

Computer Vision and Internet of Everything (IoE) for Societal Needs

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Empowering Smart Education Through Computer Vision and Internet of Everything in School Transportation

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ABSTRACT

This chapter introduces an innovative smart school transportation system designed for a smart town within a broader smart city framework. By leveraging computer vision, the Internet of Everything (IoE), and advanced surveillance technologies, the system enhances safety and convenience for students, parents, schools, public transportation, drivers, law enforcement, and government agencies. The research approach uses qualitative methods to gather insights from key stakeholders. The case study focuses on Kota Baru Parahyangan City, with Cahaya Bangsa Classical School as a key example. Through the use of computer vision tools like facial recognition and object detection, the system allows for real-time monitoring and tracking of students throughout their journey. The IoE integration ensures smooth connectivity for communication and data exchange between surveillance cameras, central monitoring systems, and IoT-enabled vehicles. This intelligent school transportation system not only enhances safety but also improves traffic management and resource allocation.

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1. INTRODUCTION

The rapid transformation of technology produced the smart town concept as an innovative solution to fabricate sustainable communities with efficient connectivity. The fundamental feature of smart towns consists of connecting intelligent systems with technologies to enhance multiple life elements across urban areas (Ercan & Kutay, 2021). Transportation proves essential in this framework because it focuses on protecting student safety as well as their transportation convenience to school (Chen, Liu, Wan, Qiao, & Pei, 2021).

The current traditional approaches to school transportation supervision prove ineffective for creating sufficient results. The current system of manual attendance recording along with paper documents and delayed information causes issues for authorities with education management responsibilities and parents as well as transportation service operators. The lack of effective school transportation management systems requires new intelligent solutions which combine computer vision with Internet of Everything (IoE) technology according to (Gubbi, Buyya, Marusic, & Palaniswami, 2013).

The proposed system depends on IoE integration because it enables continuous connectivity and smooth communication functions. The complete infrastructure of the town receives internet connectivity as a result of public-private partnerships between the governments. Surveillance cameras communicate through the central monitoring system and the transportation vehicles and permit reliable information sharing. The system utilizes IoT systems throughout its design by establishing connections between school buses and private parent cars and public transport to support continuous data gathering and time-sensitive communication exchange.

Several advantages come from implementing the intelligent school transportation system. The system enhances student safety because it tracks and identifies students precisely during their whole riding experience. Quick responses to emergencies together with unforeseen circumstances enable taking immediate protective action for students' safety. The system provides improved convenience to all members from the school management to parents and transportation employees alongside police and other law enforcement agencies. The system provides real-time updates regarding transportation movement which improves scheduling coordination with different stakeholders.

The proposed system serves as a contribution toward advancing the development of a smart town. The system uses computer vision with object detection techniques together with facial recognition capabilities to enhance surveillance capabilities that support traffic control and security operations of law enforcement agencies. IoE integration enables the formation of a connected system that uses data analytics to improve transportation management systems and enhance school-based activities.

Qualitative research approaches will serve to gather the system requirement information from both users and customers. The Design Science Research Methodology (DSRM) will direct research elements through a sequential methodology that builds new system architecture. The proposed system will use Kota Baru Parahyangan City in West Bandung Indonesia together with Cahaya Bangsa Classical School (CBCS) as its illustrative settings.

The smart transportation system powered by AI and Internet of Everything solves the pressing emergency requirement to protect student safety while sustaining their education when school attendance becomes impossible because of health reasons or accidents. Effective student presence monitoring proves difficult for existing transport systems while their ability to establish reliable communications remains a challenge under these conditions.