO algorithms and other details. Artificial Human Optimization Algorithms that are created by modifying PSO algorithm were shown in [8-12]. Articles [13-25] gives complete details related to Artificial Human Optimization Field and its algorithms. Benchmark Functions used in this paper are taken from [26]. Some updates in this area are available elsewhere and may find attention of the readers [27-29].

The rest of the article is organized as follows:

Section 2 shows Particle Swarm Optimization algorithm. Section 3 to Section 12 shows "Human Bhagavad Gita Particle Swarm Optimization (HBGPSO)", "Human Poverty Particle Swarm Optimization (HPPSO)", "Human Dedication Particle Swarm Optimization (HuDePSO)", "Human Selection Particle Swarm Optimization (HuSePSO)", "Human Safety Particle Swarm Optimization (HuSaPSO)", "Human Kindness Particle Swarm Optimization (HKPSO)", "Human Relaxation Particle Swarm Optimization (HRPSO)", "Multiple Strategy Human Particle Swarm Optimization (MSHPSO)", "Human Thinking Particle Swarm Optimization (HTPSO)", "Human Disease Particle Swarm Optimization (HDPSO)" respectively. Results are explained in Section 13. Section 14 gives Conclusions.

2. PARTICLE SWARM OPTIMIZATION

Particle Swarm Optimization (PSO) was proposed by Kennedy and Eberhart in 1995. PSO is based on Artificial Birds. It has been applied to solve complex optimization problems.

In PSO, first we initialize all particles as shown below. Two variables $pbest_i$ and gbest are maintained. $pbest_i$ is the best fitness value achieved by i^{th} particle so far and gbest is the best fitness value achieved by all particles so far. Lines 4 to 11 in the below text helps in maintaining particle best and global best. Then the velocity is updated by rule shown in line no. 14. Line 15 updates position of i^{th} particle. Line 19 increments the number of iterations and then the control goes back to line 4. This process of a particle moving towards its local best and also moving towards global best of particles is continued until termination criteria will be reached.

Procedure: Particle Swarm Optimization (PSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **for** each dimension d **do**
14) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
15) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **end for**
19) iterations = iterations + 1
20) **while** (termination condition is false)

3. HUMAN BHAGAVAD GITA PARTICLE SWARM OPTIMIZATION

Bhagavad Gita is a Hindu sacred text. There are no Hybrid PSO algorithms based on Bhagavad Gita till date. According to Bhagavad Gita “He who is successful is not ideal. He who failed is not ideal. Only he is ideal and revered who irrespective of success or failure stands steadfast in the pursuit of his mission”. Human Bhagavad Gita Particle Swarm Optimization (HBGPSO) is designed based on this fact.

The population consists of ideal and non ideal candidates. Based on random number generated and IdealCandidateProbability, the human is classified into either ideal or non ideal candidate. Ideal candidate is not affected by success or failure and he moves in search space without any halt. So velocity and position are always updated as shown in line number 15 and 16 irrespective of anything. But this is not the case for non ideal candidate. Based on random number generated and SuccessProbability, non-ideal candidate is classified to facing either success or failure. Non ideal candidate will not update velocity and position and moves into halted state when he faces failure as shown in line number 25. He updates velocity and position when he faces success as shown in line number 21 and 22. Hence failure or success is not a matter for ideal candidate. But non ideal candidate will stop progress when he faces failure.

Procedure: Human Bhagavad Gita Particle Swarm Optimization (HBGPSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (random(0,1) < IdealCandidateProbability) **then** // ideal candidate
14) **for** each dimension d **do**

15) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
16) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **else** // non ideal candidate
19) **if** (random(0,1) < SuccessProbability) **then**
20) **for** each dimension d **do**
21) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
22) $x_{i,d} = x_{i,d} + v_{i,d}$
23) **end for**
24) **else** // non ideal candidate with failure
25) // non ideal candidate with failure doesnot update position and velocity
26) **end if**
27) **end if**
28) **end for**
29) iterations = iterations + 1
30) **while** (termination condition is false)

4. HUMAN POVERTY PARTICLE SWARM OPTIMIZATION

There are no Hybrid PSO algorithms based on Human Poverty till date. The population consists of Rich Humans and Poor Humans. Based on random number generated and RichCandidateProbability, the human is classified into either Rich or Poor. Rich Humans have enough money to move in the search space without any halt. So velocity and position are always updated as shown in line number 15 and 16 irrespective of anything. But this is not the case for poor Humans. Based on random number generated and DonationsProbability, Poor Human is classified to having enough money to move in the search space or having insufficient money. Poor Human will not update velocity and position and moves into halted state when he doesn't have enough money as shown in line number 25. He updates velocity and position when he gets donations and has enough money to travel in search space as shown in line number 21 and 22. Hence money is not a matter for Rich Human. But Poor candidate will stop progress when he did not get sufficient money to travel in search space.

Procedure: Human Poverty Particle Swarm Optimization (HPPSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (random(0,1) < RichCandidateProbability) **then** // rich candidate
14) **for** each dimension d **do**
15) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
16) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **else** // poor candidate

19) **if** (random(0,1) < DonationsProbability) **then** // poor candidate gets donations
20) **for** each dimension d **do**
21) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
22) $x_{i,d} = x_{i,d} + v_{i,d}$
23) **end for**
24) **else**
25) // poor candidate with no donations doesnot update position and velocity
26) **end if**
27) **end if**
28) **end for**
29) iterations = iterations + 1
30) **while** (termination condition is false)

5. HUMAN DEDICATION PARTICLE SWARM OPTIMIZATION

There are no Hybrid PSO algorithms based on Human Dedication till date. Based on random number generated and HumanDedicationProbability, Human is classified into either Dedicated Human or Non Dedicated Human. Dedicated Humans move faster in search space by having a high dedication factor of 0.9 as shown in line number 16. But Non Dedicated Humans have a low dedication factor of 0.1 and move slower in search space than Dedicated Humans as shown in line number 21.

Procedure: Human Dedication Particle Swarm Optimization (HuDePSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (rand(0,1) < HumanDedicationProbability) // dedicated humans
14) **for** each dimension d **do**
15) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
16) $x_{i,d} = x_{i,d} + 0.9 * v_{i,d}$
17) **end for**
18) **else** // non-dedicated humans
19) **for** each dimension d **do**
20) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
21) $x_{i,d} = x_{i,d} + 0.1 * v_{i,d}$
22) **end for**
23) **end if**
24) **end for**
25) iterations = iterations + 1
26) **while** (termination condition is false)

6. HUMAN SELECTION PARTICLE SWARM OPTIMIZATION

There are no Hybrid PSO algorithms based on Human Selection till date. There are 2 options to select from for Humans. Either Humans move towards local best position or they move towards global best position. Based on random number generated and Human Selection Probability, Humans select from 2 options available. If random number generated is less than Human Selection Probability then Human move towards local best as shown in line number 15. Otherwise, Human move towards global best position as shown in line number 20.

Procedure: Human Selection Particle Swarm Optimization (HuSePSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (rand(0,1) < HumanSelectionProbability) // moves towards local best
14) **for** each dimension d **do**
15) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
16) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **else** // moves towards global best
19) **for** each dimension d **do**
20) $v_{i,d} = w*v_{i,d} + C_2*Random(0,1)*(gbest_d – x_{i,d})$
21) $x_{i,d} = x_{i,d} + v_{i,d}$
22) **end for**
23) **end if**
24) **end for**
25) iterations = iterations + 1
26) **while** (termination condition is false)

7. HUMAN SAFETY PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Human Safety Particle Swarm Optimization (HuSaPSO). The code for HuSaPSO is shown below.

Procedure: Human Safety Particle Swarm Optimization (HuSaPSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**

13) **for** each dimension d **do**
14) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(x_{i,d} – pworst_{i,d})$
$+ C_2*Random(0,1)*(x_{i,d} – gworst_d)$
15) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **end for**
19) iterations = iterations + 1
20) **while** (termination condition is false)

8. HUMAN KINDNESS PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Human Kindness Particle Swarm Optimization (HKPSO). The code for HKPSO is shown below.

Procedure: Human Kindness Particle Swarm Optimization (HKPSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** ($f(x_i) < f(pbest_i)$) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** ($f(pbest_i) < f(gbest)$) **then**
9) $gbest = pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **for** each dimension d **do**
14) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
15) $x_{i,d} = x_{i,d} + KindnessFactor_i * v_{i,d}$
17) **end for**
18) **end for**
19) iterations = iterations + 1
20) **while** (termination condition is false)

9. HUMAN RELAXATION PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Human Relaxation Particle Swarm Optimization (HRPSO). The code for HRPSO is shown below.

Procedure: Human Relaxation Particle Swarm Optimization (HRPSO)
1) Initialize all particles
2) Initialize RelaxationProbability
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** ($f(x_i) < f(pbest_i)$) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** ($f(pbest_i) < f(gbest)$) **then**
9) $gbest = pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** Random(0,1) < = RelaxationProbability

```
14)                     continue   // continues to next particle
15)             end if
16)             for each dimension d do
17)                     v_{i,d} = w*v_{i,d} +
                                C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})
                                + C_2*Random(0,1)*(gbest_d – x_{i,d})
18)                     x_{i,d} = x_{i,d} + v_{i,d}
19)             end for
20)     end for
21)     iterations = iterations + 1
22) while ( termination condition is false)
```

10. MULTIPLE STRATEGY HUMAN PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Multiple Strategy Human Particle Swarm Optimization (MSHPSO). The code for MSHPSO is shown below.

Procedure: Multiple Strategy Human Particle Swarm Optimization (MSHPSO)

```
1) Initialize all particles
2) iterations = 0
3) do
4)      for each particle i do
5)              If ( f( x_i ) < f( pbest_i ) ) then
6)                      pbest_i = x_i
7)              end if
8)              if ( f( pbest_i ) < f( gbest ) ) then
9)                      gbest = pbest_i
10)             end if
11)             If ( f( x_i ) > f( pworst_i ) ) then
12)                     pworst_i = x_i
13)             end if
14)             if ( f( pworst_i ) > f( gworst ) ) then
15)                     gworst = pworst_i
16)             end if
17)     end for
18)     If ((iterations == 0) || (iterations%2==0)) then
                 // for starting and even iterations
19)             for each particle i do
20)                     for each dimension d do
21)                         v_{i,d} = w*v_{i,d} +
                                    C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})
                                    +C_2*Random(0,1)*(gbest_d – x_{i,d})
22)                         x_{i,d} = x_{i,d} + v_{i,d}
23)                     end for
24)             end for
25)     else // for odd iterations
26)             for each particle i do
27)                     for each dimension d do
28)                         v_{i,d} = w*v_{i,d} +
                                C_1*Random(0,1)*( x_{i,d} - pworst_{i,d} )
                                + C_2*Random(0,1)*( x_{i,d} - gworst_d)
29)                         x_{i,d} = x_{i,d} + v_{i,d}
30)                     end for
31)             end for
32)     end if
33)     iterations = iterations + 1
34) while ( termination condition is false)
```

11. HUMAN THINKING PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Human Thinking Particle Swarm Optimization (HTPSO). The code for HTPSO is shown below.

Procedure: Human Thinking Particle Swarm Optimization (HTPSO)

```
1) Initialize all particles
2) iterations = 0
3) do
4)      for each particle i do
5)              If ( f( x_i ) < f( pbest_i ) ) then
6)                      pbest_i = x_i
7)              end if
8)              if ( f( pbest_i ) < f( gbest ) ) then
9)                      gbest = pbest_i
10)             end if
11)             If ( f( x_i ) > f( pworst_i ) ) then
12)                     pworst_i = x_i
13)             end if
14)             if ( f( pworst_i ) > f( gworst ) ) then
15)                     gworst = pworst_i
16)             end if
17)     end for
18)     for each particle i do
19)             for each dimension d do
20)                     v_i,d = w*v_i,d + Random(0,1)*(pbest_i,d – x_i,d) + Random(0,1)*(gbest_d – x_i,d)
21)                     v_i,d = v_i,d + Random(0,1)*( x_i,d - pworst_i,d ) + Random(0,1)*( x_i,d - gworst_d)
22)                     x_i,d = x_i,d + v_i,d
23)             end for
24)     end for
25)     iterations = iterations + 1
26) while (termination condition is false)
```

12. HUMAN DISEASE PARTICLE SWARM OPTIMIZATION

Please see [25], to understand Human Disease Particle Swarm Optimization (HDPSO). The code for HDPSO is shown below.

Procedure: Human Disease Particle Swarm Optimization (HDPSO)

```
1) Initialize all particles
2) iterations = 0
3) do
4)      for each particle i do
5)              If ( f( x_i ) < f( pbest_i ) ) then
6)                      pbest_i = x_i
7)              end if
8)              if ( f( pbest_i ) < f( gbest ) ) then
9)                      gbest = pbest_i
10)             end if
11)     end for

12)     If ((iterations == 0) || (iterations%2==0)) then
                // for starting and even iterations
13)             for each particle i do
14)                     for each dimension d do
15)                        v_i,d = w*v_i,d +
                                C_1*Random(0,1)*(pbest_i,d – x_i,d)
                                +C_2*Random(0,1)*(gbest_d – x_i,d)
```

16) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **end for**
19) **else** // for odd iterations
20) **for** each particle i **do**
21) **for** each dimension d **do**
22) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(x_{i,d} - pbest_{i,d})$
$+ C_2*Random(0,1)*(x_{i,d} - gbest_d)$
23) $x_{i,d} = x_{i,d} + v_{i,d}$
24) **end for**
25) **end for**
26) **end if**
27) iterations = iterations + 1
28) **while** (termination condition is false)

13. RESULTS

Ten Artificial Human Optimization methods titled “Human Bhagavad Gita Particle Swarm Optimization (HBGPSO)”, “Human Poverty Particle Swarm Optimization (HPPSO)”, “Human Dedication Particle Swarm Optimization (HuDePSO)”, “Human Selection Particle Swarm Optimization (HuSePSO)”, “Human Safety Particle Swarm Optimization (HuSaPSO)”, “Human Kindness Particle Swarm Optimization (HKPSO)”, “Human Relaxation Particle Swarm Optimization (HRPSO)”, “Multiple Strategy Human Particle Swarm Optimization (MSHPSO)”, “Human Thinking Particle Swarm Optimization (HTPSO)”, “Human Disease Particle Swarm Optimization (HDPSO)” are applied on Ackley, Beale, Bohachevsky, Booth and Three-Hump Camel Benchmark Functions and results obtained are shown in this section. The Figures of benchmark functions are taken from [26].

