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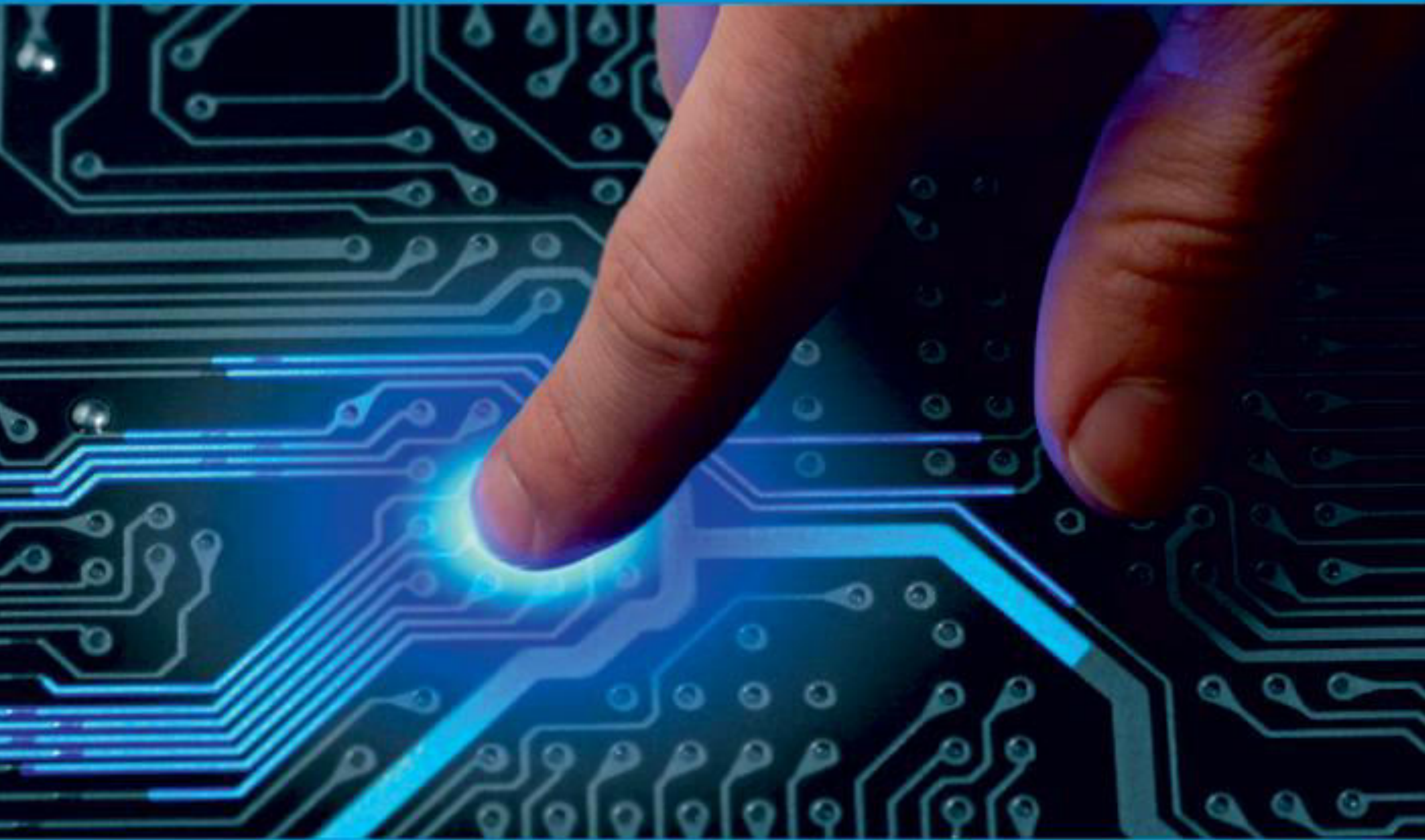

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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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Smart Stretcher

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ABSTRACT: Integrating health information technology into primary care involves various electronic methods that enhance care quality and streamline processes. This project aims to showcase the key features of an intelligent stretcherand a vital signs monitoring system for unconscious individuals. We have chosen Arduino for information processing, enabling the system to collect and transmit the patient's heart rate and respiratory rate directly to the intensive care unit via IoT. This data is also relayed to the police station to inform them about the accident. The system utilizes affordable technology and combines multiple functions to provide an efficient solution. Additionally, the stretcher is equipped with an automatic movement mechanism that can be operated by a singleperson, reducing the need for additional manpower.

I. INTRODUCTION

In today's context, healthcare institutions play a crucial role in the community, especially in providing emergency services for a range of issues. Technological advancements are essential for effective patient treatment and improving medical equipment efficiency. Information technology significantly enhances the quality, care, and effectiveness of healthcare services. The integration of technology is becoming increasingly vital in the healthcare sector.

