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ИСПОЛЬЗОВАНИЕ ИСКУССТВЕННЫХ НЕЙРОННЫХ СЕТЕЙ ПРИ ПРОВЕРКЕ МОЩНОСТИ ЗАРЯДНЫХ СТАНЦИЙ ЭЛЕКТРОМОБИЛЕЙ
USING ARTIFICIAL NEURAL NETWORKS TO ADJUST THE POWER OF ELECTRIC VEHICLE CHARGING STATIONS

Аннотация: В данной статье рассматривается эффективность искусственных нейронных сетей на станциях зарядки электромобилей, их удобство, а также плюсы и минусы их использования для регулировки мощности зарядных станций. В настоящее время использование искусственных нейронных сетей на станциях зарядки электромобилей имеет большое значение для повышения эффективности этих станций и опыта водителей. В заключение дается представление о возможностях искусственных нейронов для эксплуатации зарядных станций в наиболее оптимальном режиме.

Abstract. This article discusses the effectiveness of artificial neural networks in electric vehicle charging stations, their convenience, and the pros and cons of using them to adjust the power of charging stations. Currently, the use of artificial neural networks in electric vehicle charging stations is of great importance for improving the efficiency of these stations and the experience of drivers. In conclusion, it provides insights into the capabilities of artificial neurons to operate charging stations in the most optimal mode.

Ключевые слова. Искусственные нейронные сети, зарядные станции, электромобиль, эффективность, инфраструктура, энергетический ресурс, прогнозирование спроса на зарядку, оптимизация, режим реального времени, управление зарядкой и т. д.

Keywords. Artificial neural networks, charging stations, electric vehicles, efficiency, infrastructure, energy resources, charging demand prediction, optimization, real-time mode, charging management, etc.

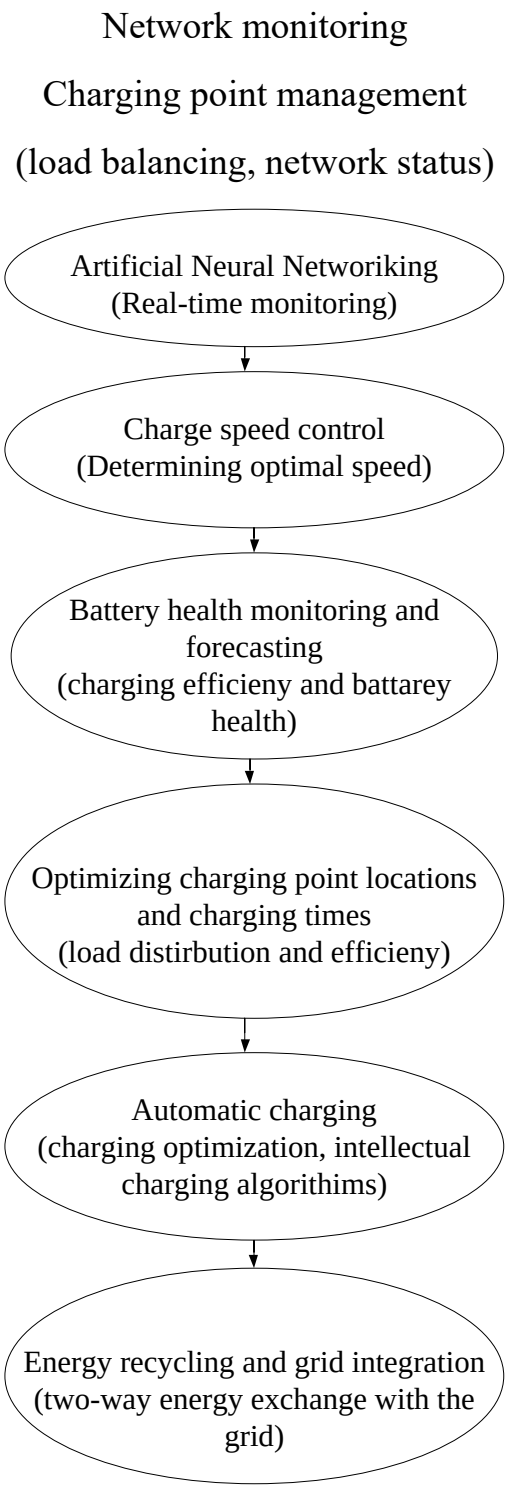
Introduction. The development of artificial neural networks is currently being applied in many areas. With their help, it is possible to predict the charging demand of electric vehicle owners. This demand forecast takes into account factors such as historical data, weather conditions, holidays and working days. When artificial neural networks are used in energy supply, they help optimize energy consumption in the network. As a result, it is possible to distribute electricity evenly between charging stations and prevent overloads [1,2].

