2018ICSE0621
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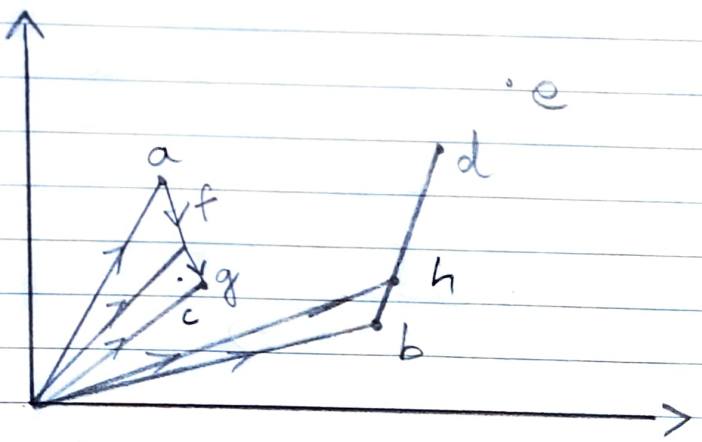
7-CSE-10

Part-B

Q.1] Particle Swarm Algorithm:-

- It is a computational method that optimizes a problem iteratively trying to improve a candidate solution with regard to a given measure of quality.
- Each particle's movement is influenced by its of local best known position but is also guided toward the best known position in the search space which are updated as better positions are found by other particles. This is expected to move the swarm to best solution.



Vector Representation of PSO

- Hypothesis are plotted in this space and seeded with an initial velocity as well as communication channel between the particles.
- This method is used to fit the best path / solution to reach destination.

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——> STEPS IN PSO:-

Step 1: Initialize the position of a, b, c, d, e

Step 2: Initialize the next position decided by the individual swarms as a', b', c', d', e'.

Step 3: Global decision:

$f(a', b, c, d, e)$
$f(a, b', c, d, e)$
$f(a, b, c', d, e)$
$f(a, b, c, d', e)$
$f(a, b, c, d, e')$

Step 4: Next a: $a + w_1 * \text{Random} * (a' - a) + w_2 * \text{Random} * (\text{global} - a)$

Next b: $b + w_1 * \text{Random} * (b' - b) + w_2 * \text{Random} * (\text{global} - b)$

Next c: $c + w_1 * \text{Random} * (c' - c) + w_2 * \text{Random} * (\text{global} - c)$

Step 5: Change current values to next i.e.

$f(\text{next } a, b, c, d, e)$
$f(a, \text{next } b, c, d, e)$
$f(a, b, \text{next } c, d, e)$
$f(a, b, c, \text{next } d, e)$
$f(a, b, c, d, \text{next } e)$

Step 6: If $f(\text{next } a, b, c, d, e) < f(a', b, c, d, e)$ then update the value of a' as 'next a' else a' will not change. [Similarly for b, c, d, e].

Step 7: Repeat steps 3 to 6 to reach the final decision. Here we use, $\boxed{\text{next } a(t+1) = a(t) + \Delta a(t+1)}$

The weight of the iteration is given by,

$$\boxed{w(t+1) = \frac{w(t) - t * w(t)}{\text{iter}}}$$

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Flowchart for PSO: