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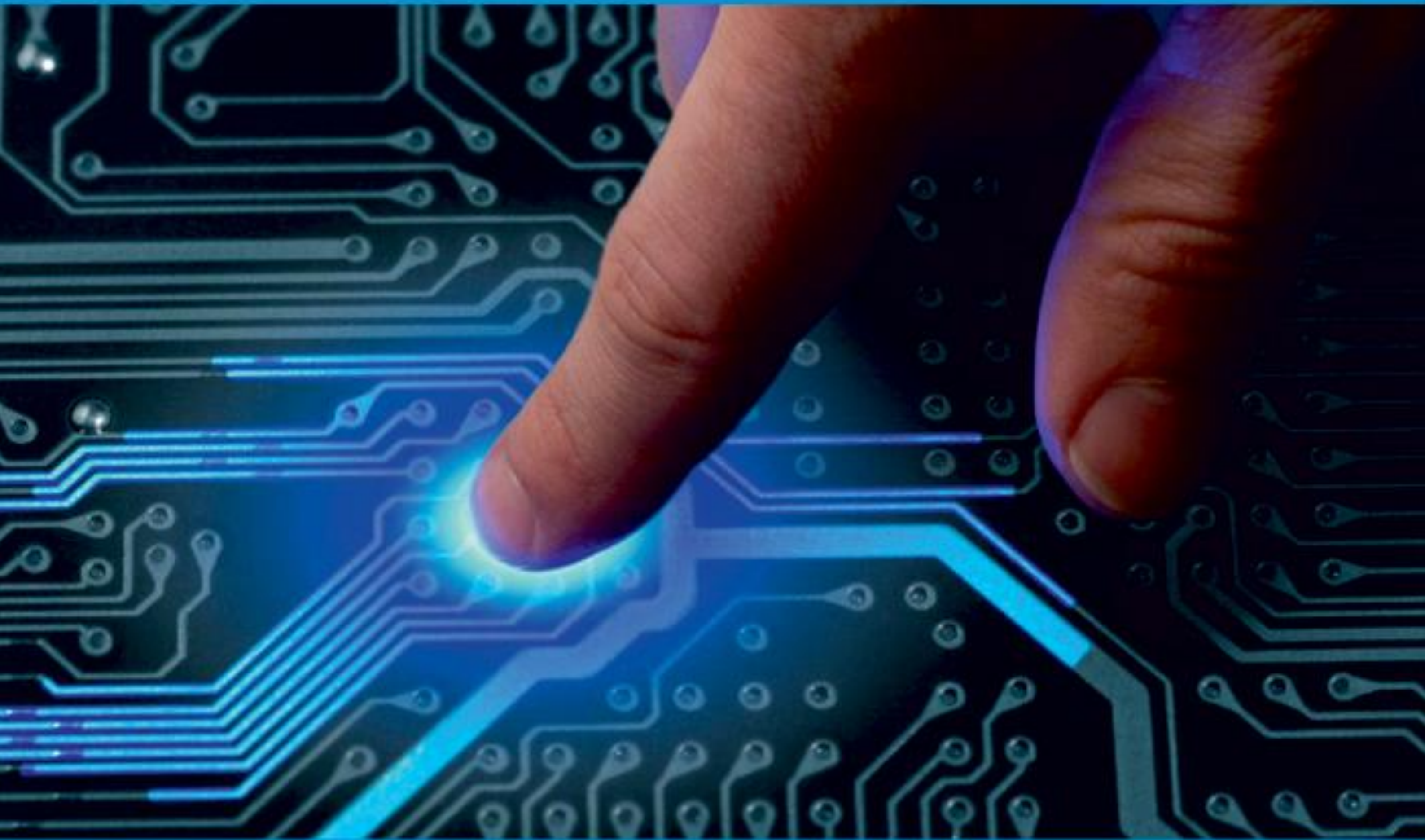

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IOT Based Stretcher with Automatic Sanitization

