Title: Solution to Unit Commitment in Power System Operation Planning Using Binary Coded Modified Moth Flame Optimization Algorithm (BMMFOA): A Flame Selection Based Computational Technique

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Solution to Unit Commitment in Power System Operation Planning Using Binary Coded Modified Moth Flame Optimization Algorithm (BMMFOA): A Flame Selection Based Computational Technique

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Highlights:

- Modifications in flame selection approach in basic moth-flame approach are introduced
- Binary variants of basic and modified moth-flame approach are developed
- Application of proposed approaches to solve various test cases of unit commitment are simulated
- Comparative analysis with existing classical and heuristic approaches
- Statistical significance of proposed approaches is demonstrated.

Abstract: **This paper presents an intelligent computational technique, modified moth-flame optimization algorithm (MMFOA) to examine the exploration and exploitation characteristics of basic MFOA approach. Additionally, the binary coded variants of basic as well as MMFOA namely binary coded modified moth flame optimization algorithms (BMMFOA) are developed for solving unit commitment (UC) problem. The moth-flame algorithm is a nature inspired heuristic search approach that mimics the traverse navigational properties of moths around artificial lights tricked for natural moon light. Unlike many other swarm based approaches, the position update in MFOA is a one-to-one procedure between a moth and corresponding flame. In the basic MFOA, to improve exploitation characteristics of moths, the flame number is reduced as a function of iteration count. The last flame with worst fitness is then duplicated to serve as position update reference for left over (excess) moths. The four additional variants proposed in this paper includes different flame selection procedures based on balance between exploitation and exploration aspects of search process. The proposed BMMFOA variants are tested on unit commitment problem of power system operational scheduling. The binary mapping of continuous/real valued moth, flame locations for solving UC problem is carried out using modified sigmoidal transformation. The efficacy of the proposed BMMFOA against basic MFOA and other approaches for various test systems is analysed in terms of solution quality, execution time and convergence characteristics. Also, several standard statistical tests such as**