Charging stations powered by neural networks support supply and demand-based pricing. This can increase prices during peak hours or decrease prices during off-peak hours. This, in turn, helps ensure the stability of the network by evenly distributing the load and charging electric vehicles at certain intervals. When placing charging stations, optimal locations can be selected using artificial neural networks, taking into account settlements, road infrastructure and charging requirements.

Methods. There are several ways to use artificial neural networks in the charging process of electric vehicles. These methods are mainly used to optimize the charging process, increase efficiency, and use energy resources.

This demonstrates the main methods and their interconnections for using artificial neural networks in the charging process of electric vehicles. Each stage helps to increase the efficiency of the system and ensures optimal allocation of energy resources [3].

Methods for using artificial neural networks in charging electric vehicles



Results. The technology of using artificial neural networks in charging electric vehicles is currently being used in various developed countries of the world to increase energy efficiency and optimize electric vehicle infrastructure. Currently, several projects are being implemented in different countries of the world aimed at using artificial neural networks and artificial intelligence to manage the integration of electric vehicles with the grid. For example, Japanese companies Nissan Leaf and Honda Clarity have implemented Vehicle 2 Grid, i.e., electric vehicle-to-grid technology using

electric vehicles. This technology is used to control the grid and send excess energy to charging stations, and with this technology, electric vehicles have achieved significant results in absorbing excess load on the grid, optimizing energy consumption, and increasing system efficiency. Currently, the Netherlands is also using artificial neural networks and artificial intelligence to optimize charging networks. Through their “Smart Charging” systems, they automatically adjust the operating time and speed of charging points according to the needs of drivers, and they have managed to slightly increase the efficiency of the charging system and further optimize the energy distribution in the network. Norway, on the other hand, has achieved significant results in network management and charging time forecasting using artificial intelligence and neural networks to efficiently process electric vehicle charging systems. This is especially useful in optimizing the network in rural areas and taking into account weather conditions [4].

In the UK, there are several projects and trials to use artificial neural networks in charging electric vehicles, and they are working to improve the efficiency of electric vehicles and charging systems through the integration of “Smart Charging” and “Vehicle to Grid” technologies, and the results they have achieved so far are that energy distribution and charging systems have been managed more effectively with the help of technology. Charging times and speeds have been optimized according to the needs of drivers, and overloads and shortcomings in the network have been identified and their management has been considered. In China, which is considered a leader in the production and export of electric vehicles, great attention is also being paid to the use of artificial neural networks and artificial intelligence in the development of electric vehicles and charging infrastructure. As the number of electric vehicle bases in China is growing rapidly, artificial intelligence is being used to manage the location of charging stations and energy distribution, and as a result, the efficiency of the electric vehicle charging point and network management system has increased with the help of artificial intelligence. Several cities in China have achieved success in optimizing energy distribution by implementing intelligent management systems for electric vehicles and charging infrastructure [5].

Discussion. The practical application of the proposed methods, as mentioned above, demonstrates several efficiencies and positive aspects of using charging stations. The use of artificial neural networks in power adjustment of charging stations includes the following main aspects [6].

Neural networks help to increase the efficiency of charging stations, prevent overloads and system failures in the network. As a result, the efficiency of energy supply increases, and with the ability to dynamically control power, the efficiency of charging stations increases, which ensures more stable and efficient operation of the network.

1. Load management is very important when adjusting the power of charging stations. Artificial neural networks continuously monitor the status of charging points and the energy flow to them, ensuring the highest efficiency. The result is a reduction in network overload, more efficient use of energy resources, and effective management of charging station operations.
2. Using artificial intelligence and neural networks, changes in electricity prices can be predicted. Using neural networks, charging stations can be adjusted in accordance with changes in electricity prices. This creates opportunities for network optimization, adjusting charging times taking into account energy prices, and providing efficient service to users.
3. Neural networks allow for continuous monitoring of the battery status of an electric vehicle. The battery status, charging threshold, and other parameters are evaluated by the neural network to optimize charging speed and efficiency.
4. Using neural networks, data from charging stations is analyzed and the system automatically optimizes itself. This allows the system to learn and adjust to user needs in real time. The system automatically adjusts power, which reduces human intervention and increases the efficiency of the charging process.
5. To improve the efficiency of charging stations, artificial neural networks can be used to select the optimal charging speed and efficiency when improving power. This allows users to charge faster and more efficiently. This can improve system efficiency by accurately predicting charging speed and efficiency and guiding users to charge at the right time.

Conclusion. Using artificial neural networks to adjust the power of charging stations increases network efficiency, can manage the needs of drivers in real time, and can make charging station management more efficient and automated with the help of an automatic optimization and integration system. In short, artificial neural networks make the process of adjusting the power of charging stations more efficient, stable and user-friendly. This technology plays an important role in ensuring the development of the electric vehicle system, energy efficiency and network stability.

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