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ABSTRACT**:** Patient transportation within a healthcare setting is a critical aspect of providing timely and efficient care. Traditionalmethods often face challenges related to manual control, potential obstacles, and infection control. The proposed automatic stretcher system aims to address these challenges by introducing a robotic stretcher that can be controlled remotely through a mobile application, ensuring both efficiency and flexibility in patient transportation. The key features of the system include the integration of ultrasonic sensors for obstacle detection, IOT connectivity through NodMCU for real-time monitoring, and an automatic UV light disinfection system. These features not only enhance the ease of use for healthcareprofessionals but also contribute to infection control measures by automatically disinfecting the stretcher's surface when unoccupied. In this era of connectivity, the Internet of Things plays a pivotal role in transforming traditional medical equipment into smart, data-enabled devices. The integration of an Arduino microcontroller serves as the central processing unit, orchestrating the various components of the stretcher system. This includes coordinating movements based on ultrasonic sensor inputs, managing IOT communication, and activating the UV light disinfection system.

KEYWORDS: Automatic Stretcher, Sterilization, Internet of things, UV Light, Ultrasonic sensor, Infrared sensor, LCD.

I. INTRODUCTION

In hospitals, staff often encounter challenges when moving patients, especially during times of limited manpower such as the COVID-19 pandemic or emergencies like earthquakes or fires. The "IoT based Stretcher with automatic sanitization" project addresses these challenges by providing a mobile solution that allows paramedical staff to effortlesslytransfer patients to wards, ICUs, or emergency rooms without requiring additional manpower. To prevent the spread of infections, the stretcher automatically sanitizes using ultraviolet rays, ensuring the safety of both patients and staff. Powered by an Arduino microcontroller and NodMCU, and equipped with various sensors such as IR and ultrasound, as well as visual and auditory alarms, the stretcher ensures comprehensive patient and staff safety. Operating on battery power, the stretcher autonomously transports and sanitizes patients, offering a cost-effective and efficient solution to reduce infections and mitigate losses due to inadequate manpower. Additionally, the project measures patients' vital parameters upon reaching the designated ward, contributing to enhanced patient care. Traditional approaches to patient transfer have limitations and may not always be effective. Therefore, there is a pressing need for an advanced system thatintegrates technology to enhance patient safety and prevent infections.

INTRODUCTION TO INTERNET OF THINGS: The Internet of Things (IoT) encompasses the utilization of variouscontrol systems to manage diverse processes and machinery, aiming to reduce reliance on human labor. IoT refers to a network of physical objects, or "things," embedded with sensors, software, and other technologies. These objects are interconnected, enabling the exchange of data with other devices and systems via the Internet. In our context, IoT is employed to enable staff to interact with the stretcher and to facilitate communication through mobile applications, software technologies, signal detectors, and sensors. Additionally, IoT allows for the determination of the appropriate ward or room for patient transfer. IoT enables the display of information on LCD screens and triggers audible alerts, such as a buzzer, when obstacles are detected or during the stretcher's sterilization process. Essentially, IoT enhances the functionality and connectivity of the stretcher system, streamlining operations and improving overall efficiency.

INTRODUCTION TO PROTEUS DESIGN SUITE: The Proteus Design Suite, developed by Lab center Electronics Ltd, is a pivotal software tool in the realm of electronic design automation. IoT caters primarily to engineers and technicians involved in the creation of schematics and electronic prints for manufacturing printed circuit boards (PCBs). Available in multiple languages, including English, French, Spanish, and Chinese, Proteus enjoys widespread adoption
worldwide. IoT its core, the suite comprises various modules, with the flagship product being a Windows application designed specifically for schematic capture, simulation, and PCB layout design. Its adaptable configurations cater to diverse design needs and microcontroller simulation requirements. Noteworthy features include an IoT router and basic mixed-mode SPICE simulation capabilities, which are indispensable for efficiently designing PCBs.One of the standout features of the Proteus Design Suite is its schematic capture functionality. This component serves a dual purpose as both a simulation tool and the initial stage in the design process for PCB layouts. By providing users with comprehensive functionality, IoT enables the creation and visualization of electronic circuits, offering a crucial step in the development process before the circuits are physically realized on PCBs.

INTRODUCTION TO ARDUINO IOT: The Arduino Integrated Development Environment (IoT) serves as a comprehensive platform for programming and interfacing with Arduino microcontroller boards. The Arduino Uno, a prominent board within the Arduino ecosystem, is based on the ATmega328 microcontroller and features 14 digitalinput/output pins, 6 analog inputs, and various components including a 16 MHz ceramic resonator, USB connection, power jack, ICSP header, and reset button. Unlike its predecessors, the Uno utilizes the Atmega16U2 as a USB-to-serial converter instead of the FTDI USB-to-serial driver chip. Subsequent revisions of the Uno, such as Revision 2 and Revision 3, introduced enhancements like additional pinouts, improved reset circuits, and compatibility features for future boarditerations. These advancements ensure compatibility with various shields and peripherals, while the robust features of the Uno make IoT a versatile choice for a wide range of projects.

INTRODUCTION TO NODMCU: The NodMCU, powered by the ESP8266 microcontroller from Espressif
Systems, is a versatile device designed to serve as a self-contained Wi-Fi networking solution, bridging existing microcontrollers to Wi-Fi networks while also supporting standalone applications. Equipped with a built-in USB connector and a variety of pin-outs, the NodMCU is easily connectable to a laptop for flashing using a micro-USB cable, akin to Arduino. Operating IoT a voltage of 3.3V, IoT boasts features such as Wi-Fi Direct (P2P) and soft-AP support, with a current consumption ranging from 10uA to 170mA. With an integrated TCP/IP protocol stack, a Ten silica L106 32-bit processor running IoT speeds of 80-160MHz, and 16MB of flash memory (expandable up to 512K), IoT offers ample capabilities. The NodMCU supports b/g/n Wi-Fi standards, with a maximum of five concurrent TCP connections, and includes 17 GPIO pins, one analog-to-digital input with 1024-step resolution, and a power output of +19.5dBm in 802.11bmode.

INTRODUCTION TO BLINK APP: The Blink app, developed by Amazon, serves as a robust solution for home security and surveillance needs. IoT empowers users to remotely monitor their homes with live video streaming from Blink security cameras, enabling them to keep a close eye on their property from anywhere. The app offers real-time alerts and notifications for motion detection, ensuring that users are promptly informed of any activity in their monitored areas. Furthermore, Blink allows users to customize camera settings such as motion sensitivity and recording duration, cateringto their specific security requirements.

One of the standout features of the Blink app is its cloud storage options for recorded video footage. This feature ensures that users can access their surveillance recordings securely, even in the event of camera tampering or theft. By providing convenient access to stored footage, the app enhances the overall effectiveness of home security monitoring. Overall, theBlink app presents a user-friendly interface and seamless integration with Blink security cameras, offering homeowners peace of mind knowing that their properties are being monitored effectively, even when they are away from home. With its comprehensive features and reliable performance, the Blink app stands as a valuable tool in the realm of home security.

II. EXISTING SYSTEM

The current systems addressing the challenges of automatic stretchers with sanitization lack comprehensive integration, leading to limitations and drawbacks. Various individual solutions or technologies are employed, each with its own set ofshortcomings:

Manual Sanitization Methods: Some existing stretcher systems rely on manual sanitization methods, which may be inconsistent and time-consuming. The manual process increases the risk of inadequate disinfection, compromising patientsafety and contributing to potential infections.

Traditional Stretcher Systems: Conventional stretcher systems often lack IoT integration, resulting in a limited ability to provide real-time monitoring and data-driven decision-making. These systems may not effectively adapt to diverse healthcare facility layouts and patient care scenarios due to a lack of flexibility in control options.

Limited Obstacle Detection: Stretcher systems without advanced obstacle detection mechanisms face safety risks, as they may be more prone to collisions during transportation. The absence of robust obstacle detection technologies compromises patient and healthcare professional safety.

Inadequate Emergency Response Mechanisms: Existing stretcher systems may lack effective automated responses to emergency situations, causing delays in providing necessary assistance to patients. This limitation emphasizes the need for more responsive and integrated solutions.

Cost and Scalability: Some current stretcher technologies may be expensive to implement, requiring complex installations. This could hinder widespread adoption in various healthcare settings, limiting accessibility and practicality.

These existing challenges in stretcher systems underscore the importance of an integrated and IoT-based automatic stretcher with sanitization, such as the proposed project. By overcoming these drawbacks, the "IoT based Stretcher with automatic sanitization " aims to provide a more efficient, adaptable, and cost-effective solution for healthcare facilities, ultimately improving patient care and safety.

III. PROPOSED METHADOLOGY

The "IoT based Stretcher with automatic sanitization” project introduces a comprehensive integrated system designed to elevate healthcare standards by ensuring optimal patient transportation, sanitization, and safety. This innovative system incorporates various components, each contributing to an advanced and efficient healthcare environment. Key features include remote control via a mobile app, ultrasonic obstacle detection for enhanced safety, real-time IoT connectivity, automatic UV light disinfection, emergency notifications for timely interventions, integration with an Arduino microcontroller for centralized control, and overall enhancement of the healthcare environment. This collective approach addresses the pressing needs of modern healthcare settings, promising improved patient care, safety, and streamlined operations.:

- **Mobile App Remote Control**: Seamlessly enhancing patient transportation efficiency, the stretcher allows for flexible control through a dedicated mobile app. This innovative approach empowers healthcare professionals to optimize the transportation process, improving overall workflow.
- **Ultrasonic Obstacle Detection**: Elevating safety standards, the stretcher employs advanced ultrasonic obstacle detection. This feature actively prevents accidents by swiftly identifying obstacles and enabling the stretcher to navigate with precision, ensuring a secure and accident-free patient transfer.
- **Real-time IoT Monitoring**: The stretcher integrates real-time IoT monitoring, providing healthcare professionals within valuable insights. This data-driven approach enhances decision-making by offering immediate information on the stretcher's status, optimizing workflow management within healthcare environments.
- **Automated UV Disinfection:** Ensuring a consistently sanitary healthcare environment, the stretcher incorporates automated UV disinfection. This feature not only streamlines infection control measures but also contributes to maintaining a sterile atmosphere during patient transportation.
- **Emergency Notifications**: Prioritizing patient safety, the stretcher facilitates timely intervention through instant emergency notifications. This swift communication mechanism ensures that healthcare professionals can respond promptly to unforeseen circumstances, enhancing overall patient well-being.

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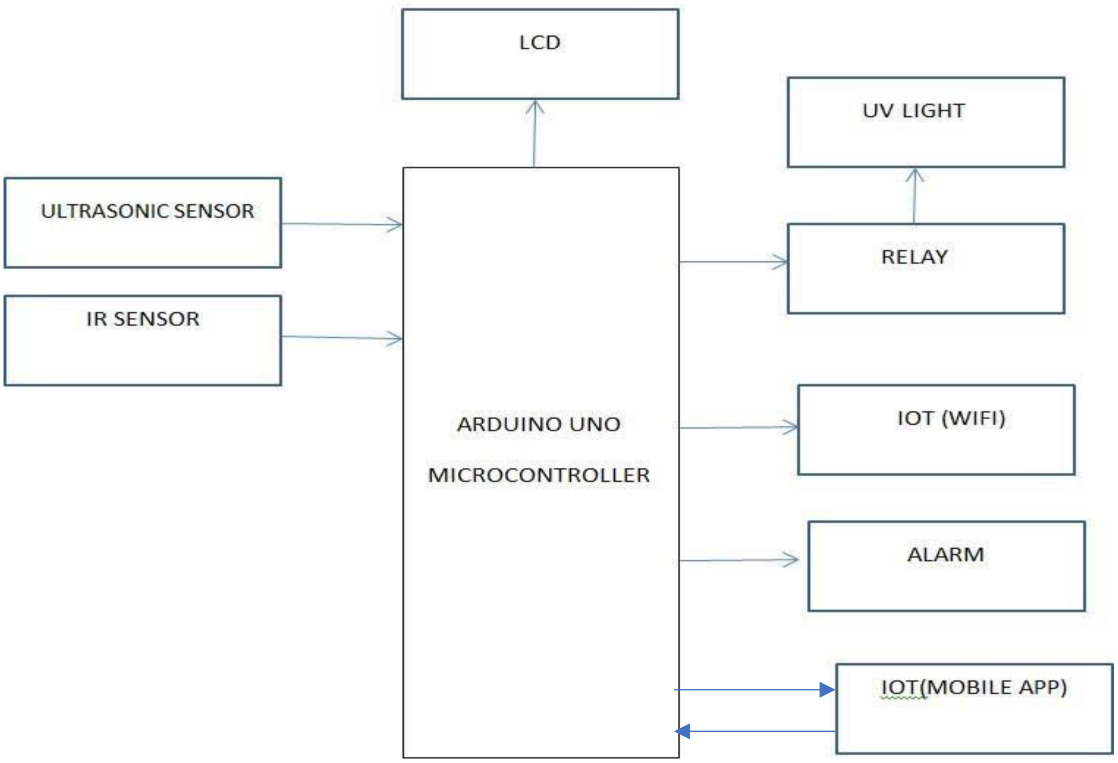
- **Arduino Microcontroller Integration**: Centralized control is achieved through seamless integration with an Arduino microcontroller. This ensures a smooth and reliable operation of the stretcher, minimizing the risk of system malfunctions and providing healthcare professionals with a robust platform for patient transportation.
- **Healthcare Environment Enhancement**: Committed to meeting modern healthcare demands, the stretcher significantly contributes to creating an advanced healthcare environment. This holistic approach aligns with the evolving needs of healthcare facilities, promising an elevated standard in patient transportation and care.

