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Smart Bus Pass System

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Abstract: *Public transportation is a vital component of urban infrastructure, yet most bus pass systems still rely on traditional paper-based methods or manual ticketing. These approaches often lead to challenges such as pass duplication, ticket fraud, lengthy verification times, and lack of centralized data management. To address these limitations, the Smart Bus Pass System integrates both Radio Frequency Identification (RFID) and Quick Response (QR) code technologies with a web-based database platform to provide a secure, efficient, and automated fare collection solution. In this system, each passenger is assigned a unique RFID card and a digital QR pass linked to their online account. When boarding the bus, the passenger can either tap the RFID card on the reader or scan the QR code using a scanner connected to the microcontroller (Arduino Uno or NodeMCU). The system validates the user information via a central server, which verifies the pass, updates travel data, and displays the transaction status on an LCD screen in real time. The administrative web portal allows transport authorities to manage user registrations, renew passes, monitor usage, and generate analytical reports. This hybrid system reduces human intervention, minimizes operational delays, and improves transparency and accountability in public transport management. Additionally, it supports cashless operations, real-time data monitoring, and seamless scalability for integration with future IoT-based smart city infrastructure and mobile payment gateways.*

Keywords: RFID, QR Code, Smart Bus Pass, Automation, Public Transportation, IoT, Contactless System, Fare Management, Embedded System, Smart City

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