

## ***Extended Abstract***

### ***Purpose***

The Internet of Things is an extensive network of physical objects such as devices, machines, buildings, and other tools in which sensors, network connections, and software are embedded as a small system. The method of clustering things is one of the efficient methods to reduce energy consumption in the data transfer phase in the Internet of Things. In clustering, each cluster has a node called the cluster head, which is responsible for coordinating network operations and collecting data from sensor nodes. The most important objective of this study is to improve the amount of energy consumption in the data transfer cycle. Most of the communication and computing tasks should be completed within a limited period to avoid unfavorable consequences since IoT applications are very time-sensitive and critical. Thus, ensuring real-time support in large-scale IoT networks is one of the most important and challenging research issues.

### ***Methodology***

PSO, CPSO, and FCPSO algorithms were used in this study. Finally, the FCPSO algorithm was formulated using the theory of fractional order derivatives. MATLAB was used to simulate and evaluate IoT information security and PSO, CPSO, and FCPSO in smart buildings. Also, the results of the proposed method were compared with similar methods. Several parameters are affected. The values of these parameters strongly depend on the convergence improvement. In this study, the following parameters are considered when transferring data to the center or between things:

- E<sub>tx</sub> and E<sub>rx</sub>: energy used to transfer and receive data, respectively, in the nodes.
- D<sub>ij</sub>: distance between node i and node j.
- E<sub>elec</sub>: energy available in each node.
- F<sub>ij</sub>: data transfer rate between two nodes.
- C<sub>S</sub>, C<sub>R</sub>, and C<sub>B</sub>: base station node cost, sensor node cost, and reinforcing node cost, respectively.

All simulations were performed in the Windows 10 operating system using quad-core 2.5 GHz processors, working frequency 2, and a memory capacity of 8 GB. The simulation was done in MATLAB 2020 software. Ten bench test functions were used to examine the effectiveness of the proposed algorithm.

### ***Finding***

In the scenario where the FCPSO method is used for information transfer, the energy consumption can be reduced by using the FCPSO method for optimization. The second test method uses the same described method to evaluate E<sub>tx</sub> and E<sub>rx</sub> parameters. These two parameters can be viewed as a single parameter whose value can be set arbitrarily for each thing. The FCPSO method performs better than the standard transfer mode in this test condition.

In this measurement, the amount of memory consumption (in megabytes) to complete authentication requests in smart buildings based on the Internet of Things has been investigated and compared based on the number of sent packages. The results indicate that the third method has the lowest memory consumption for more packets, while the proposed method could reduce the memory consumption for a high number of packets.

In the second test, the amount of energy required to transfer data from the source to the destination is evaluated. The number of data packets increased in each successive step. Results shows that the proposed method uses less energy than comparable methods.

The accuracy criterion shows how well the proposed technique can accurately display the identity in smart buildings based on the Internet of Things. Results compares the accuracy rate of the proposed technique for 188 unique identity effects with the accuracy of the second and third methods for different packets.

The simulation results indicate that the proposed method is more accurate than the second and third methods for identifying distinct packets in IoT-based smart buildings.

## ***Conclusion***

In this study, a model based on the cycle and transfer of information to the base station and between items was used for energy consumption and the Internet of Things network. The most crucial challenges in IoT routing are the energy consumption of each node, comparability, error tolerance, and network dynamics. It is necessary to evaluate the quality of a node using appropriate criteria for effective communication and information transfer. In this study, the energy used to transfer and receive data in nodes, the energy available in each node, the distance between two nodes, and the data transfer rate between two nodes were evaluated. Given the objective of this study, which is to optimize energy consumption in the Internet of Things, the FCPSO algorithm was used to reduce energy consumption during information transfer. Using the FCPSO algorithm to reduce energy consumption in the Internet of Things is possible due to the capability of the algorithm to optimize the problem by considering the number of parameters that can significantly affect the performance of the problem, which is the goal of many optimization problems. The simulation results revealed that using the FCPSO method improves and reduces energy consumption during the program execution and information transfer cycle. The most important limitation of this study is that there is not enough data to build an optimal model. Thus, the possibility for model non-convergence increases. Another crucial issue in this regard is the degree of computational complexity that new data transfer models require.