The merits of the envisioned IoT-Based Automatic Stretcher with Sanitization encompass the seamless integration of diverse sensors and technologies. This ensures prompt detection and notification of emergencies such as accidents or fireincidents, fostering a heightened level of safety during patient transportation. Additionally, the real-time monitoring capabilities dedicated to assessing the health of the stretcher's sanitation and UV disinfection features contribute to a morehygienic healthcare environment. The inherent cost-effectiveness of the proposed system further positions IoT as a pragmatic and accessible solution. This innovative approach not only elevates the standards of patient care but also enhances operational efficiency in healthcare facilities. Ultimately, the proposed automatic stretcher promises to save lives,mitigate potential damages, and redefine the landscape of patient transportation in healthcare settings.

IV. BLOCK DIAGRAM



Block Diagram of IoT Based automatic stretcher with automatic sanitization

V. EXPLANATION

The proposed "IoT-based Automatic Stretcher with Sanitization" project offers a comprehensive solution to enhance patient care and safety within hospital environments. By integrating advanced technologies, including IoT sensors and sanitization mechanisms, the system aims to mitigate the risks associated with patient transfer and hospital-acquired infections. The project consists of multiple components, each playing a crucial role in ensuring a clean and secure environment within the hospital. The block diagram for the "IoT Based Automatic stretcher with sanitizer" project can be summarized as follows:

Input Devices:

- **Start Button**: The start button serves as an input trigger for the system to initiate the stretcher's movement and sanitization process through mobile application.
- **Sensors:** Infrared Sensor, Ultrasonic sensor motion sensors, detect patient presence, and movement within the hospital.
- **Control Unit:** Arduino: Acts as the main control unit that receives inputs from the IoT sensors and coordinatesthe operation of the system, including stretcher movement and sanitization. **Output Devices:**
- **Automatic Stretcher:** The stretcher automatically adjusts its position based on patient needs and movements, ensuring comfort and safety during transportation within the hospital.
- **Sanitization Mechanism:** Incorporates UV-C light or other sanitization methods to disinfect the stretcher and surrounding surfaces, reducing the risk of contamination within hospital premises.
- **16x2 LCD Display:** Provides real-time information about the system's status, including patient occupancy, environmental conditions, and sanitization progress.
- **Buzzer:** Generates audible alerts to notify hospital staff of emergencies or system malfunctions.
-

VI. WORKING METHADOLOGY

The IoT-based automatic stretcher with sanitizer operates through a sophisticated interplay of various components, each fulfilling crucial roles in ensuring seamless patient transport and hygiene management in healthcare settings. IoT the heart of the system lies the Arduino, orchestrating the stretcher's operation by receiving inputs from sensors and executingcorresponding actions. The IR sensor detects the presence of a patient, prompting the Arduino to activate further processes, such as UV light disinfection via the relay. Concurrently, the ultrasonic sensor constantly scans the environment for obstacles, signalling the Arduino to adjust the stretcher's movement trajectory or issue alarms as necessary.