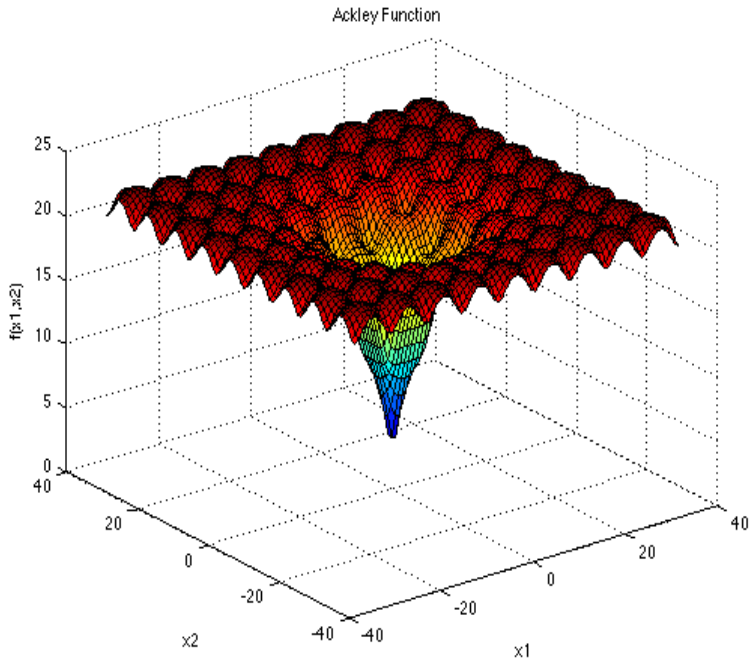

Fig. 1. Ackley Function

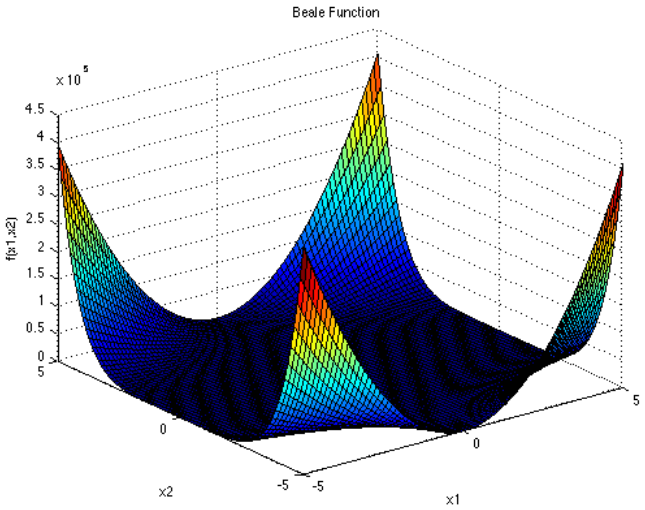

Fig. 2. Beale Function

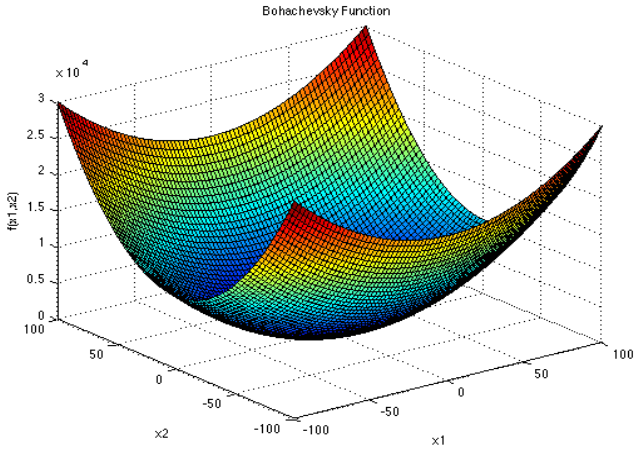

Fig. 3. Bohachevsky Function

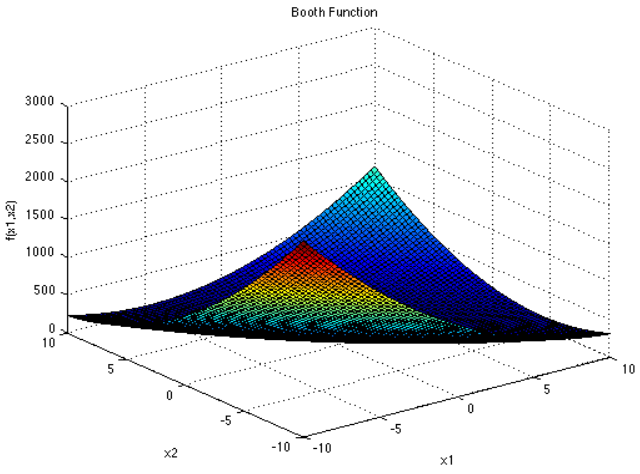

Fig. 4. Booth Function

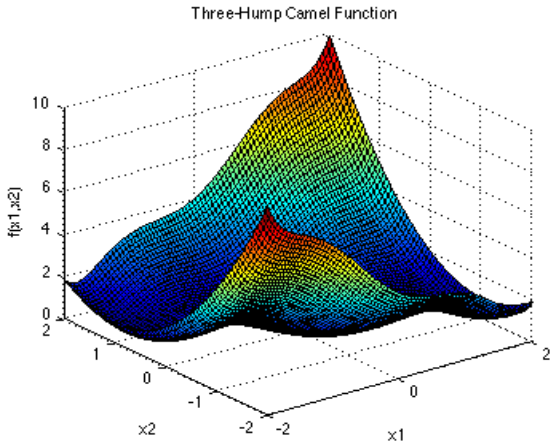

Fig. 5. Three-Hump Camel Function

Benchmark Function / AHO Algorithm	PSO	HBGPSO	HPPSO	HuDePSO	HuSePSO	HKPSO	HRPSO
Ackley							
Beale							
Bohachevsky							
Booth							
Three-Hump Camel							

Fig. 6. Overall Result Part One

Benchmark Function / AHO Algorithm	HuSaPSO	MSHPSO	HTPSO	HDPSO
Ackley				
Beale				
Bohachevsky				
Booth				
Three-Hump Camel				

Fig. 7. Overall Result Part Two

In Fig. 6 and Fig. 7, first row shows AHO algorithms and first column shows benchmark functions. Green represents “Performed Well”. Red represents “Didn’t Performed Well”. Blue represents “Performed Between Well and Not Well”.

From Fig. 6 it is clear that HBGPSO, HPPSO, HuDePSO, HuSePSO, HKPSO, HRPSO and PSO Performed Well for all benchmark functions.

From Fig. 7 it can be observed that HuSaPSO didn’t perform well even on single benchmark function. MSHPSO and HDPSO performed well on three benchmark functions. HTPSO performed well on only single benchmark function.

14. CONCLUSIONS

Artificial Human Optimization Algorithms (AHO Algorithms) inspired by Bhagavad Gita (HBGPSO), Human Poverty (HPPSO), Human Dedication (HuDePSO) and Human Selection (HuSePSO) are proposed in this work. Ten AHO algorithms are applied on 5 benchmark functions and results obtained are shown in this work. Six AHO algorithms performed as good as PSO algorithm where as

remaining four AHO algorithms didn't performed as good as PSO. HuSaPSO performed worst among all algorithms used in this work. All algorithms designed in this work performed as good as PSO. A general misunderstanding among people is that algorithms inspired by Humans will perform better than other algorithms inspired by other beings. For example, let algorithm A is inspired by Birds and Algorithm B is inspired by Humans. Then because of misunderstanding, it will lead to conclusion that Algorithm B performs better than Algorithm A because Humans are best beings and most intelligent beings on this planet. In this work, we have found that HuSaPSO inspired by Humans did not performed well even on single benchmark function where as PSO inspired by birds performed well on all benchmark functions. Our future work is to design "Human Cricket Particle Swarm Optimization (HCPSO)", "Human Farming Particle Swarm Optimization (HFPSO)" inspired by Human Cricket game and Human Farming respectively. Artificial Human Optimization Algorithms designed from scratch will also be part of our future work.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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DISCLAIMER

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Chapter 2
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Artificial Soul Optimization

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DOI:

ABSTRACT

The soul is eternal and continues to exist even after a person or animal has died. The major theme conveyed in this work is that the soul continues to exist after death and takes on a new body. The main purpose of this chapter is to create a new field known as "Artificial Soul Optimization (ASO)." In this work, the phrase "Artificial Soul Optimization" is coined. All optimization techniques based on Artificial Souls will be classified as part of the "Artificial Soul Optimization" field (ASO Field). Artificial Birds and Artificial Humans are the basic entities in search space in Particle Swarm Optimization and Artificial Human Optimization, respectively. Artificial Souls are the basic entities in the search space in Artificial Soul Optimization. The ASO Field ideas are combined with the Particle Swarm Optimization (PSO) algorithm in this paper to develop a novel hybrid algorithm titled "Soul Particle Swarm Optimization" (SoPSO).Various benchmark functions are used to test the proposed SoPSO method. The results are compared to the PSO algorithm. This study creates the world's first Hybrid PSO algorithm based on Artificial Souls.

Keywords: Artificial souls; artificial soul optimization; artificial soul computing; computational intelligence; evolutionary computing; particle swarm optimization; genetic algorithms; artificial human optimization; bio-inspired computing; nature inspired computing; machine learning; artificial intelligence.

1. INTRODUCTION

In sacred Hindu religious books such as Srimad Bhagavatham [1] and Bhagavad Gita [2], the word Soul appears. “Soul Optimization” is a term that refers to the optimization of real souls. It's also known as "Real Soul Optimization." The focus of this research is on the Artificial Soul Optimization Field (ASO Field), which is defined in the paper's abstract. As a result, it's critical to distinguish between "Artificial Soul Optimization" and "Real Soul Optimization." The corresponding author asked, “Is there something like Soul Computing?” on Researchgate and an expert replied, “Just like I doubt you would find algorithms for ‘Unicorn computing’, I don't think you will find anything on ‘Soul computing’...”. Hence there is so much yet to be done in Real Soul Computing and Artificial Soul Computing fields.

Nikola Tesla said, "The day science begins to study non-physical phenomena, it will make more progress in one decade than in all the previous centuries of its existence". Hence authors would like to suggest scientists to study and do projects related to non-physical phenomena like Real Soul Computing and Artificial Soul Computing. The current work studies Artificial Soul Optimization which comes under Artificial Soul Computing.

New ASO Field algorithms are created in this work by modifying Particle Swarm Optimization (PSO) algorithm with ASO Field concepts. Articles [3-9] give details related to PSO algorithms. Hybrid PSO Algorithms that are created by modifying PSO algorithm were shown in [10-14]. Hybrid PSO algorithms that are created by modifying PSO algorithm with Artificial Human Optimization (AHO) Field concepts and details related to AHO Field are given in articles [15-28]. There are no Artificial

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Soul Optimization Algorithms (ASO Algorithms) proposed in literature till date. Benchmark Functions used in this paper are taken from [29]. Some updates in this area are available elsewhere and may find attention of the readers [30-32].

The rest of the article is organized as follows:

Section 2 shows Particle Swarm Optimization algorithm. Section 3 shows "Soul Particle Swarm Optimization (SoPSO)". Results are explained in Section 4. Section 5 gives opportunities that are present in ASO Field. Section 6 gives Conclusions.

2. PARTICLE SWARM OPTIMIZATION

Particle Swarm Optimization (PSO) was proposed by Kennedy and Eberhart in 1995. PSO is based on Artificial Birds. It has been applied to solve complex optimization problems.

In PSO, first we initialize all particles as shown below. Two variables $pbest_i$ and gbest are maintained. $pbest_i$ is the best fitness value achieved by i^{th} particle so far and gbest is the best fitness value achieved by all particles so far. Lines 4 to 11 in the below text helps in maintaining particle best and global best. Then the velocity is updated by rule shown in line no. 14. Line 15 updates position of i^{th} particle. Line 19 increments the number of iterations and then the control goes back to line 4. This process of a particle moving towards its local best and also moving towards global best of particles is continued until termination criteria will be reached.

Procedure: Particle Swarm Optimization (PSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **for** each dimension d **do**
14) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
15) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **end for**
19) iterations = iterations + 1
20) **while** (termination condition is false)

3. SOUL PARTICLE SWARM OPTIMIZATION

The basic entities in Soul Particle Swarm Optimisation (SoPSO) are Artificial Souls. Each Artificial Soul corresponds to a point in search space. For the sake of simplicity, in this work we assume that there are two types of bodies that each Artificial Soul can take. The first body has Body Factor of BF1 and the second body has a Body Factor of BF2. In each generation, Artificial Souls take either first body or second body based on random number generated and BodySelectionProbability. If random number generated is less than BodySelectionProbability then first body is taken else second body is taken. In this study we took BF1 as 0.9 and BF2 as 0.1. Hence if Artificial Soul takes first body then it moves faster in search space because BF1 is 0.9. Whereas if Artificial Soul takes second body it moves slower in the search space because BF2 is 0.1. In each generation, body is dead after velocity

and position are updated. Hence Artificial Soul takes new body in next generation. So the Artificial Soul remains eternal in all generations whereas the bodies taken are dead and a new body is taken in every generation by Artificial Souls.

In line number 13, a random number is generated and compared with BodySelectionProbability. If random number is less than BodySelectionProbability then the Soul takes first body else it takes second body. If first body is selected by Soul then lines 14-17 are executed and body factor BF1 is used in the position update equation. If second body is selected then lines 19-22 are executed and body factor BF2 is used in the position update equation. After velocity and position updates, the body taken by Soul is dead. This is the procedure shown for first generation and first Soul. The same procedure is repeated for all the Artificial Souls in first generation. Hence after velocity and position updates, all bodies taken by Souls are dead. Now the second generation is started and Souls take bodies based on random number and BodySelectionProbability as shown in line number 13. The remaining procedure is same as that of first generation. This process continues until termination criteria will be reached.

Procedure: Soul Particle Swarm Optimization (SoPSO)

1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (rand(0,1) <BodySelectionProbability) // Soul takes first body
14) **for** each dimension d **do**
15) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
16) $x_{i,d} = x_{i,d} + BF1* v_{i,d}$
17) **end for**
18) **else** // Soul takes second body
19) **for** each dimension d **do**
20) $v_{i,d} = w*v_{i,d} + C_1*Random(0,1)*(pbest_{i,d} – x_{i,d}) + C_2*Random(0,1)*(gbest_d – x_{i,d})$
21) $x_{i,d} = x_{i,d} + BF2* v_{i,d}$
22) **end for**
23) **end if**
24) **end for**
25) iterations = iterations + 1
26) **while** (termination condition is false)

4. RESULTS

The proposed Soul Particle Swarm Optimization (SoPSO) is applied on five benchmark functions. Results obtained are compared with PSO.

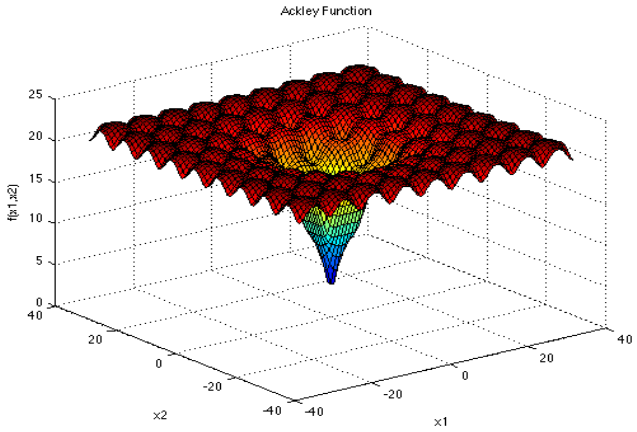

Fig. 1. Ackley function

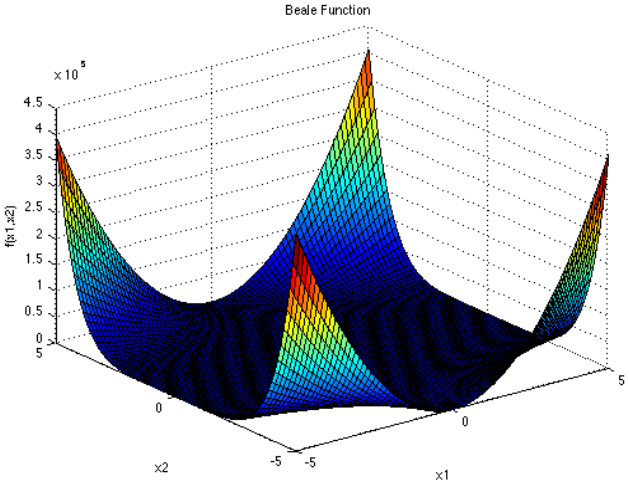

Fig. 2. Beale Function

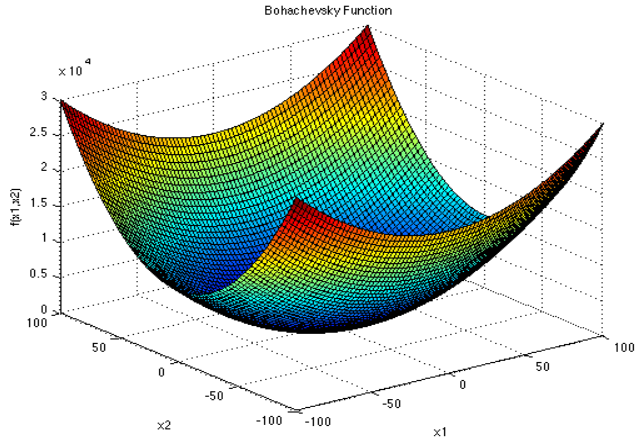

Fig. 3. Bohachevsky Function

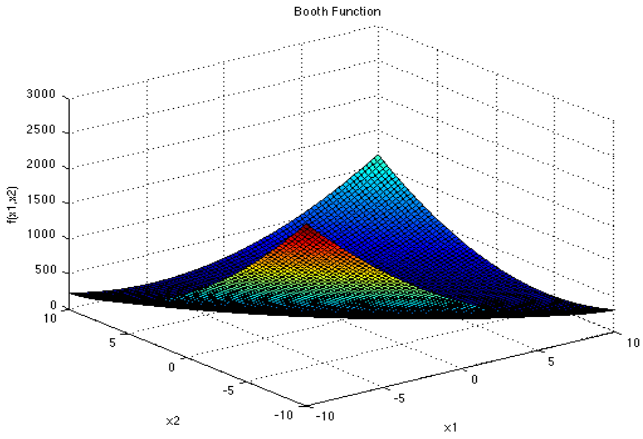

Fig. 4. Booth Function

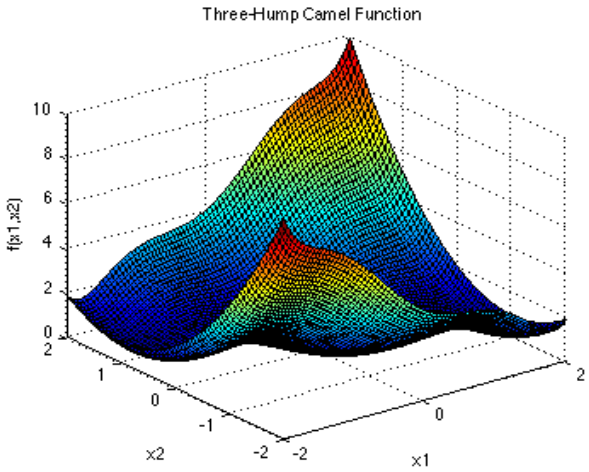

Fig. 5. Three-hump camel function

Table 1. Overall result

Benchmark Function / Algorithm	SoPSO	PSO
Ackley Function		
Beale Function		
Bohachevsky Function		
Booth Function		
Three-Hump Camel Function		

In Table 1 Green represents Performed well. Red represents didn't performed well. Blue represents performed between well and not well. From Table 1 we can see that both SoPSO and PSO performed well on all benchmark functions.

5. INTERESTING OPPORTUNITIES IN ARTIFICIAL SOUL OPTIMIZATION FIELD

The following are opportunities for experts in Computational Intelligence Field:

1) International Institute of Artificial Soul Optimization, Hyderabad, INDIA
2) Indian Institute of Technology Roorkee Artificial Soul Optimization Labs, IIT Roorkee

3) Foundation of Artificial Soul Optimization, New York, USA.
4) IEEE Artificial Soul Optimization Society
5) ELSEVIER journals in Artificial Soul Optimization
6) Applied Artificial Soul Optimization – A New Subject
7) Advanced Artificial Soul Optimization – A New Course
8) Invited Speech on "Artificial Soul Optimization" in world class Artificial Intelligence Conferences
9) A Special issue on "Artificial Soul Optimization" in a Springer published Journal
10) A Seminar on "Recent Advances in Artificial Soul Optimization" at Technical Festivals in colleges
11) International Association of Artificial Soul Optimization (IAASO)
12) Transactions on Artificial Soul Optimization (TASO)
13) International Journal of Artificial Soul Optimization (IJASO)
14) International Conference on Artificial Soul Optimization (ICASO)
15) www.ArtificialSoulOptimization.com
16) B.Tech in Artificial Soul Optimization
17) M.Tech in Artificial Soul Optimization
18) PhD in Artificial Soul Optimization
19) PostDoc in Artificial Soul Optimization
20) Artificial Soul Optimization Labs
21) To become "Father of Artificial Soul Optimization" field

6. CONCLUSIONS

A new field titled "Artificial Soul Optimization (ASO)" is invented in this work. A new algorithm titled Soul Particle Swarm Optimization (SoPSO) is designed and results show that proposed SoPSO performed well on all benchmark functions like PSO. In this work, a list of opportunities in ASO Field is shown for Computational Intelligence Field Experts. Not much work was done in Soul Computing and Artificial Soul Computing Fields till date. The new ASO field invented in this work comes under Artificial Soul Computing Field. There is scope for other innovative algorithms like Soul Ant Colony Optimization (SoACO) similar to SoPSO.

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Thanks to everyone (and everything) who directly or indirectly helped us to reach the stage where we are now today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 3
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Artificial God Optimization

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DOI:

ABSTRACT

Nature Inspired Optimization Algorithms have become popular for solving complex Optimization problems. Two most popular Global Optimization Algorithms are Genetic Algorithms (GA) and Particle Swarm Optimization (PSO). Of the two, PSO is very simple and many Research Scientists have used PSO to solve complex Optimization Problems. Hence PSO is chosen in this work. The primary focus of this paper is on imitating God who created the nature. Hence the term "Artificial God Optimization (AGO)" is coined in this paper. Artificial Gods are the basic entities in Artificial God Optimization (AGO). AGO is a new field which is invented in this work. A new Algorithm titled "God Particle Swarm Optimization (GoPSO)" is created and applied on various benchmark functions. The World's first Hybrid PSO Algorithm based on Artificial Gods is created in this work. GoPSO is a hybrid Algorithm which comes under AGO Field as well as PSO Field. Results obtained by PSO are compared with created GoPSO algorithm. A list of opportunities that are available in AGO field for Artificial Intelligence field experts are shown in this work.

Keywords: Artificial gods; artificial god optimization; artificial god computing; computational intelligence; evolutionary computing; particle swarm optimization; genetic algorithms; artificial human optimization; bio-inspired computing; nature inspired computing; machine learning; artificial intelligence.

1. INTRODUCTION

John Henry Holland proposed Genetic Algorithms in 1970's. From 1970's to till date, there are hundreds of Nature Inspired Optimization Algorithms proposed in literature. A Research scientist asked on Researchgate the following question in March 2015:

"Question: What are the various Nature Inspired Optimization Algorithms?"

Another Research Scientist replied the following algorithms as answer to the above question:

Answer: "The following is the list of various Nature Inspired Optimization Algorithms:

1. Genetic Algorithms (GA)
2. Simulated annealing (SA)
3. Artificial immune systems (AIS)
4. Boids
5. Tabu Search
6. Memetic Algorithm (MA)
7. Ant Colony Optimization Algorithm (ACO)
8. Cultural Algorithms (CA)
9. Particle Swarm Optimization (PSO)
10. Self-propelled Particles
11. Differential Evolution (DE)

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12. Bacterial Foraging Optimization
13. Harmony Search (HS)
14. MBO: Marriage in Honey Bees Optimization
15. Artificial Fish School Algorithm
16. Bacteria Chemotaxis (BC) Algorithm
17. Social Cognitive Optimization (SCO)
18. Artificial Bee Colony Algorithm
19. Bees Algorithm
20. Glowworm Swarm Optimization (GSO)
21. Honey-Bees Mating Optimization (HBMO) Algorithm
22. Invasive Weed Optimization (IWO)
23. Shuffled Frog Leaping Algorithm (SFLA)
24. Central Force Optimization
25. Intelligent Water Drops algorithm, or the IWD algorithm
26. River Formation Dynamics
27. Biogeography-based Optimization (BBO)
28. Roach Infestation Optimization (RIO)
29. Bacterial Evolutionary Algorithm (BEA)
30. Cuckoo Search (CS)
31. Firefly Algorithm (FA)
32. Gravitational Search Algorithm (GSA)
33. Group Search Optimizer
34. League Championship Algorithm (LCA)
35. Bat Algorithm
36. Bumble Bees Mating Optimization (BBMO) Algorithm
37. Eagle Strategy
38. Fireworks algorithm for optimization
39. Hunting Search
40. Altruism Algorithm
41. Spiral Dynamic Algorithm (SDA)
42. Strawberry Algorithm
43. Artificial Algae Algorithm (AAA)
44. Bacterial Colony Optimization
45. Differential Search Algorithm (DS
46. Flower pollination algorithm (FPA)
47. Krill Herd
48. Water Cycle Algorithm
49. Black Holes Algorithm
50. Cuttlefish Algorithm
51. Gases Brownian Motion Optimization
52. Mine blast algorithm
53. Plant Propagation Algorithm
54. Social Spider Optimization (SSO)
55. Spider Monkey Optimization (SMO) algorithm
56. Animal Migration Optimization (AMO) Algorithm
57. Artificial Ecosystem Algorithm (AEA)
58. Bird Mating Optimizer
59. Forest Optimization Algorithm
60. Golden Ball
61. Grey Wolf Optimizer
62. Seed Based Plant Propagation Algorithm
63. Lion Optimization Algorithm (LOA): A Nature-Inspired Meta heuristic Algorithm
64. Optics Inspired Optimization (OIO)
65. The Raven Roosting Optimization Algorithm
66. Vortex Search Algorithm
67. Water Wave Optimization
68. collective animal behavior CAB algorithm

69. Bumble bees mating optimization BBM
70. Flower Pollinated Algorithm
71. Chaos Optimization
72. Wind Driven Algorithm
73. Parliamentary optimization algorithm POA
74. Aritificial Chemical Process Algorithm
75. Aritificial Chemical Reaction Optimization Algorithm
76. Chemical Reaction Algorithm
77. Bull optimization algorithm
78. Elephent herding optimization (EHO)
79. Rain Optimization Algorithm".

