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VITALVIEW: WIRELESS VITAL DISPLAY WITH SMART GLASS AR TECHNOLOGY

[1]Mr. S. Vijayakumar, [2]Janaki R, [3]Kaviranjani A, [4]Kiruthiga S, [5]Kaviya P

[1]Head of the Department, Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu. Email: svijaymeped1@gmail.com
[2]Department of Biomedical Engineering, Gnanamani College Of Technology, Namakkal, Tamil Nadu. Email: janakihari12345@mail.com
[3]Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu. Email: akaviranjani2003@gmail.com
[4]Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu.
Email: Kiruthiga.biomedical.2020@mail.com
[5]Department of Biomedical Engineering, Gnanamani College Of Technology, Namakkal, Tamil Nadu. Email: kaviyapathy1@gmail.com

ABSTRACT-

Doctors eagerly adopt technologies for better patient care, with augmented reality (AR) emerging as a promising innovation. AR enhances medical data utilization by overlaying artificial information onto the senses. In hospitals, patient details like vital signs are typically handwritten near beds. Our solution provides doctors with AR goggles for instant access to patient data without manual notes.

Surgeons actively pursue technologies to elevate their operating environments, often leading the adoption of innovations for improved surgical outcomes. In the digital age, various disruptive technologies, such as augmented reality (AR), are increasingly accessible and affordable. The integration of AR into healthcare is inevitable, promising enhanced utilization of medical data.

Various applications of augmented reality (AR) are being explored in surgery, from anatomy to intraoperative procedures and post-operative rehabilitation. AR involves integrating artificial information into the user's senses, enhancing task efficiency. Our proposed system utilizes semi-transparent glasses within an AR headset to display crucial information for doctors, seamlessly blending it with the real-world view. Real-time patient data collected by sensors in hospitals is transmitted wirelessly to the AR glasses, alerting doctors to abnormal conditions for prompt intervention based on the patient's current health status.

1. INTRODUCTION-

The AR interface holds significant promise for improving user performance over traditional Graphical User Interfaces, offering better spatial understanding. Augmented reality expands the physical world by overlaying digital information, integrating sounds, videos and graphics directly into the existing environment. It can be deployed on screens, glasses, handheld device and mobile head-mounted displays, leveraging technologies like S.L.A.M. and depth tracking. In medicine's future, AR is set to revolutionize patient care by providing efficient access to up-to-date information for doctors. It aids healthcare professionals in education, training, diagnostics and treatment through real-time patient data visualization. Our approach utilizes AR to present patients' basic medical reports. The paper structure includes discussions on related AR work (Section 2), demonstrations of various Arduino-connected sensors (Section 3), explanations of sensor data collection and transmission to goggles via ZigBee (Section 4) and concludes with Future Work and References.

The paper "Vision based People Tracking for Ubiquitous Augmented Reality Applications" addresses the challenge of vision-based people tracking, crucial for surveillance and human behavior estimation, yet with minimal impact on Augmented Reality (AR) applications. Meanwhile, "Stepping into the Operating Theater: ARAV - Augmented Reality Aided Vertebroplasty" explores AR's utility for preoperative diagnostics, intraoperative navigation, and postoperative follow-up examination, providing foundational concepts for system development.

AR interfaces have demonstrated significant promise over traditional Graphical User Interfaces, enhancing spatial understanding by overlaying digital information onto the physical world. AR technology integrates sounds, videos, and graphics directly into the user's environment, accessible via various devices such as screens, glasses and handheld devices. Key technologies include S.L.A.M. for localization and mapping and depth tracking for object distance calculation.

In medicine, AR holds considerable potential, facilitating access to up-to-date patient information for doctors, aiding in education, training, diagnostics, and treatment. The proposed system utilizes AR to visualize patients' basic medical reports, enhancing the utility of paper documents by embedding electronic information and providing a better view. Additionally, an E-learning system for three-dimensional geometry improves understanding by displaying objects in 3D, enhancing accessibility and comprehension.

