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Smart IoT-Driven Blood Bank: Real-Time Stock Monitoring and Management

1st Shanmugapriya A
Department of Electronics and Communication Engineering
Sri Eshwar College of Engineering
Coimbatore, India.
gctshanmugapriya@gmail.com

2nd Kalaivani A
Department of Computer Science
Nallamuthu Gounder Mahalingam College
Coimbatore, India
kalaivanimathsca@gmail.com

3rd Sangeetha Devi A
Department of Mathematics
Nehru Institute of Engineering and Technology
Coimbatore, India
sangeethadevi.a@gmail.com

4th Jayapriya P
Department of Computer Science
Nallamuthu Gounder Mahalingam College
Coimbatore, India
topriyadamu@gmail.com

ABSTRACT

Blood donation facilities are essential for providing blood in times of need; however, problems, including unavailable donors, inefficient manual processes, and poor inventory control, make management difficult. For the purpose of improving accessibility, dependability, and efficiency in blood bank activities, this study suggests an Internet of Things-based blood stock control system. Real-time blood stock monitoring is made possible by the system's integration of RFID technology, cloud-based data transfer, and Internet of Things sensors (temperature, relative humidity, and infrared). In order to verify appropriate storage, the first module consists of sensors placed in blood storage racks to monitor stock levels and environmental conditions. Monitoring from a distance is made possible by the second module's automated data transmission to administrators via a Wi-Fi module. Blood seekers can quickly access the third module, which uses RFID for real-time inventory tracking and updates the blood stock availability on a web-based platform. According to experimental results, blood type detection was highly accurate (96.5%), while real-time data transfer speeds varied according to network availability (fastest at 1.9s on 4G). Professionals working in blood organizations who participated in a usability assessment reported increases in productivity, dependability, and managerial simplicity. This automated blood bank system guarantees quicker and more effective emergency responses while reducing waste, thereby enhancing the accuracy of blood availability.

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