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RESEARCH ARTICLE

AN OVERVIEW OF SWARM INTELLIGENCE IN ARTIFICIAL INTELLIGENT SYSTEMS

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Abstract

Swarm intelligence refers to a kind of problem-solving ability that emerges in the interactions of simple information-processing units. The concept of a swarm suggests multiplicity, stochasticity, randomness, and messiness. Advancement of technology has led to problems that are complex and more challenging.Swarm intelligence techniques were mostly developed for solving optimization problems.

Introduction:-

Swarm intelligence is a collective behavior in decentralized, self-organized systems, natural or artificial. SI systems are made up of a population of simple agents interacting locally with one another and their environment. The inspiration often comes from nature, especially biological systems. The agents are no centralized control structure dictating how individual agents should behave, local and to a certain degree random, interaction between such agents lead to the emergence of intelligent global behavior, unknown to the individual agents.

Swarm
It is an aggregation of similar animals generally towards the same direction is called swarm.

Intelligence
Anything which acts intelligently, then that behavior is called as intelligence

Swarm Intelligence (SI)
Swarm intelligence is an emerging field of biologically inspired artificial intelligence based on the behavioral models of social insects. It is the study of decentralized, self-organized system, which can move quickly in coordinated manner. Very adoptive in nature and global behavior. Randomness enables the continuous exploration of the alternatives and it ensures that the better solution will be found.

Artificial Intelligence (AI)
Artificial Intelligence is the synthesis and analysis of computational agent that acts intelligently. Here agent is something that acts in an environment. For example Dog, Human, Robot etc. agent's actions are appropriate for its goals and circumstances, it is flexible to changing environments goals. It learns from fast experiences and makes appropriate choices given perceptual and computational limitations. AI may be interpreted as the opposite of real intelligence.

Characteristics of Swarming
1. Simple rule for individual
2. No control: No one in the whole thing i.e controlling each other, the rule is equally made for each individual.

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3. Decentralized and Robust:
4. Emergence: If it group is there the performance will be very high and complex function will become very easy
5. Solve optimization problem: Insect colony or animal societies, swarm intelligence solves the optimization problem.

How the animal and Artificial Intelligence is comes together?
Any attempt do design algorithms or distributed problem solving devices inspired by the collective behavior of social insect colony and other animal societies.

People swarm? Yes they can
Many minds into one mind artificial swarm intelligence can apply then minds can ask the questions, reach decisions, make predictions, play games, crack jokes, create memes, pick stocks, express opinions and solve the problems etc..

Key Capabilities of Swarm Intelligence
1. Scheduling/ Load balancing: The emphasis is on the relative position of the job rather that its direct predecessor or its direct successor in the schedule and summation evaluation rule is followed.
2. Clustering: cluster is collection of agents which are similar and are dissimilar to the agents in other cluster.
3. Optimization: An optimization problem is problem of finding the best solution form all the feasible solutions.
4. Routing: Routing is based on the principles that backward agents utilize the useful information gathered by forward ants on their trip from source to destination.

Principles of Swarm Intelligence
Principle 1: Awareness
Each member must be aware of its surroundings and abilities

Principle 2: Autonomy
To self-coordinate each member must operate as an autonomous master (not as slave).

Principle 3: Solidarity
When a task is completed, member should autonomously look for a new task.

Principle 4: Expandability
The system must permit dynamic expansion where members are seamlessly aggregated.

Principle 5: Resiliency
When members are removed, the system must be self-healing.

Advantages
1. Flexible: The colony respond to internal disturbances and external challenges
2. Robust: Tasks are completed even if some agents fail.
3. Scalable: from a few agents to millions
4. Self-organized: The solutions are emergent rather than pre-defined.
5. Decentralized: There is no central control in the colony
6. Adaptation: The swarm system can not only adjust to predetermined stimuli but to new stimuli.
7. Speed: Changes in the network can be propagated very fast.
8. Modularity: agents act independently of other network layers.
9. Parallelism: Agents operations are inherently parallel.

Applications of Swarm Intelligence
1. United state of America Military work: Human being not driving the military Vehicles. Controlling unmanned vehicles by SI.
2. Space Agency
3. Robotics
4. Controlling the Cancer Tumor for detecting the nanobots
5. For locating Tumor
6. Data mining: which data is being used, where data came from, where the data goes off.

7. Mobile media

Examples of system studied by swarm intelligence are

1. Colonies of ants and terminate.
2. Schools of fish.
3. Flocks of birds
4. Herds of land animals
5. Honey bees colony.
6. Traffic: cars
7. Immunity System: cells and molecules
8. Bacterial growth

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