From the above answer we can find that many Nature Inspired Optimization algorithms are proposed in literature till date. But there is not even a single algorithm which takes God (who created the nature) as Inspiration for creating innovative optimization algorithms. Hence a new field titled "Artificial God Optimization (AGO)" is invented in this work. AGO field is defined as follows:

Artificial Birds are the basic entities in Particle Swarm Optimization algorithm. Similarly, Artificial Gods are the basic entities in Artificial God Optimization (AGO). All the optimization algorithms which are proposed based on Artificial Gods will come under AGO Field. Each Artificial God corresponds to a point in search space. In addition to Artificial Gods there can be Artificial non-Gods in the population. Each Artificial non-God corresponds to a point in the search space. Artificial non-Gods are less powerful than Artificial Gods.

Details related to God can be found in Ancient Hindu Religious Texts [1-2]. AGO Field concepts are applied to Particle Swarm Optimization (PSO) algorithm to create New AGO Field algorithms. PSO field details are given in articles [3-9]. Articles [10-28] show details related to Hybrid PSO Algorithms that are created by modifying PSO algorithm. Till date, there are no Artificial God Optimization Algorithms (AGO Algorithms) proposed in literature. This work makes use of this research gap and invents AGO field. Some updates in this area are available elsewhere and may find attention of the readers [30,31].

The rest of the article is organized as follows:

Particle Swarm Optimization algorithm is shown in Section 2. Section 3 shows "God Particle Swarm Optimization (GoPSO)". Results are explained in Section 4. Opportunities that are present in AGO Field are shown in Section 5. Conclusions are given in Section 6.

2. PARTICLE SWARM OPTIMIZATION

Particle Swarm Optimization (PSO) was proposed by Kennedy and Eberhart in 1995. PSO is based on Artificial Birds. It has been applied to solve complex optimization problems.

In PSO, first we initialize all particles as shown below. Two variables $pbest_i$ and gbest are maintained. $pbest_i$ is the best fitness value achieved by i^{th} particle so far and gbest is the best fitness value achieved by all particles so far. Lines 4 to 11 in the below text helps in maintaining particle best and global best. Then the velocity is updated by rule shown in line no. 14. Line 15 updates position of i^{th} particle. Line 19 increments the number of iterations and then the control goes back to line 4. This process of a particle moving towards its local best and also moving towards global best of particles is continued until termination criteria will be reached.

Procedure: Particle Swarm Optimization (PSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** ($f(x_i) < f(pbest_i)$) **then**

6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **for** each dimension d **do**
14) $v_{i,d} = w*v_{i,d} +$
$C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})$
$+ C_2*Random(0,1)*(gbest_d – x_{i,d})$
15) $x_{i,d} = x_{i,d} + v_{i,d}$
17) **end for**
18) **end for**
19) iterations = iterations + 1
20) **while** (termination condition is false)

3. GOD PARTICLE SWARM OPTIMIZATION

The basic entities in the God Particle Swarm Optimization (GoPSO) are Artificial Gods and Artificial non-Gods. Gods can always move in the search space. Whereas non-Gods can move in the search space only if non-God receives blessings of Gods. Based on random number generated and GodProbability, the particle is classified into either Artificial non-God or Artificial God. If a particle is classified as Artificial God then it will update position and velocity irrespective of anything. If particle is classified as Artificial non-God then there are two cases. Based on random number generated and BlessingsOfGodProbability the particle is classified into Blessed non-God or not blessed non-God. Blessed non-God can move in search space and hence updates velocity and position. Not Blessed non-God cannot move in search space and hence doesn't update velocity and position.

If the random number generated in line number 13 is less than GodProbability then particle is classified as Artificial God else it is classified as Artificial non-God. Lines 14-17 are executed by God. Lines 19-26 are executed by non-God. If the random number generated is less than BlessingsOfGodProbability then the non-God is blessed else it is not blessed non-God. Blessed non-God executes lines 20-23. Hence velocity and position are updated for Blessed non-God. Line number 25 is blank. Hence Not Blessed non-God is blocked and does nothing. The same procedure is repeated for all particles in first generation.

In second generation, line number 13 is again executed. Particle classified as God in first generation can be classified as non-God in second generation. Particle classified as non-God in first generation can be classified as God in second generation. Similarly, in second generation, line number 19 is again executed. So, whether non-God receives blessings of God or not is dependent on the random number generated and BlessingsOfGodProbability. The remaining procedure is same as that of first generation.

Procedure: God Particle Swarm Optimization (GoPSO)
1) Initialize all particles
2) iterations = 0
3) **do**
4) **for** each particle i **do**
5) **If** (f(x_i) < f($pbest_i$)) **then**
6) $pbest_i = x_i$
7) **end if**
8) **if** (f($pbest_i$) < f(gbest)) **then**
9) gbest = $pbest_i$
10) **end if**
11) **end for**
12) **for** each particle i **do**

```
13)             if ( random(0,1) <GodProbability )then //God
14)                     for each dimension d do
15)                             v_{i,d} = w*v_{i,d} +
                                C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})
                                + C_2*Random(0,1)*(gbest_d – x_{i,d})
16)                             x_{i,d} = x_{i,d} + v_{i,d}
17)                     end for
18)             else //non-God
19)                     if ( random(0,1) <BlessingsOfGodProbability) then// Blessed non-God
20)                             for each dimension d do
21)                                     v_{i,d} = w*v_{i,d} +
                                        C_1*Random(0,1)*(pbest_{i,d} – x_{i,d})
                                         + C_2*Random(0,1)*(gbest_d – x_{i,d})
22)                                     x_{i,d} = x_{i,d} + v_{i,d}
23)                             end for
24)                     else // non-God without blessings does nothing
25)
26)                     end if
27)             end if
28)     end for
29)     iterations = iterations + 1
30) while ( termination condition is false)
```

4. RESULTS

Benchmark Functions used in this paper are taken from [29]. The proposed God Particle Swarm Optimization (GoPSO) is applied on five benchmark functions. Results obtained are compared with PSO.

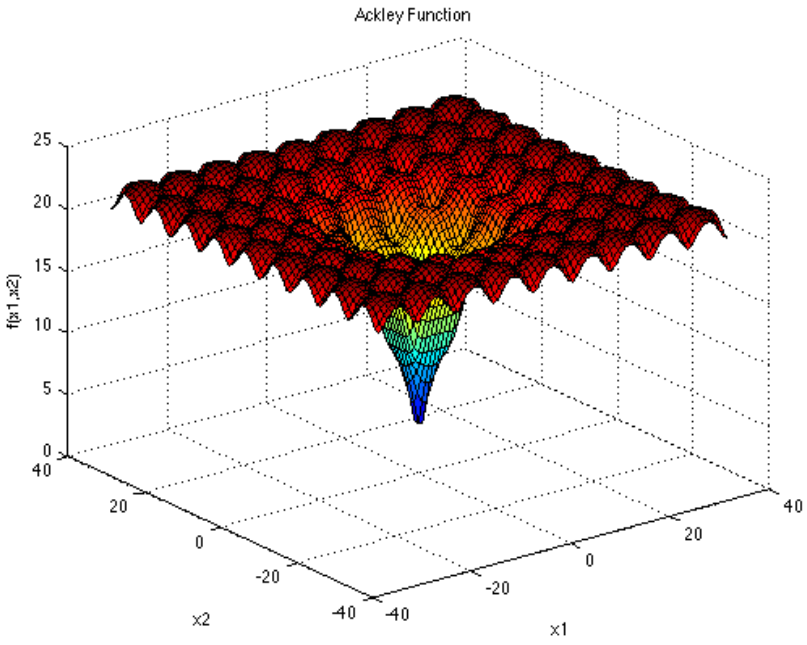

Fig. 1. Ackley function

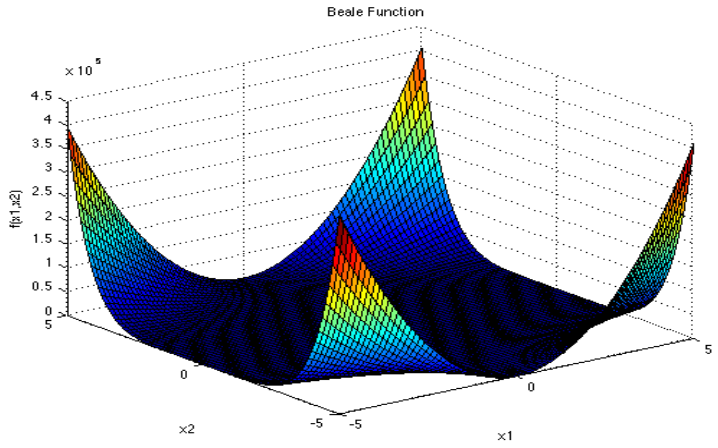

Fig. 2. Beale Function

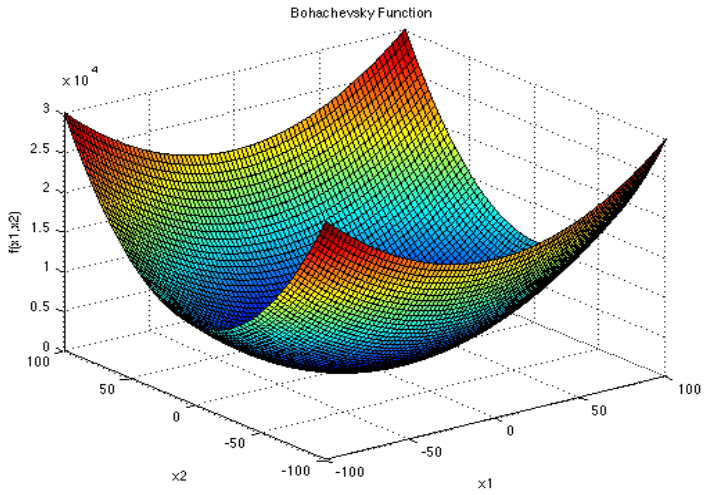

Fig. 3. Bohachevsky Function

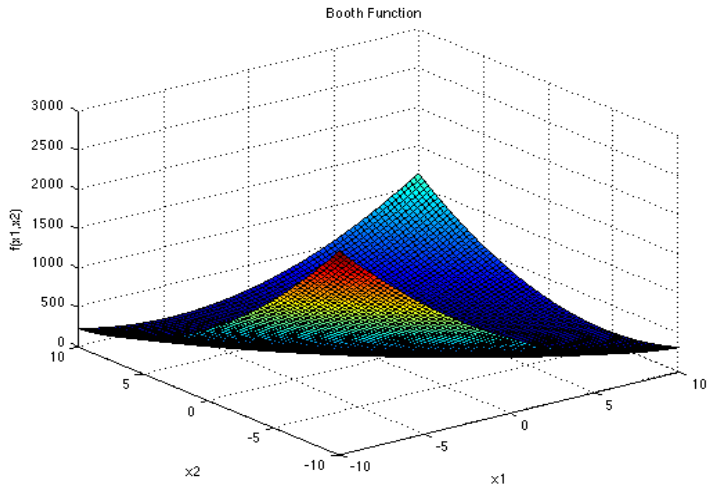

Fig. 4. Booth Function

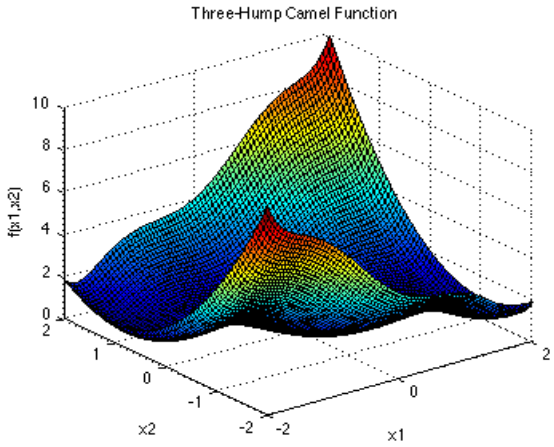

Fig. 5. Three-Hump camel function

Table 1. Overall result

Benchmark Function / Algorithm	GoPSO	PSO
Ackley Function		
Beale Function		
Bohachevsky Function		
Booth Function		
Three-Hump Camel Function		

In Table 1 Green represents Performed well. Red represents didn't performed well. Blue represents performed between well and not well. From Table 1 we can see that both GoPSO and PSO performed well on all benchmark functions.

