QACO for structural topology optimization ⇒

① define the optimization problem
② create a quantum ant colony
③ initialize the quantum ant colony
④ Iterate the quantum ant colony
→ Each ant moves through the design space
→ The ants pheromone is updated.
→ The ants pheromone is used to guide the ants to determine best solution.
⑤ measures the quantum ant colony.

(a) define optimization problem → specifying objective function and the design space
(b) create QAC → set of qubits that represent ant and another set of qubits represent pheromone

ACO < ants / pheromone → QACO < ants ≡ qubits / pheromone = qubits

(c) Initializing QAC → randomly assigning values to qubits.

(d) Iteration
(e) measure QAC → by measuring qubits.

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① objective function
② decision variable
③ Constraints.

No parameter optimization is done for any meta-heuristics algorithm.
→ ~~Constant~~ Constraints are directly applied on the problem.

Quantum computing and Ant colony optimization

1) problem formulation
2) objective function
3) Quantum ACO setup
4) Quantum Encoding
5) Quantum ACO algorithm
6) Quantum Annealing [optimal] *
7) Simulation and Debugging
8) Quantum Hardware
9) parameter Tuning and optimization
10) Result analysis
11) Post- processing
12) Iterative optimization.

(1,2) → Synonymous

MID

END

problem formulation ⇒ define str. topology with clear objectives and constraints.

⇒ The goal is to find the optimal layout of materials within a given design space to acheive specific performance.

⇒ objective → minimize the structural compliance or maximize stiffness of a mechanical structure to external loads while considering material volume as a constraint.

⇒