Monitoring the health conditions of unconscious patients, particularly following accidents, is critical. Healthcare professionals need timely information to make informed diagnoses. To facilitate this, several sensors are embedded in a stretcher to continuously monitor the patient's health. This data is transmitted to the hospital server via IoT, allowing doctors to stay updated.

Additionally, it is important for police officials to be notified about the incident and its location, which our proposed system accomplishes through IoT. In emergencies, the system can promptly assess the patient's health status. IoT technology not only reduces the need for manual effort but also simplifies access to physical devices. Furthermore, it features autonomous control, enabling the stretcher to move automatically while still being guided by an operator.

II. RELATED WORKS

Various research initiatives emphasize the role of technology in assisting individuals with disabilities or mobility impairments. Previous studies have utilized health devices, such as sensors, to track patients' health conditions over time. These sensor devices are worn by individuals to continuously monitor their health issues, providing real-time data on their fluctuating conditions. Healthcare professionals, who are closely connected to the patients, can then observe these changes and respond accordingly.

Another project introduces a prototype of an intelligent stretcher that can be controlled via voice commands, equipped with a system to monitor vital signs for individuals with disabilities or reduced mobility. The project uses Raspberry Pi and Arduino for data processing, integrating software for comprehensive data collection to create a cohesive system. The primary benefit of this prototype is to enhance medical treatment for patients while improvingoverall care delivery.
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III. KEY FEATURES OF THE SYSTEM

1. Focus on Technology for Assistance: The project highlights the importance of integrating advanced technology to assist individuals with disabilities or mobility impairments, aiming to enhance their quality of life and independence.
2. Continuous Health Monitoring: It employs wearable sensor devices that monitor patients' health conditions inreal time. This continuous tracking allows for the detection of any changes in health status, ensuring timely interventions.
3. Healthcare Professional Oversight: The data collected by the sensors is accessible to healthcare professionals who are closely involved with the patient. This collaboration enables them to monitor the patient's fluctuating health conditions effectively and make informed decisions based on real-time information.
4. Intelligent Stretcher Prototype: The project includes the development of an intelligent stretcher, which can be operated via voice commands. This innovative feature not only makes it easier for caregivers to assist patients but also enhances accessibility for those with mobility challenges.
5. Vital Signs Monitoring System: The stretcher is equipped with a comprehensive monitoring system for vital signs, ensuring that patients with reduced mobility are constantly observed. This helps in quickly identifying any potential health issues.
6. Data Processing with Raspberry Pi and Arduino: The project utilizes Raspberry Pi and Arduino technology for data processing. These devices are chosen for their reliability and versatility, allowing for effective data collection and analysis.
7. Integration of Hardware and Software: A seamless integration of hardware and software components is designed to create a cohesive system that can efficiently collect, process, and display health data, contributing to better patient management.
8. Enhanced Medical Treatment: Ultimately, the project aims to improve the quality of medical treatment provided to patients. By combining advanced monitoring technology with professional oversight, it strives to facilitate better healthcare outcomes and support for individuals with disabilities or mobility impairments.
9. User-Centric Design: The design of both the sensor devices and the intelligent stretcher emphasizes user-friendliness, ensuring that both patients and caregivers can easily interact with the technology.
10. Potential for Future Development: This project lays the groundwork for future advancements in assistive technology, encouraging ongoing research and innovation in the field of healthcare for individuals with disabilities.

IV. SYSTEM SETUP

A. BLOCK DIAGRAM

The project involves a prototype that combines electronic devices, microcontrollers, and health monitoring sensorsinto a simple stretcher design. This stretcher features a semi-automatic driving mechanism to enhance functionality.To understand the prototype, it can be divided into three main sections:

1. Biometric
2. Health Information Updates to Hospital
3. Driving Circuit

As illustrated in the block diagram of the stretcher implementation (see Fig. 1), the microcontroller serves as the core of the system, coordinating all processes related to data updates and the driving mechanism.

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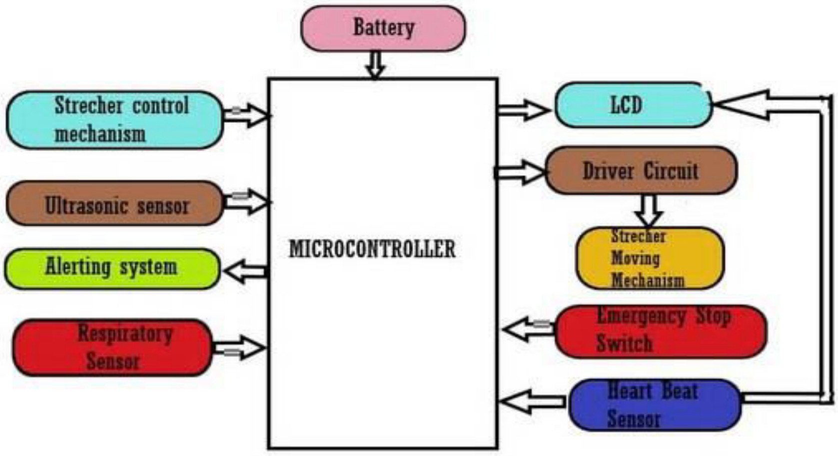

The prototype includes biometric sensors, respiratory sensors, and heartbeat sensors connected to an Arduino Mega, specifically the ATMega2560 model. These sensors provide analog input to the microcontroller. Biometric data is transmitted to the police station via IoT, while pulse and respiratory rates are sent to the hospital server.

