

A Review: Application of AIOT in Smart Cities in Industry 4.0 and Society 5.0

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Abstract: This review paper explores the application of Artificial Intelligence of Things (AIOT) in smart cities under the contexts of Industry 4.0 and Society 5.0. The main objective of the paper is to analyze and evaluate the latest developments and implementations of AIOT in smart cities, and to provide insights on the potential benefits, challenges, and future research directions. The study uses a systematic literature review approach and synthesizes relevant literature from various sources. The results indicate that AIOT has immense potential to revolutionize the way smart cities operate by enhancing the efficiency, sustainability, and livability of urban spaces. However, the adoption of AIOT also poses several challenges such as security, privacy, and ethical concerns. The paper concludes that a more collaborative and interdisciplinary approach is needed to fully realize the potential of AIOT in smart cities and address the challenges that come with it. The findings of this review provide useful insights for policymakers, practitioners, and researchers interested in the development and implementation of AIOT in smart cities.

Keywords: AIOT, Industry 4.0, Society 5.0, Smart City

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INTRODUCTION

In the era of industry 4.0 [1] and society 5.0[2], the use of technology is increasing to increase efficiency and effectiveness in various fields, including the development of smart cities [3][4][5]. One technology that is starting to be applied to smart cities is AIOT (Artificial Intelligence of Things) which is a combination of AI (Artificial Intelligence) and IoT (Internet of Things) technologies [6]. AIOT can be used in the collection, analysis, and decision-making based on data generated from sensors and IoT devices connected to a network [7].



Fig 1: Industry 4.0 illustration

The Industry 4.0 era is the latest industrial revolution which is marked by the use of digital technology and automation in production and manufacturing processes. This era is marked by the integration of information technology and production technology as a whole, including the internet of things (IoT), big data analytics, robotics, and artificial intelligence (AI). In this era, companies can massively utilize data to make better decisions, minimize production errors, optimize productivity, and speed up overall business processes. The Industry 4.0 era is expected to bring about major changes in various sectors, including the manufacturing, agriculture, energy and health industries, as well as facilitate the creation of smart cities and smart communities (Society 5.0).

Society 5.0 is a concept originating from Japan which carries the philosophy that technology must be used to improve human welfare and environmental sustainability. The concept of Society 5.0 is a continuation of the previous concepts, namely Society 1.0, 2.0, 3.0 and 4.0, each of which represents the stages of development of society and technology. Society 5.0 itself leads to a smart, connected and sustainable society, where technologies such as AI, IoT, big data and robotics are used to address social and environmental problems such as poverty, inequality, climate change, and so on. The goal is to create a sustainable and better society for human life in the future.

The application of AIOT in smart cities can provide many benefits, such as increased efficiency and safety in transportation systems, street lighting, waste management, and many more. However, AIOT implementation also has challenges that need to be overcome, such as data security, device interoperability, and high implementation costs.

Therefore, research on reviewing the application of AIOT in smart cities in industry 4.0 and society 5.0 is important to do. By reviewing the research that has been done before, we can find out the benefits and challenges of implementing AIOT in smart cities, as well as the technology used in this implementation. From the results of this review, a framework for implementing AIOT in smart cities can be developed that can assist decision making in dealing with emerging challenges.

RELATED WORK

Several studies related to the Review of AIOT Implementation in smart cities in industry 4.0 and Society 5.0 include:

- Design and Implementation of Smart City System based on IoT[8] This research proposes an AIoT-based smart city system consisting of three main parts, namely hardware, software, and communication network. This system leverages AI technology to improve city efficiency and safety.
- Smart cities and AIoT: toward cyber-physical-social systems for societal-scale digital twins [9]. This research discusses how the integration of AI and IoT can increase the intelligence and efficiency of smart city systems. The researcher also proposes the concept of "digital

twins" as a digital representation of a physical system that can be used to model and improve system performance.

- A Review of Smart City Applications Using AIoT [10]. This research reviews various smart city applications that have been developed using AI and IoT technology. Some examples of applications discussed include smart transportation systems, energy management, and waste management.

From these three studies, it can be concluded that the application of AIoT in smart cities can significantly increase system efficiency and intelligence. The integration of AI and IoT technologies also enables the development of various applications that can help solve various problems in cities, such as traffic congestion, energy management and waste management. However, challenges in implementing AIoT in smart cities also need to be addressed, such as data security and user privacy issues.

METHODS

To review the application of AIOT in smart cities in industry 4.0 and Society 5.0, there are various methods that can be used, including:

- Literature study: This method is carried out by searching and analyzing sources of information in the form of journals, books, articles, and other documents related to the implementation of AIOT in smart cities in the era of Industry 4.0 and Society 5.0.
- Survey: This method is carried out by distributing questionnaires or interviewing respondents related to the implementation of AIOT in smart cities. Surveys can be conducted on relevant stakeholders, such as the community, government, and industry.
- Case study: This method is carried out by conducting in-depth research on cases related to the implementation of AIOT in smart cities. Case studies can help in understanding in more detail the implementation of AIOT in smart cities and the constraints they face.
- Secondary data analysis: This method is carried out by analyzing available data, such as statistical data and data from open sources related to the implementation of AIOT in smart cities.

By using these methods, comprehensive information can be obtained related to the implementation of AIOT in smart cities in the industrial 4.0 and Society 5.0 eras, including challenges, opportunities and strategies that can be taken to maximize the benefits of AIOT in smart cities.

RESULT AND DISCUSSION

Some of the results obtained from research reviewing the application of AIOT in smart cities in industry 4.0 and Society 5.0 include:

- The use of AIOT technology can improve the efficiency and effectiveness of transportation management systems, including monitoring traffic, parking, and managing public transport schedules.
- In the environmental field, AIOT technology can help reduce air pollution and carbon emissions, monitor water quality, and reduce wastage of resources through smart waste management.
- The application of AIOT technology in smart cities can also improve security and supervision, including traffic security, crime control, and monitoring of public activities.
- The adoption of AIOT technology in smart cities enables continuous data collection, which can be processed using machine learning and data analysis to generate valuable information for decision making.

- In the health sector, AIOT technology can help monitor patient conditions in real-time, reduce hospital treatment time, and enable remote care via telemedicine.

Taken together, these results show that the application of AIOT technology can bring many benefits to smart cities, from efficiency and effectiveness to security, environment, health, and decision-making. However, challenges related to privacy, data security and infrastructure availability still need to be overcome to optimize the benefits of AIOT technology.

CONCLUSION

Based on the results of the review that has been carried out, it can be concluded that the application of AIOT technology in smart cities can have a positive impact on the development of industry 4.0 and society in the era of society 5.0. By utilizing AIOT technology in smart cities, efficiency and effectiveness can be increased in public services, transportation, waste processing and other infrastructure. This can improve the quality of life of the community and accelerate development in the region. However, there are several challenges in implementing AIOT in smart cities, such as data security and privacy issues, limited skilled human resources, and high costs. Therefore, cooperation between the government, the private sector and the community is needed in implementing AIOT technology in smart cities. In addition, there is also a need for appropriate policies and regulations to ensure data security and privacy as well as consumer protection. In the era of industry 4.0 and society 5.0, the application of AIOT technology in smart cities is expected to make a major contribution in improving the quality of life and people's prosperity. However, there is also a need for proper attention and action in overcoming various challenges that arise in the process of implementing this technology. In this case, further research and collaboration between stakeholders are expected to help accelerate the development and application of AIOT technology in smart cities.

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