## CLAIMS

[Claim 1]

A method for scheduling charging and discharging for a charge-discharge system, wherein the charge-discharge system is electrically connected to a grid, the charge-discharge system comprises a plurality of charge-discharge devices, and the method for scheduling charging and discharging comprises:

obtaining a plurality of vehicle information about a plurality of electric vehicles, wherein the plurality of vehicle information comprises a departure time and a state of charging, and each of the plurality of electric vehicles corresponds to one of the plurality of charge-discharge devices;

obtaining a plurality of system information about the charge-discharge system, wherein the system information comprises a total power capacity and a plurality of profits, and the plurality of profits comprises a grid-to-vehicle profit, a vehicle-to-grid profit, and a vehicle-to-vehicle profit;

maintaining the total power capacity unchanged in a first pattern when one of the plurality of electric vehicles is discharged;

increasing the total power capacity in a second pattern when one of the plurality of electric vehicles is discharged;

establishing a fitness function according to the plurality of vehicle information and the plurality of system information;

executing a bio-inspired algorithm to determine a charge-discharge operation for each of the plurality of electric vehicles on a corresponding charge-discharge device at each of a plurality of time intervals according to the fitness function; and

applying a corresponding charge-discharge operation to a corresponding electric

vehicle by the plurality of charge-discharge devices.

[Claim 2]

The method for scheduling charging and discharging according to claim 1, wherein the step of executing the bio-inspired algorithm according to the fitness function comprises:

performing an initialization to generate a plurality of individuals, wherein each of the plurality of individuals comprises a plurality of charge-discharge operations of the plurality of electric vehicles in the corresponding charge-discharge devices at the plurality of time intervals;

calculating a fitness of each of the plurality of individuals according to the fitness function;

selecting a plurality of first individuals from the plurality of individuals according to the fitness;

performing a recombination procedure and a mutation procedure on the plurality of first individuals to generate a plurality of offspring individuals; and

adjusting the plurality of offspring individuals according to the plurality of system information and the plurality of vehicle information, and deleting at least one of the adjusted offspring individuals to proceed a next iteration according to a plurality of conditions.

[Claim 3]

The method for scheduling charging and discharging according to claim 2, wherein the step of performing the initialization to generate the plurality of individuals

comprises:

generating a plurality of combinations for the plurality of electric vehicles; and

determining the plurality of charge-discharge operations of the plurality of electric vehicles on the corresponding charge-discharge devices at the plurality of time intervals according to a corresponding vehicle order, for each of the plurality of combinations, wherein each of the plurality of electric vehicles is in first order in one of the plurality of combinations.

[Claim 4]

The method for scheduling charging and discharging according to claim 1, wherein the plurality of vehicle information further comprises an arrival time, and the step of establishing the fitness function according to the plurality of vehicle information and the plurality of system information comprises:

calculating a charge amount according to the state of charging of the plurality of electric vehicles at a corresponding arrival time and the state of charging of the plurality of charge-discharge operations at the plurality of time intervals;

calculating a demand electric power according to the state of charging, an expected departure power, and a battery capacity of the plurality of electric vehicles at the corresponding arrival time;

calculating a satisfaction according to the charge amount and the demand electric power;

adding up the plurality of profits at the plurality of time intervals to obtain a total profit; and

establishing the fitness function according to the satisfaction and the total profit.

[Claim 5]

The method for scheduling charging and discharging according to claim 4, wherein the step of establishing the fitness function according to the plurality of vehicle information and the plurality of system information further comprises:

setting the fitness function to a first fitness function at least one of previous time intervals of the plurality of time intervals if a profit per unit of electric power under a grid-to-vehicle transmission pattern increases over time and the total power capacity decreases over time, and setting the fitness function to a second fitness function at rest time intervals of the plurality of time intervals, wherein the first fitness function comprises a motivation factor more than the second fitness function.

[Claim 6]

The method for scheduling charging and discharging according to claim 4, wherein the fitness function comprises a first penalty factor, and the method for scheduling charging and discharging further comprises:

setting the first penalty factor to reduce the calculated fitness according to the fitness function if the charge-discharge operation of one of the plurality of electric vehicles at least one of last time intervals of the plurality of time intervals is discharging.

[Claim 7]

The method for scheduling charging and discharging according to claim 6, wherein the fitness function comprises a second penalty factor, and the method for scheduling charging and discharging further comprises:

setting the second penalty factor to reduce the calculated fitness according to the fitness function if the state of charging of one of the plurality of electric vehicles at the departure time is lower than the state of charging at the arrival time.

[Claim 8]

The method for scheduling charging and discharging according to claim 4, wherein the total profit further comprises an importance, and the method for scheduling charging and discharging further comprises:

setting the importance to decrease monotonically with a stay time of the plurality of electric vehicles in the charge-discharge system.

[Claim 9]

The method for scheduling charging and discharging according to claim 4, wherein the total profit further comprises a weight, and the method for scheduling charging and discharging further comprises:

setting the weight to a constant when calculating the grid-to-vehicle profit;

setting the weight to be positively related to a difference value between a profit per unit of electric power under a vehicle-to-grid transmission pattern and a profit per unit of electric power under a grid-to-vehicle transmission pattern when calculating the vehicle-to-grid profit; and

setting the weight to be positively related to the profit per unit of electric power under the vehicle-to-grid transmission pattern when calculating the vehicle-to-vehicle profit.