5. INTERESTING OPPORTUNITIES IN ARTIFICIAL GOD OPTIMIZATION FIELD

The following are the opportunities in Artificial God Optimization field (AGO field) for experts in Artificial Intelligence field:

1) International Institute of Artificial God Optimization, Hyderabad, INDIA
2) Indian Institute of Technology Roorkee Artificial God Optimization Labs, IIT Roorkee
3) Foundation of Artificial God Optimization, New York, USA.
4) IEEE Artificial God Optimization Society
5) ELSEVIER journals in Artificial God Optimization
6) Applied Artificial God Optimization – A New Subject
7) Advanced Artificial God Optimization – A New Course
8) Invited Speech on "Artificial God Optimization" in world class Artificial Intelligence Conferences
9) A Special issue on "Artificial God Optimization" in a Springer published Journal
10) A Seminar on "Recent Advances in Artificial God Optimization" at Technical Festivals in colleges
11) International Association of Artificial God Optimization (IAAGO)
12) Transactions on Artificial God Optimization (TAGO)
13) International Journal of Artificial God Optimization (IJAGO)
14) International Conference on Artificial God Optimization (ICAGO)
15) www.ArtificialGodOptimization.com
16) B.Tech in Artificial God Optimization
17) M.Tech in Artificial God Optimization
18) PhD in Artificial God Optimization

19) PostDoc in Artificial God Optimization
20) Artificial God Optimization Labs
21) To become “Father of Artificial God Optimization” field

6. CONCLUSIONS

Artificial God Optimization field (AGO field) is invented in this work. A novel God Particle Swarm Optimization (GoPSO) is created in this work. PSO and GoPSO performed well on all benchmark functions. The invented AGO field comes under Artificial God Computing Field. As mentioned in arXiv pre-print, arXiv: 1903.12011 [cs.NE], there is scope for many PhD’s and PostDoc’s in Artificial Human Optimization field. It is also mentioned that there are millions of articles possible in AHO field. Similarly, we can easily prove that AGO field invented in this work has millions of opportunities which are yet to be explored by Research Scientists across the globe.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 4
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Artificial Satisfaction

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DOI:

ABSTRACT

John McCarthy was a computer scientist and cognitive scientist from the United States.He created the term "artificial intelligence" (Wikipedia, 2020).Satish Gajawada is an independent scientist and inventor from India.
In this work, he invented the term "Artificial Satisfaction" (Gajawada, S., and Hassan Mustafa, 2019a).This article introduces a new field called "Artificial Satisfaction." Following the release of this work, “Artificial Satisfaction” shall be referred to as “The Brother of Artificial Intelligence.”
In this paper, a new algorithm called the "Artificial Satisfaction Algorithm (ASA)" is devised and implemented.
The “Artificial Satisfaction Algorithm (ASA)” is created by combining the Particle Swarm Optimization (PSO) Algorithm with Artificial Satisfaction Concepts for the sake of simplicity. Five benchmark functions are subjected to the PSO and ASA algorithms. A comparison is done between the acquired results. Rather than building sophisticated algorithms from scratch, the focus of this work is on defining and introducing “Artificial Satisfaction Field” to the rest of the world.

Keywords: Intelligence; artificial intelligence; satisfaction; artificial satisfaction; new invention; new creation; new area of research; computer science; algorithm; nature inspired computing; bio-inspired computing;

1. DEFINITION OF ARTIFICIAL SATISFACTION FIELD

“Satisfaction,” according to the Cambridge English Dictionary, is a pleasant feeling that you get when you acquire something you desired or when you do what you intended to accomplish [1]. Artificial Satisfaction (AS) field algorithms are inspired by the word "satisfaction. "By emulating "Satisfaction," research scientists create AS field algorithms. The field of "Artificial Human Satisfaction" will include simulations of human satisfaction in order to construct and develop algorithms. Artificial Satisfaction Field algorithms are built by simulating all live organisms' "satisfaction." As a result, the topic of "Artificial Satisfaction" includes a sub-field called "Artificial Human Satisfaction." Unlike Artificial Intelligence, the focus of this research is on "Artificial Satisfaction," which takes into account the "Satisfaction" of all living beings, not just humans.

2. BILLIONS AND TRILLIONS OF OPPORTUNITIES IN THE NEW ARTIFICIAL SATISFACTION FIELD

There is an Excellent Future for Artificial Satisfaction (AS) Field Research Scientists. There are billions and trillions of opportunities in the Artificial Satisfaction field. Some of them are shown below:

1) International Institute of Artificial Satisfaction, Hyderabad, INDIA
2) Indian Institute of Technology Roorkee Artificial Satisfaction Labs, IIT Roorkee
3) Foundation of Artificial Satisfaction, New York, USA.
4) IEEE Artificial Satisfaction Society

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[2]*Faculty of Specified Education, Dept. of Educational Technology, Banha University, Egypt.*
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5) ELSEVIER journals in Artificial Satisfaction
6) Applied Artificial Satisfaction – A New Subject
7) Advanced Artificial Satisfaction – A New Course
8) Invited Speech on “Artificial Satisfaction” in world-class Artificial Intelligence Conferences
9) A Special Issue on “Artificial Satisfaction” in a Springer published Journal
10) A Seminar on “Recent Advances in Artificial Satisfaction” at Technical Festivals in colleges
11) International Association of Artificial Satisfaction
12) Transactions on Artificial Satisfaction
13) International Journal of Artificial Satisfaction
14) International Conference on Artificial Satisfaction
15) www.ArtificialSatisfaction.com
16) B.Tech in Artificial Satisfaction
17) M.Tech in Artificial Satisfaction
18) Ph.D. in Artificial Satisfaction
19) PostDoc in Artificial Satisfaction
20) IBM the Artificial Satisfaction Labs
21) To become “Father of Artificial Satisfaction” field

3. ARTIFICIAL INTELLIGENCE

The following is the definition of Artificial Intelligence according to Investopedia shown in double quotes as it is:

“Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving” [2].

4. LITERATURE REVIEW

There are lakhs of researchers who are working in Artificial Intelligence. But there is no single researcher who worked in Artificial Satisfaction field to date. This work shows the World’s First Artificial Satisfaction method. For the sake of completeness, articles [3], [4, [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23] and [24] show research articles under Artificial Intelligence field. Some updates in this area are available elsewhere and may find attention of the readers [Chowdhary, K. R, [25]; Bas et al, [26]; Chen et al, [27]].

5. THE ARTIFICIAL SATISFACTION ALGORITHM

This section explains Artificial Satisfaction Algorithm (ASA). Fig. 1 shows ASA. Line number 1 initializes all the particles. Second line sets iterations to zero. In lines 4 to 11, the local best of each particle and global best of all particles are updated. The random numbers generated and SatisfactionProbability are used to group particles into either “Satisfied Beings” or “UnSatisfied Beings”. Satisfied Beings have the potential to move in search space because of their satisfaction. Hence in lines, 14 to 17 position and velocity of Satisfied Particle are updated. On the other hand, UnSatisfied Beings cannot move in the search space themselves because of their dissatisfaction. The random numbers generated and HelpOfSatisfiedPeopleProbability are used to classify UnSatisfied Beings into two groups. Either they will receive support from Satisfied Beings or not. Hence in lines 20 to 23, UnSatisfied Beings update position and velocity because they receive help from Satisfied Beings. As shown in line number 25, UnSatisfied Beings without receiving any help from Satisified Beings cannot move in search space. Line number 29 increments iterations variable by 1. The execution reaches back to line number 4 if the termination condition is false. The next iteration starts, and execution continues similar to the current iteration. If the termination condition is reached in line number 30, then execution stops, and the optimal value is returned.

1) All particles are initialized
2) generations (or iterations) = 0
3) **do**
4) **for** each particle i **do**
5) **If** (fitness_x_particle < particle_x_best_fitness) **then**
6) particle_x_best = input variable at fitness_x_particle
7) **end if**
8) **if** (particle_x_best_fitness < global_best_all_particles_fitness) **then**
9) global_best_all_particles = input variable at particle_x_best_fitness
10) **end if**
11) **end for**
12) **for** each particle i **do**
13) **if** (generate_random_number (0,1) < SatisfactionProbability) **then** // Satisfied Being
14) **for** each dimension d **do**
15) $velocity_{i,d}$ = weight*$velocity_{i,d}$ + $Constant_1$*generate_random_number(0,1)*($local\_best_{i,d}$ – $position_{i,d}$) + $Constant_2$*generate_random_number(0,1)*($global\_best_d$ – $position_{i,d}$)
16) $position_{i,d}$ = $position_{,d}$ + $velocity_{i,d}$
17) **end for**
18) **else** // UnSatisfied Being
19) **if** (random(0,1) < HelpOfSatisfiedPeopleProbability) **then** // UnSatisfied Being with Help
20) **for** each dimension d **do**
21) $velocity_{i,d}$ = weight*$velocity_{i,d}$ + $Constant_1$*generate_random_number(0,1)*($local\_best_{i,d}$ – $position_{i,d}$) + $Constant_2$*generate_random_number(0,1)*($global\_best_d$ – $position_{i,d}$)
22) $position_{i,d}$ = $position_{i,d}$ + $velocity_{i,d}$
23) **end for**
24) **else** // Unsatisfied Being without help does nothing
25)
26) **end if**
27) **end if**
28) **end for**
29) generations (iterations) = generations (iterations) + 1
30) **while** (termination_condition not reached is true)

Fig. 1. Artificial Satisfaction Algorithm (ASA)

6. RESULTS

The benchmark functions are taken from article [10] The ASA and PSO are applied on 5 benchmark functions shown in Fig. 2 to Fig. 6.

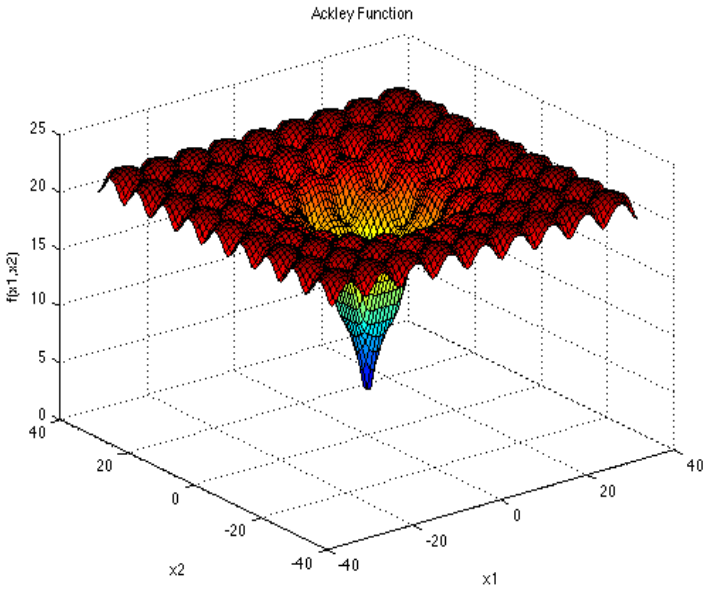

Fig. 2. Ackley function

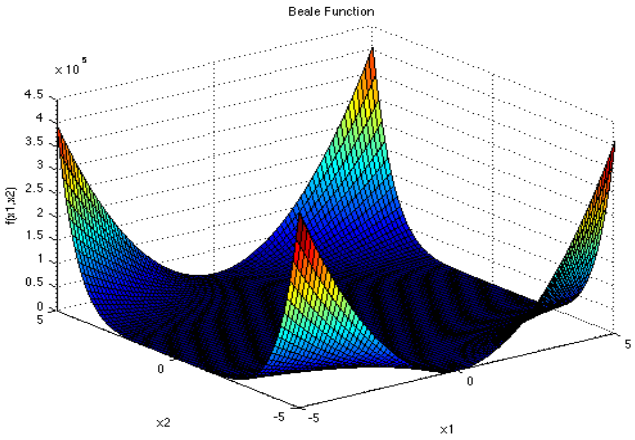

Fig. 3. Beale function

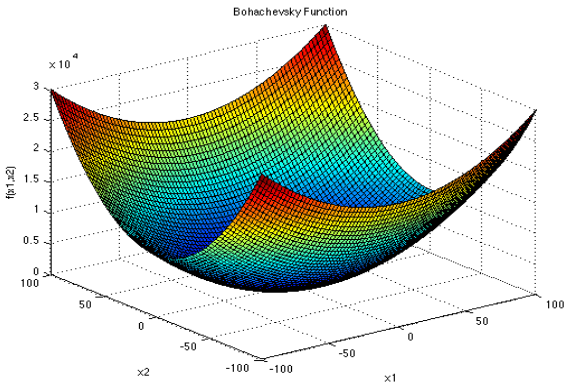

Fig. 4. Bohachevsky function

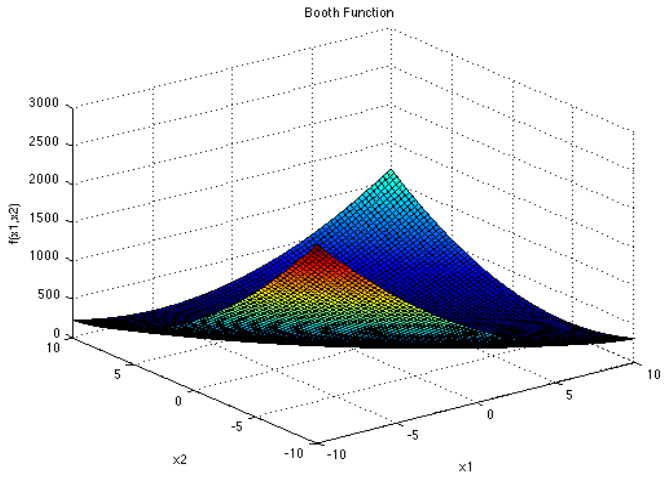

Fig. 5. Booth function

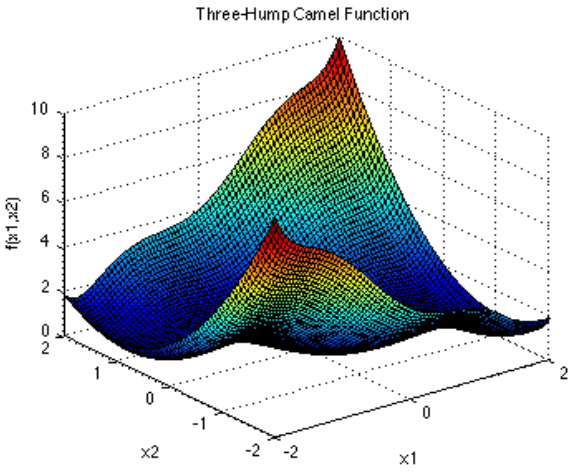

Fig 6. Three-Hump Camel Function

Table 1 shows the results obtained. Green represents performed well. Red represents not performed well. Blue represents performed between well and not well. From Table 1, we can see that all cells are green in color which means the PSO algorithm and developed ASA performed well on all benchmark functions.