Additionally, the stretcher is equipped with a driving circuit that operates based on input from a force sensor. Thestretcher moves in response to the pressure applied to this sensor. An ultrasonic sensor is also incorporated to detect obstacles in the path of the stretcher. If an obstacle is detected, a buzzer sounds to alert the person guiding the stretcher, ensuring safety during transport.

V. MODULES WITH WORKING PRINCIPLES

1. Microcontroller Module
- Component: Arduino Mega (ATMega2560)
- Working Principle: Acts as the central processing unit of the system. It receives input from various sensors, processes the data, and controls the driving mechanism. It coordinates updates to the police and hospital servers via IoT.

2. Biometric Sensor Module
- Component: Biometric sensors (e.g., fingerprint or face recognition)
- Working Principle: Captures and analyzes biometric data from the patient. This information is processed by the microcontroller and transmitted to the police station for identification purposes using IoT technology.

3. Health Monitoring Sensors
- Components:
  - Heartbeat Sensor: Monitors heart rate.
  - Respiratory Sensor: Tracks respiratory rate.
- Working Principle: These sensors provide continuous monitoring of the patient's vital signs. They convert physiological data into analog signals, which are then sent to the microcontroller. The microcontroller processes this data and updates the hospital server.

4. Driving Mechanism Module
- Component: Driving circuit with a force sensor
- Working Principle: The driving mechanism is activated based on the pressure detected by the force sensor. When force is applied (e.g., pushing), the system determines the direction and speed of movement, allowing for semi-automatic transport of the stretcher.

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5. Obstacle Detection Module
- Component: Ultrasonic sensor
- Working Principle: This sensor emits ultrasonic waves and measures the time it takes for the waves to bounce back after hitting an obstacle. If an obstacle is detected within a certain range, the microcontroller triggers an alarm (buzzer) to alert the person guiding the stretcher.

6. Power Supply Module
- Component: Battery or power adapter
- Working Principle: Provides the necessary power to all electronic components of the stretcher, ensuring continuous operation during transport.

VI. RESULT

- Enhanced Patient Monitoring: The integration of biometric, heartbeat, and respiratory sensors enabled continuous real-time monitoring of patients' vital signs. This data is crucial for timely medical interventions and has shown to improve patient safety.
- Efficient Communication: The IoT connectivity allowed for seamless data transmission to both the police station and hospital servers. The biometric data was updated instantly, ensuring that emergency services have critical information at their fingertips.

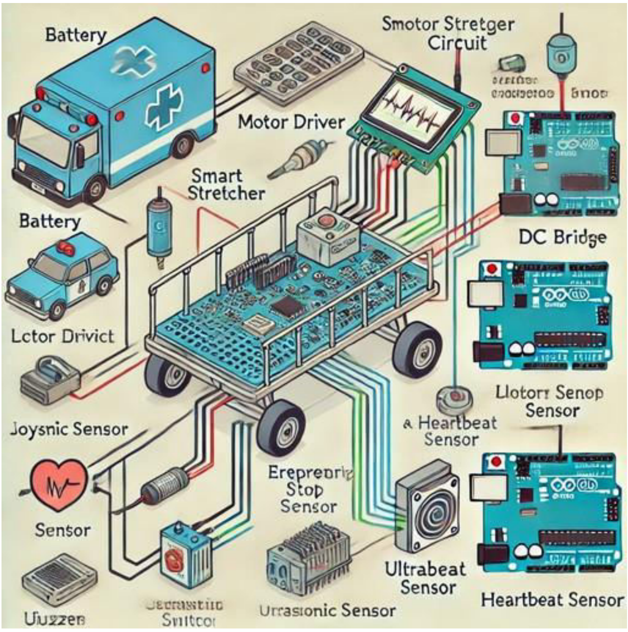

Fig 3:The hardware setup

VII. CONCLUSION

- The smart stretcher project successfully integrated advanced technology to address the needs of patients with mobility impairments. By combining health monitoring, real-time communication, and obstacle detection in a user-friendly design, the prototype significantly enhances patient care and safety.
- The results demonstrate the potential for such smart devices in modern healthcare settings. Future iterations of this project could include additional features such as GPS tracking for improved location services, more advanced health analytics, and further automation capabilities to enhance efficiency.

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