[Claim 10]

A charge-discharge system, electrically connected to a grid, the charge-discharge system comprising:

a plurality of charge-discharge devices; and

a charge-discharge controller, electrically connected to the plurality of charge-discharge devices and configured to execute a plurality of steps:

obtaining a plurality of vehicle information about a plurality of electric vehicles, wherein the plurality of vehicle information comprises a departure time and a state of charging, and each of the plurality of electric vehicles corresponds to one of the plurality of charge-discharge devices;

obtaining a plurality of system information about the charge-discharge system, wherein the plurality of system information comprises a total power capacity and a plurality of profits, and the plurality of profits comprise a grid-to-vehicle profit, a vehicle-to-grid profit, and a vehicle-to-vehicle profit;

maintaining the total power capacity unchanged in a first pattern when one of the plurality of electric vehicles is discharged;

increasing the total power capacity in a second pattern when one of the plurality of electric vehicles is discharged;

establishing a fitness function according to the plurality of vehicle information and the plurality of system information;

executing a bio-inspired algorithm to determine a charge-discharge operation for each of the plurality of electric vehicles on a corresponding charge-discharge device at each of a plurality of time intervals according to the fitness function; and

applying a corresponding charge-discharge operation to a corresponding electric

vehicle by the plurality of charge-discharge devices.

[Claim 11]

The charge-discharge system according to claim 10, wherein the step of executing the bio-inspired algorithm according to the fitness function comprises:

performing an initialization to generate a plurality of individuals, wherein each of the plurality of individuals comprises the plurality of charge-discharge operations of the plurality of electric vehicles in the corresponding charge-discharge devices at the plurality of time intervals;

calculating a fitness of each of the plurality of individuals according to the fitness function;

selecting a plurality of first individuals from the plurality of individuals according to the fitness;

performing a recombination procedure and a mutation procedure on the plurality of first individuals to generate a plurality of offspring individuals; and

deleting at least one of the plurality of offspring individuals to proceed a next iteration according to a plurality of conditions.

[Claim 12]

The charge-discharge system according to claim 11, wherein the step of performing the initialization to generate the plurality of individuals comprises:

generating a plurality of combinations for the plurality of electric vehicles; and

determining the plurality of charge-discharge operations of the plurality of electric vehicles on the corresponding charge-discharge devices at the plurality of time

intervals according to a corresponding vehicle order, for each of the plurality of combinations, wherein each of the plurality of electric vehicles is in first order in one of the plurality of combinations.

[Claim 13]

The charge-discharge system according to claim 10, wherein the plurality of vehicle information further comprises an arrival time, and the step of establishing the fitness function according to the plurality of vehicle information and the plurality of system information comprises:

calculating a charge amount according to the state of charging of the plurality of electric vehicles at a corresponding arrival time and the state of charging of the plurality of charge-discharge operations at the plurality of time intervals;

calculating a demand electric power according to the state of charging, an expected departure power, and a battery capacity of the plurality of electric vehicles at the corresponding arrival time;

calculating a satisfaction according to the charge amount and the demand electric power;

adding up the plurality of profits at the plurality of time intervals to obtain a total profit; and

establishing the fitness function according to the satisfaction and the total profit.

[Claim 14]

The charge-discharge system according to claim 13, wherein the step of establishing the fitness function according to the plurality of vehicle information and the

plurality of system information further comprises:

setting the fitness function to a first fitness function at least one of previous time interval of the plurality of time intervals if a profit per unit of electric power under a grid-to-vehicle transmission pattern increases over time and the total power capacity decreases over time, and setting the fitness function to a second fitness function at rest time intervals of the plurality of time intervals, wherein the first fitness function comprises a motivation factor more than the second fitness function.

[Claim 15]

The charge-discharge system according to claim 13, wherein the fitness function comprises a first penalty factor, and the plurality of steps further comprise:

setting the first penalty factor to reduce the calculated fitness according to the fitness function if the charge-discharge operation of one of the plurality of electric vehicles at least one of last time intervals of the plurality of time intervals is discharging.

[Claim 16]

The charge-discharge system according to claim 15, wherein the fitness function comprises a second penalty factor, and the plurality of steps further comprise:

setting the second penalty factor to reduce the calculated fitness according to the fitness function if the state of charging of one of the plurality of electric vehicles at the departure time is lower than the state of charging at the arrival time.

[Claim 17]

The charge-discharge system according to claim 13, wherein the total profit

further comprises an importance, and the plurality of steps further comprise:

setting the importance to decrease monotonically with a stay time of the plurality of electric vehicles in the charge-discharge system.

[Claim 18]

The charge-discharge system according to claim 13, wherein the total profit further comprises a weight, and the plurality of steps further comprise:

setting the weight to a constant when calculating the grid-to-vehicle profit;

setting the weight to be positively related to a difference value between a profit per unit of electric power under a vehicle-to-grid transmission pattern and a profit per unit of electric power under a grid-to-vehicle transmission pattern when calculating the vehicle-to-grid profit; and

setting the weight to be positively related to the profit per unit of electric power under the vehicle-to-grid transmission pattern when calculating the vehicle-to-vehicle profit.