Table 1. Obtained result

Benchmark Function / Algorithm	Artificial Satisfaction Algorithm (ASA)	PSO Algorithm
Ackley Function Beale Function Bohachevsky Function Booth Function Three-Hump Camel Function		

7. CONCLUSIONS

A new field titled “Artificial Satisfaction” is defined and introduced in this article. The World’s First algorithm under the Artificial Satisfaction field is designed and developed in this article. Results show

that proposed ASA and PSO algorithms performed well on all benchmark functions. There is a difference between three recently introduced new research fields titled “Artificial Human Optimization (AHO)” [9], “Artificial Soul Optimization (ASO)” [11], “Artificial God Optimization (AGO)” [12] and “Artificial Satisfaction”. AHO, ASO, and AGO are three new fields under Artificial Intelligence. But the “Artificial Satisfaction” field is a separate field like “Artificial Intelligence” and not a sub-field of Artificial Intelligence. There are billions and trillions of opportunities under the Artificial Satisfaction field. The FUTURE will be very bright for Artificial Satisfaction Field Research Scientists and Students.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 5
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Deep Loving

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DOI:

ABSTRACT

Artificial Intelligence (AI) and Deep Learning (DL) are important research areas. Artificial Intelligence's brother, "Artificial Satisfaction," was recently mentioned in the literature [1]. The phrase "Deep Loving" is coined in this chapter."Deep Loving" will be regarded as a friend of Deep Learning after the publication of this article. A proposal for a new field is not the same as a proposal for a new algorithm. We put a lot of emphasis in this study on defining and introducing "Deep Loving Field" to Research Scientists all around the world. The future of the "Deep Loving" field is forecasted by indicating that there will be few chances in this new field in the near future. A definition of Deep Learning is presented, followed by a review of the literature in the "Deep Loving" topic. By incorporating Deep Loving principles into the Particle Swarm Optimization Algorithm, the World's First Deep Loving Algorithm (WFDLA) is conceived and implemented in this study. The WFDLA algorithm's results are compared to those of the PSO algorithm.

Keywords: Deep learning; deep loving; artificial intelligence; artificial satisfaction; artificial mothers; swarm intelligence; artificial mother optimization; artificial human optimization; artificial soul optimization; artificial god optimization.

1. DEFINITION OF DEEP LOVING FIELD

Artificial Mothers (in Deep Loving Field) move through the search space to solve optimization problems, just like Mothers in the real world do. We emulate mothers in the actual world through Deep Loving. Artificial Humans, Artificial Souls, and Artificial Gods are the basic entities in search space in the Artificial Human Optimization area [2-3], Artificial Soul Optimization field [4], and Artificial God Optimization field [5], respectively. Similarly, the basic entities in the Deep Loving Field are Artificial Mothers. Whenever we think of the term "Mother," the Deep Love that each mother shows towards their family, children, etc. comes to mind. Hence the name "Deep Loving Field" is given to the field when Artificial Mothers in search space are imitating Mothers in real-world to solve optimization problems. Instead of naming the field as "Artificial Mother Optimization," a better name "Deep Loving" is chosen by us.

2. INFINITE OPPORTUNITIES IN THE NEW DEEP LOVING FIELD

Artificial intelligence (AI) techniques play an important role in the development and optimization of complex problems in various fields [6,7]. There are INFINITE OPPORTUNITIES for Artificial Intelligence field Research Scientists in Deep Loving Field. Some of them are shown below:

1. International Conference on Deep Loving (ICDL 2020)
2. IEEE TRANSACTIONS on Deep Loving (IEEE TDL 2025)
3. International Workshop on Deep Loving, Harvard University, 2050
4. B.Tech Thesis on Deep Loving, IIT Roorkee, the Year 2075
5. IBM Deep Loving Research Labs, IBM Italy
6. Applied Deep Loving - A New Course

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7. Advanced Deep Loving Course, IIT Mumbai
8. M.Tech in Deep Loving Field
9. International Institute of Deep Loving, Greece
10. Ph.D. Thesis on Deep Loving, Stanford University
11. Invited Talk on Deep Loving at Google R&D Conference, USA
12. Foundation of Deep Loving, Germany
13. International Association of Deep Loving, China
14. Deep Loving team at Microsoft Research and Development
15. YouTube videos on Deep Loving by Samsung R&D Team
16. Springer Journals on Deep Loving Field
17. Elsevier Book on Deep Loving Field
18. A Course by Deep Loving Experts on Coursera
19. Presentation on Deep Loving Field at Technical Festivals in Singapore Colleges
20. IBMSUR Award for Deep Loving Field Professor at IIT Hyderabad
21. To become a Scientist in Deep Loving Field

3. DEEP LEARNING

According to Wikipedia, the definition of Deep Learning is shown below in double-quotes as it is:

"Deep Learning is part of a broader family of machine learning methods based on Artificial Neural Networks with representation learning. Deep Learning architectures such as deep neural networks, Deep belief networks, recurrent neural networks, and convolutional neural networks have been applied to many fields including computer vision, machine vision, etc" [8].

Hence from the definition, it is clear that Deep Learning is related to Brain-Inspired Computing.

4. LITERATURE REVIEW

There are many Deep Learning papers published in the literature. But there is not even a single paper which is based on Deep Loving. The World's First Deep Loving method is created in this article. For the sake of completeness, references [9] to [12] show Deep Learning articles. You can easily find references for Deep Learning on websites like deeplearning.net.

5. WORLD'S FIRST DEEP LOVING ALGORITHM (WFDLA)

Fig. 1 shows the World's First Deep Loving Algorithm (WFDLA). This section explains WFDLA. All Artificial Mothers are initialized, and the iteration count is set to zero in the beginning. Lines 2-5 find local best, global best, local worst, and global worst of all Artificial Mothers. If Artificial Mother is affected by coronavirus, then there are two possibilities. Either Artificial Mother receives help from others or not. If Artificial Mother is affected by a coronavirus and receives help from others, then she can move in search space and updates Velocity and Position. If Artificial Mother is affected by a coronavirus and doesn't receive help from others, then she is halted and cannot move in search space. Hence, Velocity and Position are not updated. If Artificial Mother is not affected by coronavirus, then she can move in search space and updates Velocity and Position. Fig. 1 is shown below:

```
1) Initialize all Artificial Mothers. Set Iteration Counter to 0.
2) Find local best of all Artificial Mothers
3) Find global best of all Artificial Mothers
4) Find local worst of all Artificial Mothers
5) Find global worst of all Artificial Mothers
6) for each Artificial Mother do
 7)      if (Random_Number_Generated < CoronavirusProbability) then
8)              if ( Random_Number_Generated < HelpProbability) then
9)                      Update Velocity of Artificial Mother
10)                     Update Position of Artificial Mother
11)             else
```

```
12)                    // Mothers affected by coronavirus without help does nothing
13)              end if
14)        else
15)              Update Velocity of Artificial Mother
16)              Update Position of Artificial Mother
17)        end if
18) end for
19) Update Iteration Counter
20) if (termination_condition_reached is not true) then
21)        go to line number 2
22) end if
```

Fig. 1. World's First Deep Loving Algorithm (WFDLA)

6. RESULTS

The ASA algorithm in [1], and WFDLA designed in this paper are MATHEMATICALLY equal. In [1] it was shown that both ASA and PSO algorithms performed well on all benchmark functions. Hence due to MATHEMATICAL EQUALITY, both WFDLA and PSO performed well on all benchmark functions.

7. CONCLUSIONS

A new field titled "Deep Loving" is invented in this work. A new algorithm titled "World's First Deep Loving Algorithm (WFDLA) is designed, and results show that both PSO and WFDLA methods performed well on all benchmark functions. There are INFINITE OPPORTUNITIES in Deep Loving Field. Some interesting opportunities in Deep Loving Field are shown for Deep Learning and Artificial Intelligence Research Scientists and Students. As our focus in this paper is very strong on defining and introducing Deep Loving Field, we just added Deep Loving concepts to the PSO algorithm and created WFDLA for the sake of simplicity. We request Deep Learning and Artificial Intelligence field Experts to invent new Deep Loving algorithms from scratch rather than modifying existing algorithms like PSO.

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Thanks to everyone (and everything) who directly or indirectly helped us to reach the stage where we are now today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 6
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Nature Plus Plus Inspired Computing

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DOI:

ABSTRACT

In this work, we coined the term "Nature Plus Plus Inspired Computing. "N++IC" is the abbreviation for this new term. The Nature Plus Plus Inspired Computing (N++IC) field is a superset of the Nature Inspired Computing (NIC) area, just as the C++ programming language is a superset of the C programming language. In this chapter, we define and introduce the "Nature Plus Plus Inspired Computing Field. "For Artificial Intelligence Field Scientists and Students, there are several exciting options in the N++IC Field. Following the description of the Nature Inspired Computing (NIC) Field, we present a literature review of the N++IC Field. The primary objective of presenting this innovative article is to show a new path to NIC Field Scientists so that they can come up with various innovative algorithms from scratch. We integrated N++IC Field ideas to the Particle Swarm Optimization technique and built the "Children Cycle Riding Algorithm (CCR Algorithm)" since the goal of this paper is to promote N++IC to academics all around the world. Finally, the CCR Algorithm findings are presented, followed by conclusions.

Keywords: Nature inspired computing; nature plus plus inspired computing; artificial intelligence; children; evolutionary computing; computational intelligence; new area; interesting opportunities; children cycle riding; children swarm.

1. DEFINITION OF NEW NATURE PLUS PLUS INSPIRED COMPUTING FIELD

Nature Inspired Computing (NIC) Algorithms take inspiration from Mother Nature. Nature Inspired Computing Algorithms are a subset of Nature Plus Plus Inspired Computing (N++IC) Field Algorithms. Hence an algorithm belonging to the NIC field also belongs to the N++IC field. If an algorithm takes inspiration from Artificial things in addition to inspiration taken from nature, then such algorithms belong to both NIC and N++IC fields. Also, there can be algorithms that can take inspiration completely from Artificial things, and there is no inspiration taken from nature, then such algorithms belong only to the N++IC field and not the NIC field. There are three types of algorithms. Algorithms that take inspiration from nature only. The second type of algorithms are such that they take inspiration only from artificial things. The third type of algorithms takes inspiration from both nature as well as artificial things. The first category of algorithms belongs to NIC. The second category of algorithms belongs only to the N++IC field and not the NIC field. The third category of algorithms belongs to both NIC and N++IC fields. All three types of algorithms belong to the N++IC field. In the N++IC field, we added one more type of algorithms in addition to NIC field algorithms. Hence NIC field is a subset of the N++IC field.

2. INTERESTING OPPORTUNITIES IN NATURE PLUS PLUS INSPIRED COMPUTING FIELD

There are INTERESTING OPPORTUNITIES for NATURE INSPIRED COMPUTING (NIC) field Research Scientists in NATURE PLUS PLUS INSPIRED COMPUTING (N++IC) field. Some of them are shown below:

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1) B.Tech Project in N++IC field, IIT Roorkee
2) M.Tech Project in N++IC field, Harvard University
3) Ph.D. in N++IC field, IIT Hyderabad
4) Postdoc in N++IC field, Stanford University
5) International Association of N++IC field, Singapore
6) International Conference on N++IC field, Dubai
7) Transactions on NIC and N++IC, United Kingdom
8) International Journal on N++IC field, Australia
9) International Workshop on N++IC field, Hong Kong
10) The foundation on N++IC, New York
11) Seminar on N++IC field at Technical Festival in Pakistan colleges
12) Microsoft R&D team on N++IC field
13) IBM R&D N++IC field Research Labs, IBM Hyderabad
14) YouTube videos on N++IC and NIC fields by Google R&D team, Google Delhi
15) Springer Journal on N++IC
16) Elsevier book on N++IC
17) IEEE N++IC Society, Japan
18) To become a Scientist in the N++IC field
19) A Course on N++IC by Coursera
20) Advanced N++IC - A New subject
21) IBMSUR Award for a Professor in N++IC FIELD at IIT Hyderabad

3. NATURE INSPIRED COMPUTING

According to [1], the definition of NATURE INSPIRED COMPUTING is shown below in double-quotes as it is:

"The field of nature-inspired computing (NIC) is interdisciplinary in nature combining computing science with knowledge from different branches of sciences, e.g. physics, chemistry, biology, mathematics and engineering, that allows development of new computational tools such as algorithms, hardware, or wetware for problem-solving, synthesis of patterns, behaviours and organisms."

4. LITERATURE REVIEW

There are many Research Scientists and Students who are working in the field of Nature Inspired Computing. You will easily find thousands of references for Nature Inspired Computing when you search on Google. In this paper, our focus is to define a new field titled Nature Plus Plus Inspired Computing (N++IC) and how it is related to Nature Inspired Computing (NIC). Hence for the sake of completeness, we show [1-10] articles that come under NIC. As defined, NIC is a subset of N++IC, and hence [1-10] articles also belong to the N++IC field. Some updates in this area are available elsewhere and may find attention of the readers [12-14].