This project explores the effective utilization of AR and virtual reality in daily life, leveraging sensing technologies, graphics, and mobile computing to enhance user experiences. By dynamically adjusting comfort levels, the system aims to make AR and VR experiences enjoyable rather than burdensome. The objective is to design AR goggles to assist doctors in quickly identifying patient criticality, thereby reducing patient check-up times.

Surgeons exhibit a keen interest in integrating new technologies to enrich their surgical environments, driven by the imperative need to seamlessly visualize medical data and patient anatomy in tandem. Augmented Reality (AR) emerges as a pivotal solution, seamlessly blending virtual objects with the real world, thereby augmenting the surgical landscape. The primary rationale behind adopting AR lies in its capacity to elevate the quality of care provided. By enabling surgeons to access and interact with digital information overlaid onto their immediate environment, AR facilitates more precise surgical interventions, thereby minimizing medical errors and optimizing patient outcomes.

The transformative potential of AR extends beyond its role as a mere visualization tool. It fundamentally reshapes the surgical paradigm by empowering surgeons with real-time data insights and enhancing their decision-making capabilities. Whether it pertains to anatomical understanding, intraoperative guidance, or postoperative monitoring, AR offers a multifaceted approach to surgical enhancement. Its ability to seamlessly integrate digital overlays with the physical world imbues surgeons with an unprecedented level of precision and efficiency in their procedures.

In the contemporary healthcare landscape, the manual monitoring of patient parameters during surgery poses significant challenges. The continuous need for vigilance, coupled with the potential for oversight, underscores the necessity for a more automated and intuitive monitoring system. Enter the doctor-assistive system using Augmented Reality – a groundbreaking innovation poised to revolutionize surgical practices. By leveraging AR technology, this system ensures the seamless transmission of real-time patient data to surgeons, thereby enabling proactive interventions and optimizing patient care pathways.

Moreover, the adoption of AR in surgery signifies a broader trend within the medical community towards embracing disruptive technologies for improved patient outcomes. Surgeons, often early adopters of cutting-edge innovations, recognize the transformative potential of AR in revolutionizing healthcare delivery. As AR technologies become increasingly accessible and affordable, their integration into surgical workflows becomes not just plausible but imperative for delivering optimal patient care.

In essence, the convergence of augmented reality with surgical practice represents a paradigm shift in healthcare delivery. By harnessing the power of AR, surgeons can navigate complex procedures with unparalleled precision and confidence, ultimately ushering in a new era of surgical excellence and patient-centered care.

2. EXISTING SYSTEM-

Augmented Reality (AR) is gaining traction in healthcare, offering innovative solutions to various challenges. Existing AR systems in the healthcare sector include applications for medical training, surgical planning, and patient education. Surgeons can use AR to overlay virtual images onto a patient's anatomy during procedures, aiding in precise navigation and visualization. Medical students benefit from AR simulations that provide interactive learning experiences, enhancing their understanding of complex anatomical structures and medical procedures. Furthermore, AR applications assist in patient education by visualizing medical conditions and treatment options in an easily understandable format. These systems improve healthcare delivery by increasing efficiency, accuracy, and patient outcomes. As AR technology continues to advance, its integration into healthcare systems will likely expand, offering even more sophisticated tools for medical professionals and patients alike.

2.1 BLOCK DIAGRAM

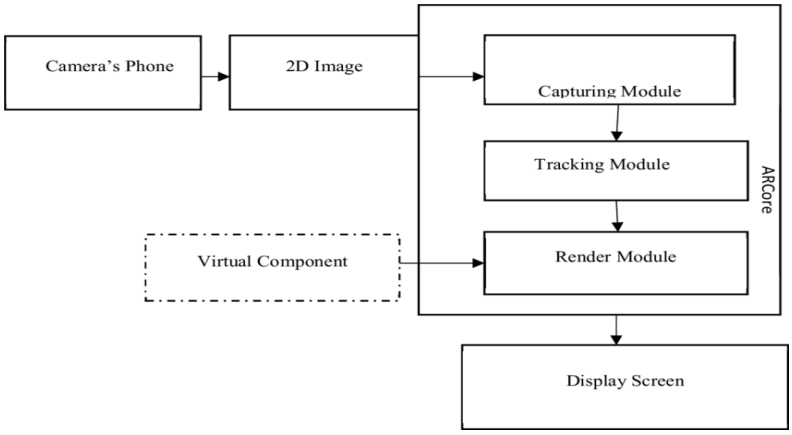

Fig 1 Block diagram of existing system

3. PROPOSED SYSTEM-

In this project, real-time patient data is gathered using sensors affixed to hospital patients. Once these sensors capture data, it is wirelessly transmitted to the doctor's augmented reality glasses. Should any abnormality arise, the doctor is promptly notified, allowing them to respond accordingly based on the patient's current health.

