AN ANALYSIS OF PARTICLE SWARM OPTIMIZATION ALGORITHM

Good Afternoon!

WE ARE:

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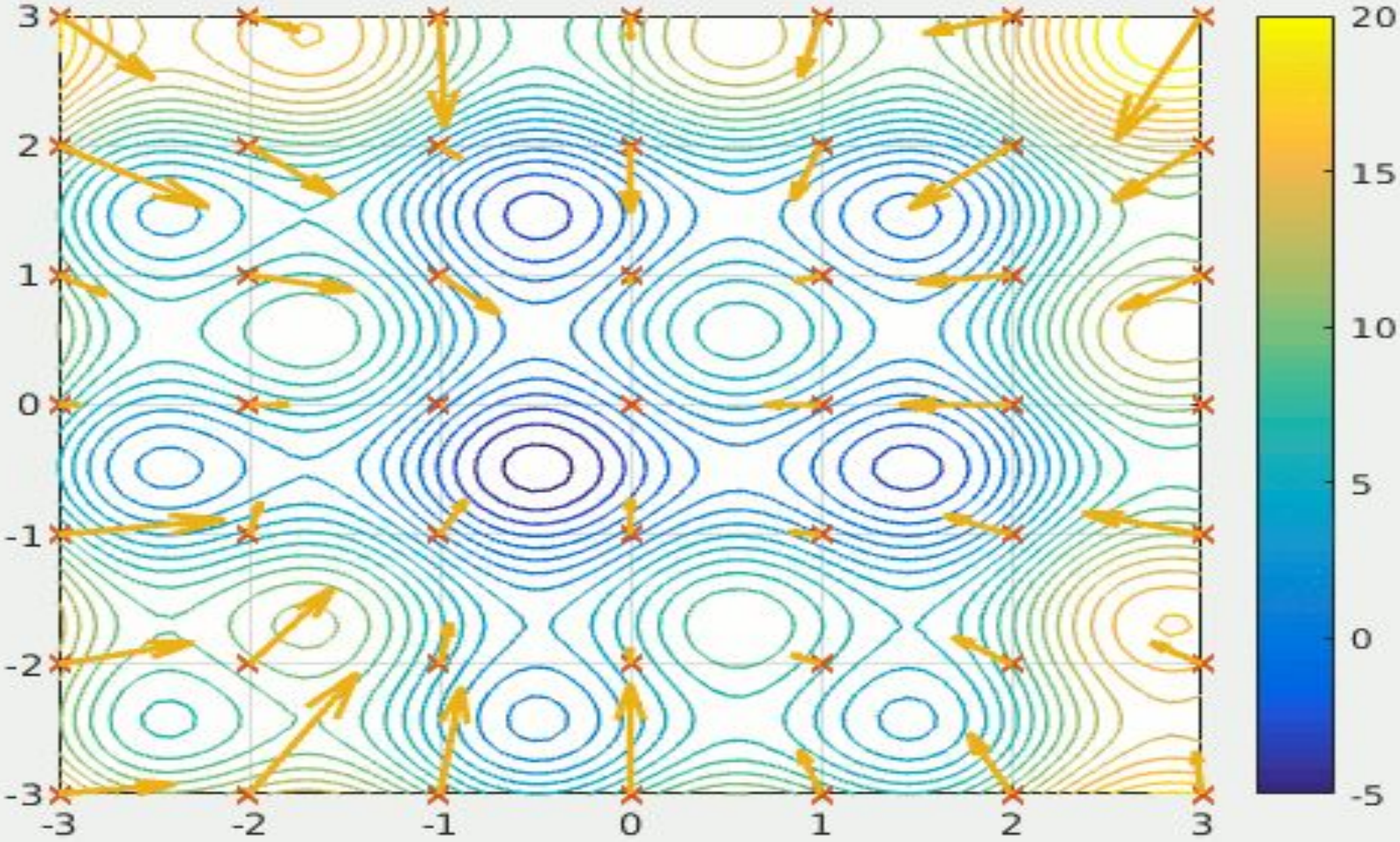
AGENDA

- INTRODUCTION
- LITERATURE REVIEW
- METHODOLOGY
- CONCLUSION
- REFERENCES

Vasudhaiva Kutumbakam

1. INTRODUCTION

- Data Mining
- Bio-inspired Algorithms
- Swarm Intelligence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3. LITERATURE REVIEW

WORK THAT HAS ALREADY BEEN DONE ON THIS ALGORITHM

R. Eberhart and J. Kennedy

The main architects behind PSO

Amreen Khan, Prof. Dr. N.G.Bawane and Prof. Sonali Bodkhe

Data mining and clustering

Kavitha Sooda, T. R. Gopalakrishnan Nair

PSO, GA, Network Routing and Shortest Path Algorithm

4. METHODOLOGY

WHAT WE HAVE DONE?

- Analysed the pseudocode
- Implemented the pseudocode in Python.
- Tried different permutations and combinations of the parameters of PSO.
- Visualized the data.