Facilitating connectivity is the NodMCU, enabling the stretcher's integration with the Internet of Things (IoT) ecosystem. Through this connection, data flows between the stretcher system and the IoT platform, providing a foundation for remote monitoring and control. Healthcare professionals leverage a dedicated mobile application interfaced with the IoT platform to oversee stretcher operations remotely. From adjusting movement parameters to initiating UV disinfectioncycles, the mobile app empowers staff with real-time insights and control, fostering efficiency and elevating patient care standards. With its seamless integration of advanced technologies, the IoT-based automatic stretcher with sanitizer streamlines patient transportation and hygiene management, promising enhanced safety and comfort within healthcare facilities.

VII. OUTCOME

Fig 8.1 Experimental setup

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Fig 8.2 Object detected Infront of stretcher

Fig 8.3 Stretcher is Under sterilization

VII. FUTURE SCOPE

- The future scope for IOT based Stretcher with automatic sanitization is promising, with potential advancements aimed IoT further enhancing patient care and emergency response capabilities. Below are some key areas of development:

- Integration with Healthcare Systems: Future iterations of the IoT-based stretcher could be seamlessly integrated with hospital and healthcare systems, allowing for automatic transmission of patient vital signs, medical history,and emergency alerts. This integration enables healthcare providers to access relevant patient information in real-time, facilitating timely and informed decision-making.

- Enhanced Sanitization Features: Continued advancements in sanitization technology may lead to the integration of more sophisticated disinfection mechanisms into the stretcher, such as UV-C light sterilization or antimicrobial coatings. These enhancements can further reduce the risk of infection transmission and ensure a hygienic environment for patients and caregivers

- Telemedicine and Remote Monitoring: Integration with telemedicine platforms and remote monitoring systems enables healthcare professionals to remotely assess patient condition, provide medical guidance, and initiate interventions as needed. This capability is particularly valuable in emergency situations where immediate medical attention is required but on-site healthcare personnel may be limited.

- Smart Notification and Alert Systems: Future IoT-based stretchers may incorporate advanced notification and alert systems that automatically notify emergency responders, hospital staff, and designated contacts in the event of critical incidents or changes in patient condition. This ensures a coordinated response and timely intervention, improving patient outcomes.

- Artificial Intelligence and Predictive Analytics: Integration of artificial intelligence algorithms and predictive analytics enables the stretcher to analyze patient data, identify trends, and predict potential health complications.By leveraging machine learning techniques, healthcare providers can proactively address patient needs and prevent adverse events before they occur.

- Modular Design for Customization: Designing the stretcher with a modular architecture allows for easy customization and scalability to accommodate diverse healthcare settings and patient requirements. Healthcare facilities can tailor the stretcher's features and functionalities to suit their specific needs, ensuring optimal performance and usability.

- Collaboration with Emergency Services: Strengthening collaboration with emergency services and first responders facilitates seamless communication and coordination during medical emergencies. Integration with emergency response systems enables rapid deployment of resources and ensures efficient triaging and patient transport.

- Overall, the future of IOT based Stretcher with automatic sanitization holds immense potential for transforming emergency medical care, improving patient outcomes, and enhancing the overall efficiency of healthcare delivery systems. Continued innovation and technological advancements in this area promise to revolutionize patient transport and emergency response practices, ultimately saving lives and promoting public health and safety.

VIII. CONLUSION

"IOT based Stretcher with automatic sanitization " project represents a pivotal advancement in healthcare infrastructure, particularly in the context of emergency medical services. By seamlessly integrating IoT technologies with essential medical equipment, this innovative solution not only streamlines the process of patient transportation but also ensures optimal hygiene standards through automated sanitizer dispensation. With its ability to reduce the risk of cross-contamination and enhance the efficiency of medical response teams, this project holds immense promise in revolutionizing emergency medical care delivery. As we continue to prioritize public health and safety, investments in such groundbreaking initiatives are essential for building resilient healthcare systems that can effectively address the challenges of the modern world.

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