For body temperature measurement, the LM35 sensor is employed due to its superior accuracy compared to a thermistor, owing to its industrial-grade design. Similarly, the heart rate sensor provides a straightforward means of monitoring cardiac function, utilizing psycho-physiological signals as stimuli for virtual reality systems.

The Arduino Uno, a microcontroller board based on the ATmega328, serves as a practical means of integrating these sensors. Furthermore, the system is equipped to identify dengue through immunity calculations and promptly inform the doctor. Patient parameters are continuously monitored and stored in the cloud, with immediate alerts sent to the doctor should any parameter exceed predefined thresholds.

3.1 ADVANTAGES

- Continuous monitoring of physical parameters with real-time updates accessible via mobile phones.
- Strict maintenance of confidentiality and real-time data freshness assurance.
- Multi-user accessibility and global information retrieval capabilities.
- Augmented Reality (AR) enriches spatial comprehension by overlaying digital information onto the physical world.
- AR seamlessly integrates sounds, videos, and graphics into the existing environment, compatible with screens, glasses, handheld devices, and mobile head-mounted displays.

3.2 BLOCK DIAGRAM

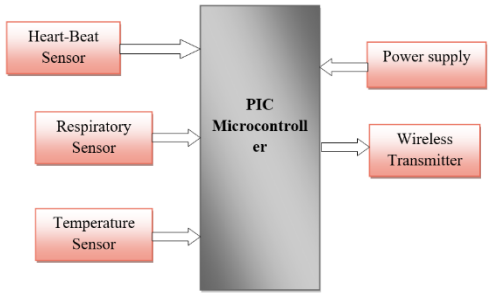

Fig.2 Transmitter side

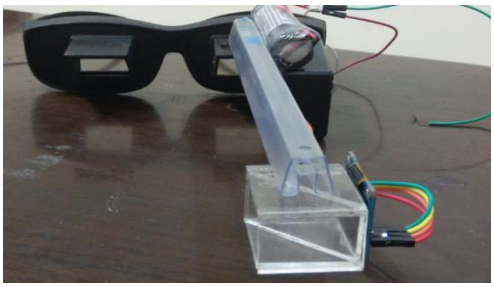

Fig.3 Receiver side

4. HARDWARE DESCRIPTION

4.1 Arduino Uno-

Arduino Uno, based on the ATmega328 microcontroller, facilitates a wide range of electronic projects. Featuring a user-friendly interface and numerous input/output pins, it seamlessly integrates sensors. Its simplicity caters to both novice and advanced users, supporting applications spanning home automation to robotics. Being open-source, it fosters community collaboration, offering a rich array of libraries. Affordable and

versatile, Arduino Uno is accessible to hobbyists, educators, and professionals. Its compatibility with various sensors enables swift development,

empowering users to materialize ideas efficiently. As a cornerstone in the maker community, Arduino Uno fuels innovation globally.

Fig.4 Arduino Uno

4.2 Heart beat sensor-

The heart rate sensor is a vital tool in monitoring cardiac activity, offering real-time data on pulse rates. It provides valuable insights into heart health, detecting irregularities and trends that aid in diagnosis and treatment. This sensor operates on the principle of psycho-physiological signals, measuring the heart's electrical activity. Its non-invasive design makes it ideal for continuous monitoring during physical activity, medical procedures, or everyday life. By capturing accurate heart rate data, this sensor enhances medical diagnostics, fitness tracking, and overall wellness management. Its compact size and wireless connectivity enable seamless integration into wearable devices, smartphones, and healthcare systems. With its precision and reliability, the heart rate sensor is indispensable in various healthcare, sports, and wellness applications, empowering users to make informed decisions about their cardiovascular health.