THE BASICS OF THE ALGORITHM

x_k^i	PARTICLE POSITION
v_k^i	PARTICLE VELOCITY
p_k^i	BEST INDIVIDUAL PARTICLE POSITION
p_k^g	BEST SWARM POSITION
w_k	CONSTANT INERTIA WEIGHT
c_1, c_2	COGNITIVE AND SOCIAL PARAMETERS
r_1, r_2	RANDOM NUMBERS BETWEEN 0 AND 1

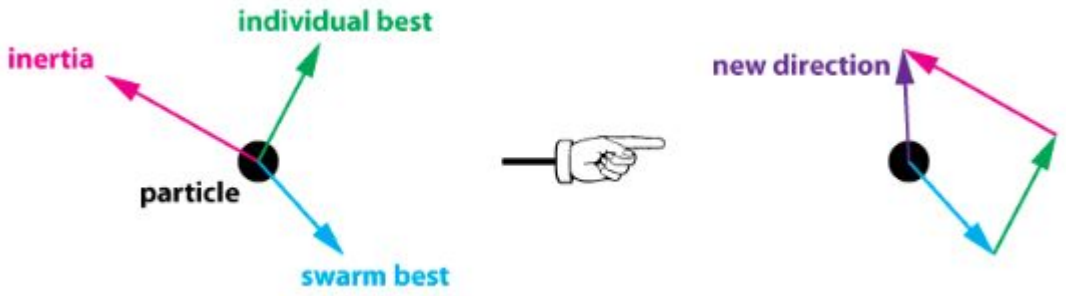
PARTICLE POSITION

$$x_{k+1}^i = x_k^i + v_{k+1}^i$$

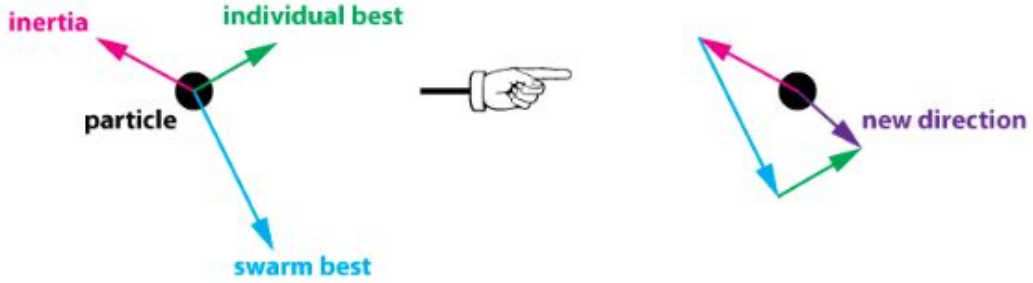
PARTICLE VELOCITY

$$v_{k+1}^i = w_k v_k^i + c_1 r_1 \left(p_k^i - x_k^i\right) + c_2 r_2 \left(p_k^g - x_k^i\right)$$

A HIGH ENERGY PARTICLE THAT WILL KEEP EXPLORING THE SEARCH SPACE



A LAZY PARTICLE THAT FOLLOWS THE HERD



PSEUDOCODE

```
Input: ProblemSize, Populationsize
Output: Pg_best
Population ← Ø
Pg_best ← Ø
for(i=1 to PopulationSize)
  Pvelocity ← RandomVelocity( )
  Pposition ← RandomPosition(Populationsize)
  Pp_best ← Pposition

  if(Cost(Pp_best) <= Cost(Pg_best))
    Pg_best  ← Pp_best

   end(if)
end(for)

while(StopCondition())
  for(P ∈ Population)
    Pvelocity ← UpdateVelocity(Pvelocity , Pg_best , Pp_best)
    Pposition ← UpdatePosition(Pposition , Pvelocity)

    if(Cost(Pposition) <= Cost(Pp_best))
      Pp_best  ← Pposition

       if(Cost(Pp_best) <= Cost(Pg_best))
         Pg_best  ← Pp_best

            end(if)
     end(if)
   end(for)
end(while)

return(Pg_best)
```

5. CONCLUSION

3 different parameters have an effect on particles,

- Previous velocity of the particle.
- Distance between particles current position to best position of the individual particle.
- Distance between particles current position to the swarms best position.

6. REFERENCES

The research that helped us do our research

★R. Eberhart, and J. Kennedy, (1995) A New Optimizer Using Particles Swarm Theory, Proc. Sixth International Symposium on Micro Machine and Human Science (Nagoya, Japan), IEEE Service Center, Piscataway, NJ, pp. 39-43.

★Amreen Khan, Prof. Dr. N.G.Bawane , Prof. Sonali Bodkhe, An Analysis of Particle Swarm Optimization with Data Clustering-Technique for Optimization in Data Mining.(IJCSE) International Journal on Computer Science and Engineering Vol. 02, No. 07, 2010, 2223-2226

★J. Kennedy, and R Eberhart, (1995), Particle Swarm Optimization, IEEE Conference on Neural Networks, pp. 1942-1948, (Perth, Australia), Piscataway, NJ, IV, 1995.

★ A. P. Engelbrecht. (2005), Fundamentals of Computational Swarm Intelligence. Wiley, 2005.

Some more of them..

★Kavitha Sooda, T. R. Gopalakrishnan Nair A Comparative Analysis for Determining the Optimal Path using Particle Swarm Optimization and Genetic Algorithms, International Journal of Computer Applications (0975 – 8887) Volume 32– No.4, October 2011

★Ming Li, Wenqiang Du, and Fuzhong Nian, An Adaptive Particle Swarm Optimization Algorithm Based on Directed Weighted Complex Network, School of Computer and Communication, LanZhou University of Technology, Lanzhou 730050, China, 2 April 2014

★Riccardo Poli,Analysis of the Publications on the Applications of Particle Swarm Optimisation, Hindawi Publishing Corporation Journal of Artificial Evolution and Applications Volume 2008, Article ID 685175, 10 pages doi:10.1155/2008/685175 30 November, 2007

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Thanks!