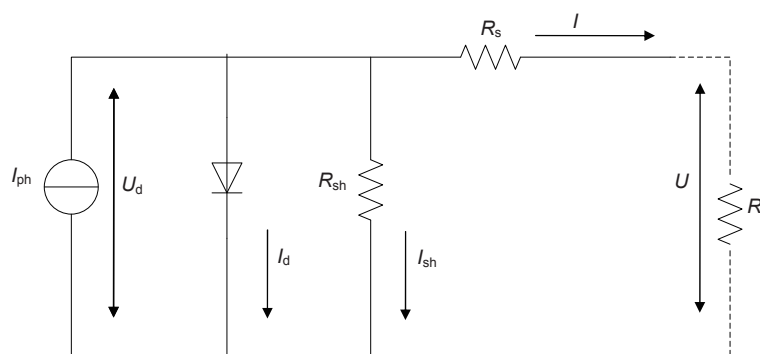


Applications of IBA for photovoltaic array under partially shaded condition

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Equivalent circuit diagram of single photovoltaic battery

Overview: The photovoltaic system is familiar to people as the new energy. Because Photovoltaic components consist of silicon, it can be considered as a constant current source, with an anti parallel diode. And output voltage and output current can be measured by instruments, and then output power can be calculated. When the sun light is balance, characteristic of the output of PV arrays is the same as one PV component. When under the partially shaded condition, there are heat spots in PV arrays, which causes problems. Such as the output curve of solar battery will has multiple peaks. Under the partially shaded condition, traditional MPPT search methods often trap in local extremum or lose the maximum power point, and they have oscillation and instability. So intelligent algorithms are used to track the maximum power point to avoid the disadvantages that traditional methods have.

Many intelligent algorithms such as partial swarm optimization, genetic algorithm, fish algorithm and so on are used to track the maximum power point. Bat algorithm is considered to track the maximum power point of PV output curves, but there are many shortcomings in bat algorithm. So an improved bat algorithm is proposed and used to find global optimal point, by introducing chaos search strategy in initial arrangement which can improve the uniformity and ergodicity. The self-adapting weight is introduced to enhance the global searching ability of previous processing and the local searching ability of late processing, and Levy flight is introduced in the same time to create the saltation velocity to out of the local extremum and to jump out the local extremum. Dynamic contraction is also used to decrease the search section more effectively, so as to avoid premature convergence of the population affected by the local extremum.

To proof the efficiency of the improved algorithm, IBA is compared with PSO, BA and ABC. Results show that all of PSO, BA and ABC have disadvantages such as instability, large amplitude and easily to precocious, and optimization mechanism of IBA algorithm can avoid trapping in local extremum and enhance the stability. To realize the tracking of maximum power point of output curve, the improved algorithm is introduced into the Boost system, and simulation results are shown as statistical data in charts. The simulation results show that modified bat algorithm can find the global optimal point fast, with high precision, under the partially shaded condition.

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