

# Solar PV Combined Efficient Torque Control of BLDC Motor Using Salp Swarm Optimization

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**Abstract**—This study provides an efficient torque and speed control method for brushless DC (BLDC) motor utilizing a fractional order proportional integral derivative (FOPID) controller based on the multiverse optimization algorithm and salp swarm optimization (SSO). When combined with a solar photovoltaic (PV) system and a voltage boosting architecture, standard PID controllers regulated the BLDC drive parameters due to their simplicity and improved steady-state performances. A solar PV system with a specific power range is chosen for the best output solution on the output side. The MPPT method employed is the incremental conductance approach for tracking maximum power from the source. However, it has a problem with unpredictability owing to load changes. The PID controller tuning also relates to the structure's parametric uncertainties. Therefore, precise control methods may be offered with the aid of the FOPID controller to address the aforementioned issues. Simulation results of the proposed MVO and SSO-based FOPID controller for BLDC speeds run in the Matlab Simulink platform. To confirm the adaptability of the suggested control scheme for BLDC motor, the outcomes are interrelated using genetic algorithm, gray wolf, and PSO-based FOPID controllers.

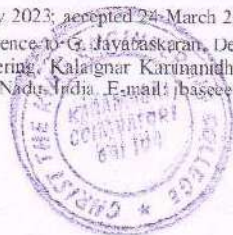
## 1. INTRODUCTION

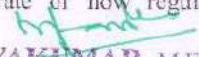
In the past few decades, “ecofriendly” manufacturing strategies have received much attention as the global consumption of electronics products has increased. The permanent magnet synchronous motor, for example, is an excellent contender for controllable speed motor applications owing to functional benefits such as an immense continuous power maximum speed, high-performance, high-power output and torque densities, and high durability [1]. The integrated Three Port Converter has indeed been performed in unicast and multicast modes to provide constructed double electrical flexibility and power rate of flow regulation.

Keywords: brushless DC motor, solar PV, proportional integral derivative controller, salp swarm optimization, multiverse optimization

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