5. CHILDREN CYCLE RIDING ALGORITHM

Fig. 1 shows the Children Cycle Riding Algorithm (CCRA). In this section, we explain CCRA. In the beginning, the iteration counter is set to zero, and all Artificial Children are initialized. The search space is full of Artificial sharp stones, which may result in damaging the tyre of the Artificial Child's Cycle. Hence we have CycleTyreDamageProbability. After the damage of the cycle tyre, the child repairs his cycle tyre with probability CycleTyreRepairedProbability.

If a cycle tyre is damaged, then there are two possibilities. Either Artificial Child repairs his cycle tyre or not. If the cycle tyre is damaged and Artificial Child gets his cycle repaired, then Artificial Child can move in search space and hence updates Velocity and Position. If the cycle tyre is damaged and Artificial Child cannot repair his cycle tyre then Artificial Child is halted and does not update his Velocity and Position. On the other hand, if Artificial Child's Cycle tyre is not damaged, then he can move in search space and hence updates Velocity and Position. At the end of the iteration, the

iteration counter is incremented. Now the control goes to line number 2. This process is continued until the termination condition is reached. Fig. 1 is shown below:

```
1) All Artificial Children are initialized, and the iteration counter is set to zero.
2) Artificial Children identifies their local best
3) Artificial Children identifies their global best
4) Artificial Children identifies their local worst
5) Artificial Children identifies their global worst
6) for each Artificial Child do
 7)       if ( random(0,1) < CycleTyreDamageProbability) then
8)                if ( random(0,1) < CycleTyreRepairedProbability) then
9)                        Artificial Child updates Velocity
10)                       Artificial Child updates Position
11)               else
12)                       // If Cycle tyre is damaged and it is not repaired then Artificial Child is
                          // halted and does nothing
13)               end if
14)       else
15)              Artificial Child updates Velocity
16)              Artificial Child updates Position
17)       end if
18) end for
19) Update Iteration Counter
20) if (termination_condition_reached is not true) then
21)       jump to line number 2
22) end if
```

Fig. 1. Children Cycle Riding Algorithm (CCRA)

6. RESULTS

The Human Poverty Particle Swarm Optimization (HPPSO) proposed in [11], and Children Cycle Riding Algorithm (CCRA) proposed in this article are MATHEMATICALLY EQUAL. In [11], it was shown that both HPPSO and PSO performed well on all benchmark functions. Hence due to Mathematical EQUALITY, both CCRA and PSO Algorithms performed well on all benchmark functions.

7. CONCLUSIONS

"Nature Plus Plus Inspired Computing (N++IC)" field is designed and introduced in this work. The difference between the two fields NIC and the N++IC is clearly explained. Children Cycle Riding Algorithm (CCRA) is designed, and results show that CCRA performed as good as the Particle Swarm Optimization algorithm. Some interesting opportunities in the N++IC field are shown for NIC field Students and Research Scientists. Research Scientists and Students did a lot of research in the NIC field. There is a lot of scope in the direction where Algorithms are inspired by both nature and Artificial things. Also, there exists a lot of scope in the direction where Algorithms are inspired by Artificial things only. Children are natural, and cycle riding is Artificial. Hence CCRA is designed by taking inspiration from both nature and Artificial things. This paper is mainly published to introduce N++IC Field to the world. Hence we just added N++IC concepts to the Particle Swarm Optimization algorithm and created CCRA. As the new field is proposed in this article, the next step for Researchers is to create new N++IC field Algorithms from scratch.

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Thanks to everyone (and everything) who directly or indirectly helped us to reach the stage where we are now today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 7
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Artificial Heart Neural Networks

Satish Gajawada[1*] and Hassan M. H. Mustafa[2]

DOI:

ABSTRACT

Artificial Neural Networks (ANN) is an interesting subject of study. The Human Brain was the inspiration for the ANN discipline. Humans' hearts and brains are critical for their survival. Many articles have been written by researchers who place a high value on the brain. However, scientists haven't done much research on the Heart, which is an important part in addition to the Brain. By integrating the notion of "Heart" into Artificial Neural Networks, the primary goal of writing this article is to present a path to ANN area Research Scientists. In this study, we coined and defined the term "Artificial Heart Neuron," which, along with Artificial Neuron, is the foundation of the Artificial Heart Neural Networks Field (AHNN Field). This piece is inspired by both the heart and the brain.

Keywords: *Brain; artificial neural networks; ANN; heart; artificial heart neural networks; AHNN; artificial neuron; artificial heart neuron.*

1. DEFINITION OF ARTIFICIAL HEART NEURAL NETWORKS FIELD

Artificial Neurons make up Artificial Neural Networks. Similarly, all algorithms containing "Artificial Heart Neurons" will be classified as "Artificial Heart Neural Networks" (AHNN Field). “Artificial Heart Neuron” is explained in the fifth section of this paper.

2. OPPORTUNITIES IN THE NEW ARTIFICIAL HEART NEURAL NETWORKS FIELD

There are many opportunities for Artificial Intelligence Research Scientists and Students in this new “Artificial Heart Neural Networks” Field (AHNN Field). Some opportunities are listed below:

1. International Institute of Artificial Heart Neural Networks, Italy
2. Indian Institute of Technology Roorkee Artificial Heart Neural Networks, IIT Roorkee
3. Foundation of Artificial Heart Neural Networks, New York, USA.
4. IEEE Artificial Heart Neural Networks Society
5. ELSEVIER journals in Artificial Heart Neural Networks
6. Applied Artificial Heart Neural Networks – A New Subject
7. Advanced Artificial Heart Neural Networks – A New Course
8. Invited Speech on “Artificial Heart Neural Networks” in world-class Artificial Intelligence Conferences
9. A Special Issue on “Artificial Heart Neural Networks” in a Springer published Journal
10. A Seminar on “Artificial Heart Neural Networks” at Technical Festivals in colleges
11. International Association of Artificial Heart Neural Networks
12. Transactions on Artificial Heart Neural Networks
13. International Journal of Artificial Heart Neural Networks
14. International Conference on Artificial Heart Neural Networks
15. www.ArtificialHeartNeuralNetworks.com

[1]*Alumnus, Indian Institute of Technology Roorkee, India.*
[2]*Faculty of Specified Education, Dept. of Educational Technology, Banha University, Egypt.*
**Corresponding author: E-mail: satish.gajawada.iit@gmail.com;*

16. B.Tech in Artificial Heart Neural Networks Field
17. M.Tech in Artificial Heart Neural Networks
18. Ph.D. in Artificial Heart Neural Networks
19. Post Doc in Artificial Heart Neural Networks
20. IBM the Artificial Heart Neural Networks Labs
21. To become the “Father of Artificial Heart Neural Networks” field.

3. ARTIFICIAL NEURAL NETWORKS

Deep Learning is the current trend in Artificial Neural Networks. According to Wikipedia, the definition of Deep Learning is shown below in double-quotes as it is:

"Deep Learning is part of a broader family of machine learning methods based on Artificial Neural Networks with representation learning. Deep Learning architectures such as deep neural networks, Deep belief networks, recurrent neural networks, and convolutional neural networks have been applied to many fields including computer vision, machine vision, etc" [1]. Hence from the definition, it is clear that Deep Learning is related to Brain-Inspired Computing.

4. LITERATURE REVIEW

Neural network is a web of million numbers of inter-connected neurons which executes parallel processing. An Artificial neural network is a nonlinear mapping structure; an information processing pattern is stimulated by the approach as biological nervous system (brain) process the information. It is used as a powerful tool for modeling the data in the application domains where incomplete understanding of the data relationship to be solved with the readily available trained data [6-9]. There are many Artificial Neural Networks papers published in the literature. But there is not even a single paper that is based on Artificial Heart Neural Networks. The World's First Artificial Heart Neural Networks method is created in this article. For the sake of completeness, references [2] to [5] show Artificial Neural Networks field articles. You can easily find references for Artificial Neural Networks on websites like deeplearning.net. We just showed many references for Artificial Neural Networks for completeness.

5. ARTIFICIAL HEART NEURON

This section explains “Artificial Heart Neuron.” Fig. 1 shows Artificial Heart Neuron. “Artificial Neuron” and “Artificial Heart Node” are the building blocks of Artificial Heart Neuron. When the input is passed to “Artificial Heart Neuron,” it goes to Artificial Neuron. The Artificial Neuron processes the input and sends it to Artificial Heart Node. The Artificial Heart node controls the input it receives and outputs the controlled input to the other Artificial Heart Neurons.

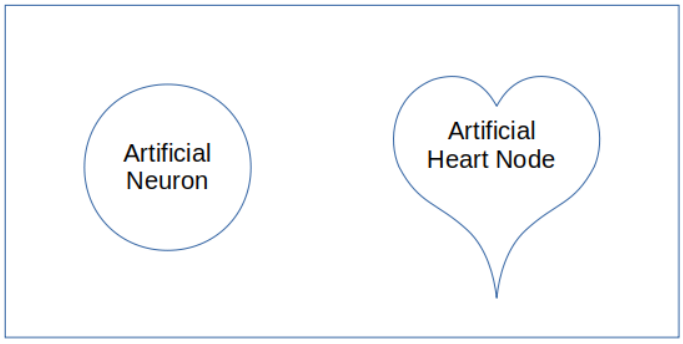

Fig. 1. Artificial Heart Neuron

The input vector [1,4,5,2] is passed to Artificial Heart Neuron. The input goes to Artificial Neuron present inside Artificial Heart Neuron. Artificial Neuron processes the input vector [1,4,5,2] in the same

way as it does when Artificial Neuron in Artificial Neural Networks (ANN). It sends the output to Artificial Heart Node. Let's say Artificial Neuron outputs 2.5 to Artificial Heart Node. The Artificial Heart Node receives 2.5 and multiplies it with Heart Controlling Factor and outputs to another Artificial Heart Neuron connected to this Artificial Heart Neuron. If Heart Controlling Factor is 1.2, then 2.5 is multiplied by 1.2, and the output is sent to the connected Artificial Heart Neuron in the next layer.

6. CONCLUSIONS

A new field titled "Artificial Heart Neural Networks (AHNN)" is designed in this article. The concept of "Heart" is introduced into Artificial Neural Networks for the first time in Research Industry History in this article. The purpose of this work is to show a path to Artificial Neural Networks Field Scientists and Students so that they will create more and more complex algorithms from scratch following in this path for getting better results. Many opportunities for Artificial Intelligence field Scientists are shown in this paper. Implementing AHNN algorithms and comparison of results with ANN algorithms will be part of our future work.

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We would like to thank everyone (and everything) who directly or indirectly helped us to reach the stage where we are now today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 8
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Artificial Excellence

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DOI:

ABSTRACT

This article introduces a new field called "Artificial Excellence". "Artificial Excellence" is a new field that falls under the area of Artificial Human Optimization. Evolutionary Computing has a subfield called Artificial Human Optimization. Computational Intelligence has a subfield called evolutionary computing. Artificial Intelligence includes the field of Computational Intelligence. As a result, "Artificial Excellence (AE)" will gain popularity as a new area of Artificial Intelligence following the publication of this paper (AI). This paper proposes a novel algorithm called "Artificial Satish Gajawada and Durga Toshniwal Algorithm (ASGDTA)."This article includes a definition of AE as well as numerous opportunities in the new AE field.
Following the definition of Artificial Intelligence, the Literature Review of the Artificial Excellence field is displayed. The novel ASGDTA Algorithm is discussed, then Results and Conclusions are shown.

Keywords: Artificial excellence; artificial human optimization; evolutionary computing; computational intelligence; artificial intelligence; artificial satish gajawada; artificial durga toshniwal; artificial satish gajawada and durga toshniwal algorithm; asgdta algorithm; particle swarm optimization algorithm; PSO algorithm.

1. DEFINITION OF ARTIFICIAL EXCELLENCE FIELD

Artificial Birds, Artificial Souls, and Artificial Gods are the fundamental entities in Particle Swarm Optimization, Artificial Soul Optimization, and Artificial God Optimization, respectively. Artificial Humans are the basic entities in Artificial Human Optimization area algorithms. The topic of Artificial Human Optimization includes a sub-branch called "Artificial Excellence (AE)."As a result, the only basic beings in the AE sector are Artificial Humans. However, there is a distinction to be made. The goal of Artificial Human Optimization is to imitate humans in general. There is no such thing as imitating certain human beings. The basis of AE is to imitate certain human beings. The basic entities in AE field algorithms are particular Human beings. Every Human is different. Hence imitating Humans in general (Artificial Human Optimization) and imitating particular Human beings (Artificial Excellence) will yield different results. If we take particular Human being (Say Ankush Mittal) then we can design algorithm "Artificial Ankush Mittal Algorithm" where the search space consists of Artificial Ankush Mittals and this Ankush Mittal Algorithm belongs to Artificial Excellence (AE) field. Section 5 of this article designs and describes world's first AE field algorithm. This algorithm is named as "Artificial Satish Gajawada and Durga Toshniwal Algorithm (ASGDTA Algorithm)". The basic entities in ASGDTA Algorithm are Artificial Satish Gajawadas and Artificial Durga Toshniwals. Just like Satish Gajawada and Durga Toshniwal move in real world and solves problems. Similarly, Artificial Satish Gajawadas and Artificial Durga Toshniwals move in search space and solves optimization problems.