Fig.5 Heart beat sensor

4.3 Respiratory sensor-

The respiratory sensor is an essential device for monitoring breathing patterns, providing real-time data on respiratory rates. It plays a crucial role in assessing lung function, detecting abnormalities, and guiding medical interventions. This sensor utilizes various technologies, such as pressure sensors or airflow meters, to accurately measure the inhalation and exhalation cycles. Its non-invasive nature makes it suitable for continuous monitoring in clinical settings, sleep studies, and respiratory therapy. By capturing precise respiratory data, this sensor aids in diagnosing conditions like sleep apnea, asthma, and chronic obstructive pulmonary disease (COPD). Its compact design and wireless connectivity enable seamless integration into wearable devices, home monitoring systems, and medical equipment. With its reliability and accuracy, the respiratory sensor is indispensable for healthcare professionals, researchers, and individuals seeking to optimize respiratory health and wellness.

Fig.6 Respiratory Sensor

4.4 Temperature sensor-

The temperature sensor is indispensable for accurately measuring ambient temperature, providing real-time data across various applications. Leveraging advanced semiconductor technology, it delivers precise readings, ensuring reliability. Widely applied in environmental monitoring, HVAC systems, and industrial processes, it maintains optimal temperature conditions. Its compact size and low power consumption enable seamless integration into portable devices, smart home systems and wearable. With a broad temperature range and high sensitivity, it facilitates precise monitoring in diverse environments. Compatible with microcontrollers and communication protocols, it seamlessly integrates into electronic projects and IoT applications. Overall, the temperature sensor is pivotal in ensuring comfort, safety, and efficiency across domains, from household appliances to industrial machinery, thereby enhancing overall quality of life and productivity.

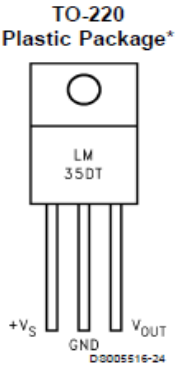

Fig.7 Pin diagram of Temperature sensor

4.5 IoT-

NodeMCU is an open-source IoT platform utilizing ESP8266 Wi-Fi SoC from Espressif Systems and ESP-12 module-based hardware. It employs Lua scripting language, built on the Espressif Non-OS SDK, and integrates open-source projects like lua-cjson and spiffs. The Internet of Things (IoT) connects everyday objects, embedding them with electronics, software, sensors, and connectivity for data exchange. NodeMCU, developed post-ESP8266 release, began with the node mcu-firmware on GitHub in October 2014. Developer Huang R expanded it into an open-hardware platform with devkit v0.9. Tuan PM's porting of MQTT client library enabled NodeMCU to support the MQTT IoT protocol using Lua. Another milestone was Devsaurus' integration of u8glib in January 2015, enabling NodeMCU to drive various displays effortlessly.

5. CONCLUSION-

The proposed system helps the doctor identify the critical patient’s faster by using the AR goggles and the microcontroller with sensors ,which displays the temperature pressure and heart beat of the patient which helps to classify if the patient requires immediate attention or not. This thus

reduces the doctor time to a greater extent preventing the doctor to check the basic details moving to each patients bed. Thus the iot based wireless Heartbeat and Temperature monitoring system is designed and implemented using microcontroller at mega 328, in which all signals directly measured from the human body and all parameters values displayed on LCD on the transmitter side. This data is transmitted to the receiver wirelessly through iot. The received signal send to pc via AR Glass window display patient's Physiological Parameter.

6. FUTURE SCOPE-

The future scope of AI-powered virtual glasses in healthcare is extensive, promising transformative advancements across multiple domains. These glasses will revolutionize surgical procedures by providing surgeons with real-time guidance, decision support, and visualization aids, ultimately improving patient outcomes. Additionally, virtual glasses will expand telemedicine services, enabling remote patient assessments, vital sign monitoring, and consultations, especially beneficial for underserved areas. In medical education, virtual glasses offer immersive simulations for practicing surgical techniques and diagnostic skills, enhancing training programs' quality and efficiency.

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