2. Opportunities in the new Artificial Excellence Field

There are many opportunities in the new Artificial Excellence field. Some of them are shown below:

1) International Institute of Artificial Excellence, Hyderabad, INDIA

[1]Alumnus, Indian Institute of Technology Roorkee, India.
[2]Faculty of Specified Education, Dept. of Educational Technology, Banha University, Egypt.
**Corresponding author: E-mail: satish.gajawada.iit@gmail.com;*

2) Indian Institute of Technology Roorkee Artificial Excellence Labs, IIT Roorkee
3) Foundation of Artificial Excellence, New York, USA.
4) IEEE Artificial Excellence Society
5) ELSEVIER journals in Artificial Excellence
6) Applied Artificial Excellence – A New Subject
7) Advanced Artificial Excellence – A New Course
8) Invited Speech on “Artificial Excellence” in world-class Artificial Intelligence Conferences
9) A Special Issue on “Artificial Excellence” in a Springer published Journal
10) A Seminar on “Recent Advances in Artificial Excellence” at Technical Festivals in colleges
11) International Association of Artificial Excellence
12) Transactions on Artificial Excellence
13) International Journal of Artificial Excellence
14) International Conference on Artificial Excellence
15) www.ArtificialExcellence.com
16) B.Tech in Artificial Excellence
17) M.Tech in Artificial Excellence
18) Ph.D. in Artificial Excellence
19) PostDoc in Artificial Excellence
20) IBM the Artificial Excellence Labs
21) To become “Father of Artificial Excellence” field

3. ARTIFICIAL INTELLIGENCE

The following is the definition of Artificial Intelligence according to Investopedia shown in double quotes as it is:

“Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving” [1].

4. LITERATURE REVIEW

Lot of research was done in Artificial Intelligence field till date. But Artificial Excellence (AE) field invented in this article is not yet explored. The world's first AE algorithm is "Artificial Satish Gajawada and Durga Toshniwal Algorithm" which is designed and developed in this article. For the sake of completeness, articles [2], [3], [4], [5], [6], [7], [8] [9], [10], [11], [12], [13] , [14], [15], [16], [17], [18], [19], [20], [21], [23] and show research articles under Artificial Intelligence field. For the sake of simplicity we are showing same articles under Artificial Intelligence as shown in article "Artificial Satisfaction - The Brother of Artificial Intelligence" published by Satish Gajawada et al in 2020 year. The focus of this paper is on designing AE field and describing AE field algorithms rather than on showing Artificial Intelligence literature. Hence we saved time by showing Artificial Intelligence field literature from a previous paper by Satish Gajawada et al. Some updates in this area are available elsewhere and may find attention of the readers [24, 25, 26].

5. THE ARTIFICIAL SATISH GAJAWADA AND DURGA TOSHNIWAL ALGORITHM

This section explains Artificial Satish Gajawada and Durga Toshniwal Algorithm (ASGDTA). Fig. 1 shows ASGDTA. All Artificial Satish Gajawadas and Artificial Durga Toshniwals are initialized in line number 1. The iterations count is set to zero in line number 2. The local best and global best of all particles are found in line number 3 and line number 4 respectively. In line number 6, if the random number generated is less than DurgaToshniwalProbability then the Artificial Human is identified as Artificial Durga Toshniwal and hence Velocity and Position of Artificial Durga Toshniwal are updated in line number 7 and line number 8 respectively. On the other hand if the random number generated in line number 6 is greater than DurgaToshniwalProbability then the Artificial Human is identified as Artificial Satish Gajawada. Artificial Satish Gajawada has two possibilities. Either Artificial Satish Gajawada receives help from Artificial Durga Toshniwal or not. This is decided by

HelpOfDurgaToshniwalProbability. In line number 10, if the random number generated is less than HelpOfDurgaToshniwalProbability then Artificial Satish Gajawada receives help from Artificial Durga Toshniwal and hence Artificial Satish Gajawada updates Velocity and Position in line number 11 and line number 12 respectively. On the other hand if the random number generated in line number 10 is greater than HelpOfDurgaToshniwalProbability then Artificial Satish Gajawada doesn't receive help from Artificial Durga Toshniwal and hence Artificial Satish Gajawada doesn't update Velocity and Position in line number 14. The generations or iterations count is incremented by 1 in line number 18. If termination condition reached is not true in line number 19 then the control goes back to line number 3 and the algorithm continues. If the termination condition reached is true in line number 19 then the algorithm terminates.

1) All Artificial Satish Gajawadas and Artificial Durga Toshniwals are initialized
2) Set iterations or generations count to zero
3) Find local best of all Artificial Satish Gajawadas and Artificial Durga Toshniwals
4) Find global best of all Artificial Satish Gajawadas and Artificial Durga Toshniwals
5) **for** each particle i **do**
6) **if** (generate_random_number (0,1) < DurgaToshniwalProbability) **then** // Durga Toshniwal
7) Update Velocity of Artificial Durga Toshniwal
8) Update Position of Artificial Durga Toshniwal
9) **else** // Satish Gajawada
10) **if** (random(0,1) < HelpOfDurgaToshniwalProbability) **then** // Satish Gajawada with Help
11) Update Velocity of Artificial Satish Gajawada
12) Update Position of Artificial Satish Gajawada
13) **else** // Satish Gajawada without help does nothing
14)
15) **end if**
16) **end if**
17) **end for**
18) generations (iterations) = generations (iterations) + 1
19) **while** (termination_condition not reached is true)

Fig. 1. Artificial Satish Gajawada and Durga Toshniwal Algorithm (ASGDTA)

6. RESULTS

The benchmark functions are taken from article (Gajawada, S., and Hassan Mustafa, 2019a). The ASGDTA and PSO are applied on 5 benchmark functions shown in Fig. 2 to Fig. 6.

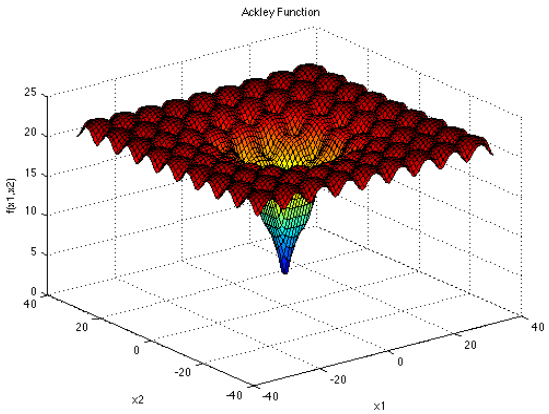

Fig. 2. Ackley function

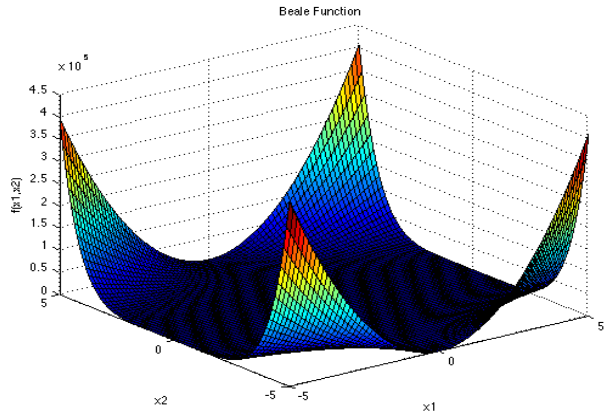

Fig. 3. Beale function

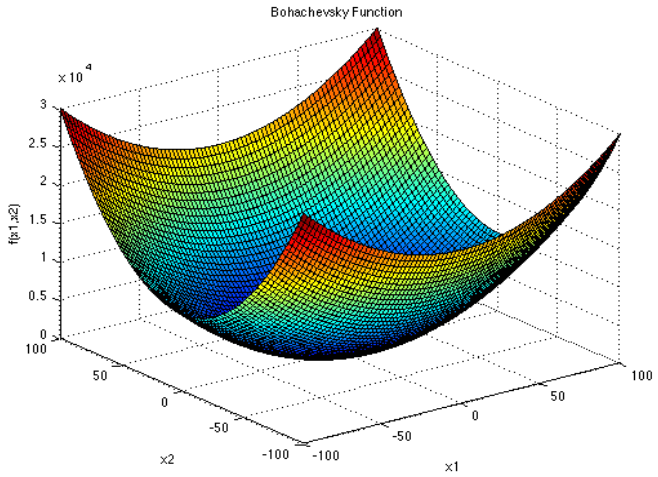

Fig. 4. Bohachevsky function

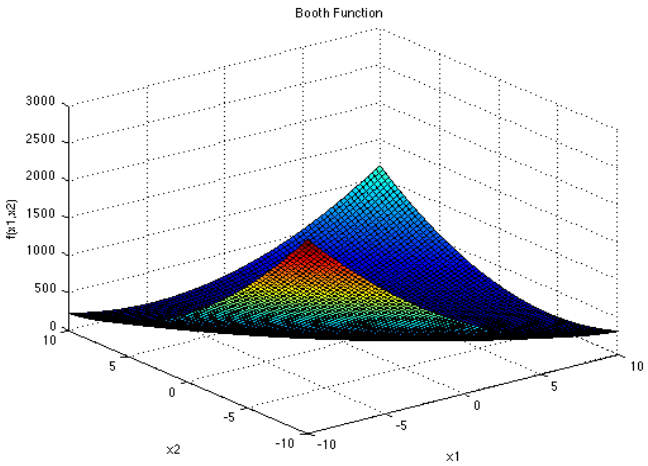

Fig. 5. Booth function

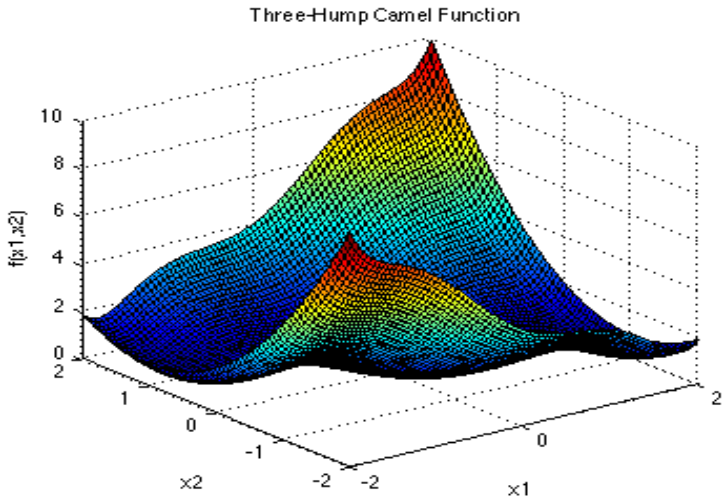

Fig. 6. Three-Hump Camel Function

Table 1 shows the results obtained. Green represents performed well. Red represents not performed well. Blue represents performed between well and not well. From Table 1, we can see that all cells are green in color which means the PSO algorithm and developed ASGDTA performed well on all benchmark functions.

Table 1. Obtained result

Benchmark Function / Algorithm	**Artificial Satish Gajawada and Durga Toshniwal Algorithm (ASGDTA)**	**PSO Algorithm**
Ackley Function Beale Function Bohachevsky Function Booth Function Three-Hump Camel Function		

7. CONCLUSIONS

A new field titled "Artificial Excellence (AE)" is invented and defined in this work. Researchers in Artificial Intelligence field can follow the path shown in this paper and create algorithms like "Artificial Narendra Modi Algorithm", "Artificial Abdul Kalam Algorithm", "Artificial Mahatma Gandhi Algorithm", "Artificial Mother Teresa Algorithm" and "Artificial Raju Algorithm" by imitating particular humans like Narendra Modi, Abdul Kalam, Mahatma Gandhi, Mother Teresa and Raju respectively. If there are 100 crores population then we can imitate all these population and create more than 100 crores algorithms. If there are 20 people in a project solving real world problems. Then we can create a AE field algorithm imitating these particular 20 people. If we have particular Humans Raju and Rani in real world and AE field algorithm size is 20 then there will be multiple particular Artificial Humans in search space like 10 Artificial Rajus and 10 Artificial Ranis. Hence from this article it is clear that there are INFINITE articles and INFINITE opportunities possible in the new AE field invented in this work.

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Thanks to everyone (and everything) who directly or indirectly helped us to reach the stage where we are now today.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Chapter 9
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Stories Inspired Optimization Algorithms

Satish Gajawada[1*] and Hassan M. H. Mustafa[2]

DOI:

ABSTRACT

The primary goal of this study is to invent and define a new area called “Stories Inspired Optimization Algorithms (SIOA)”.

Keywords: Optimization algorithms; PSO Algorithm; Artificial humans.

1. INTRODUCTION

Optimization algorithms were recently created in [1-7] by drawing inspiration from Mothers, Children, Satisfied beings, Humans, Souls, Gods, and Particular Humans. In this study, a new path is defined in which Optimization Algorithms are created using Inspiration from Stories. Modern optimization approaches have attracted an increasing number of scientists, decision makers, and researchers.

Definition of “Stories Inspired Optimization Algorithms (SIOA)”: All the Optimization Algorithms which are created by taking Inspiration from Stories will come under “Stories Inspired Optimization Algorithms (SIOA)”. Some updates in this area are available elsewhere and may find attention of the readers [8,9,10].

Example Story: There are people in a city who can fly. On every festival they used to imitate birds for searching food.

Example Algorithm: One can take Inspiration from above example Story and design “Festival People Flying Algorithm (FPFA)”. The search space consists of Artificial humans who can fly. As Artificial flying humans are imitating birds, the FPFA Algorithm is mathematically equivalent to Particle Swarm Optimization Algorithm (PSO Algorithm).

2. CONCLUSIONS

A new field titled “Stories Inspired Optimization Algorithms (SIOA)” is invented and defined in this study. An example Story and a sample “Festival People Flying Algorithm (FPFA)” are shown in this study. The advantage of “SIOA” field is that the Inspiration from which one can create Optimization Algorithms need not be real. If we believe one can get more accurate results by making Artificial humans fly then we can create a story where Humans can fly and we can take Inspiration from that story. In this letter it is not said that “SIOA” Algorithms perform better than other existing Optimization Algorithms.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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DISCLAIMER

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