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Doctors Assistive System using Augmented Reality for Critical Analysis

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Abstract. Clinicians have always been on the hunt for new technologies that may enhance the current workplace environment. They are often the first to use infrastructure that allows their profession to give a better operational and patients encounter. As the surgical environment continues to improve in the digital era, several advancements have been identified as possible disruptive technologies in the surgical workplace. Because augmented reality (AR) rapidly gets increasingly relevant, accessible, and, most importantly, affordable, its application in hospitals to better the clinical application of evidence is inescapable. Opportunities for their use in surgeons are already being investigated whether in physiology, peri operative operation, or post directly rehabilitation. Augmented reality involves the addition of synthetic content to any or all perceptions to assist the user in completing tasks more successfully (AR). We offer a way for displaying crucial information for doctors on sort of semi glasses that are integrated into an Augmented - reality and therefore mixed with the real physical world.

Keywords: Assistive system, Augmented Reality, Wireless visualization Augmented module, PIC controller, Wireless module

INTRODUCTION

Augmented reality (AR) is a technology that integrates the digital and physical worlds. AR may be utilized in the health care business to make complicated medical information simpler to grasp, enhance the way physicians and patients interact, and assist medical professionals in diagnosing and treating patients more efficiently. AR glasses, for example, may be used to superimpose digital information on a patient's body, allowing a doctor to better see the anatomy they're operating on. This reduces the number of photos and diagrams that doctors must print, saving them both time and money [1].

It has been utilized in a wide range of businesses to offer information, improve experiences, and boost productivity. However, AR has the potential to have a substantial effect in the field of health care. AR is helping to change the way we give care by giving patients and clinicians a more visual and informative method to connect. And, because AR solutions can be tailored to the demands of every health care institution, they provide a one-of-a-kind chance to increase efficiency while also improving patient experience [2].

Augmented reality has had tremendous impact on the practice of medicine. In the past few years, we have seen the impact of augmented reality in healthcare. The most well-known uses of augmented reality for health care include: the use of augmented reality in medical offices to provide visual information to patients and physicians with the use of augmented reality in the operating room to provide real-time communication between patients and physicians [3]. Augmented reality is a technology (using a head-mounted display or HMD) which allows the display

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of information using a computer-generated image or video. Augmented reality may be used to monitor an individual's health, to help detect disease, to help diagnose certain conditions, and to provide education. Augmented reality's use in health care is growing rapidly. There are many benefits to this technology that can be discussed in this paper [4].

Augmented reality (AR) is a technology that allows people in a health care setting, such as a doctor's office or emergency room, to access information such as a computer screen, video screen, or other display device. A person can then receive information from the device and use it to interact with the site. AR can be used to provide patients with access to medical information, improve collaboration with other health care professionals, and facilitate the patient's care and treatment [5].

FIGURE 1. AR Doctor

Clinicians have always been on the hunt for new technologies that may enhance the current workplace environment. They are often the first to use infrastructure that allows their profession to give a better operational and patients encounter. As the surgical environment continues to improve in the digital era, several advancements have been identified as possible disruptive technologies in the surgical workplace. Because augmented reality (AR) is fast becoming more available, accessible, and critically, inexpensive, its implementation in healthcare to improve the medical use of data is unavoidable [6].

LITERATURE REVIEW

Several solutions, including an AR clinical consultation system based on an iPad and a Kinect sensor, were created by utilizing evolving AR technologies on mobile devices. This low-cost, incredibly portable AR consultation system may be easily established at the patient's house and clinician's office with minimal interruption to their daily routine. This will not only provide patients with superb and immersive telehealth consultation experience, but it will also help physicians to efficiently explain complicated medical concerns to patients through visualization and simulation [7].

Virtual reality (VR) is a simulation of reality in which users are immersed in an artificial/virtual environment that does not exist but generates the illusion that it does. People who use this technology have the impression that they are executing everything in real time [8]. This provides consumers with a sense of accomplishment. VR technology was initially utilized for gaming, but it is now employed in a variety of industries [16], including healthcare [9]. Augmented Reality (AR) is a phenomenon in which real-life things in recognized contexts are magnified by extra visual information to help the augmentation process. The advantages include the ability to detect patient illness problems during surgical procedures with great accuracy and precision, lowering the occurrence of medical mistakes

[10].

This study proposes, constructs, and verifies a caregiver-friendly AR and IoT-enabled healthcare system. The suggested solution is built on a smart city IoT middleware platform and provide a standardized, intuitive, and non-intrusive manner to transmit information to careers about old people. We present our prototype, and our testing findings demonstrate the effectiveness of our system in IoT item recognition and retrieval tasks [11].

This article provides an overview of augmented reality applications in the healthcare business, which is a fast-growing topic under AR [12]. This technology allows the medical practitioner to see the patient's inside bodily status. This study also analyses upcoming initiatives and developments that have the potential to cause upheaval in the healthcare sector over the next decade [13]. For those who are new to this technology, this evaluation gives a helpful aggregation of several AR integrations in the field of healthcare [14].

RESEARCH METHODOLOGY

Augmented reality involves the addition of synthetic content to any or all perceptions to assist the user in completing tasks more successfully (AR). We offer a way for displaying crucial information for doctors on sort of semi glasses that are integrated into an Augmented - reality and therefore mixed with the real physical world. In this project, real-time data from hospital patients is gathered by sensors attached to the patients. Once the sensor measures the values, the data is analyzed and wirelessly transmitted to physicians' augmented reality glasses, which alerts them if an abnormal situation develops. Based on the patient's present health status, the doctor can take necessary action [15]. Figure 2 and 3 shows the transmitter and receiver of the module respectively.

Transmitter Section:

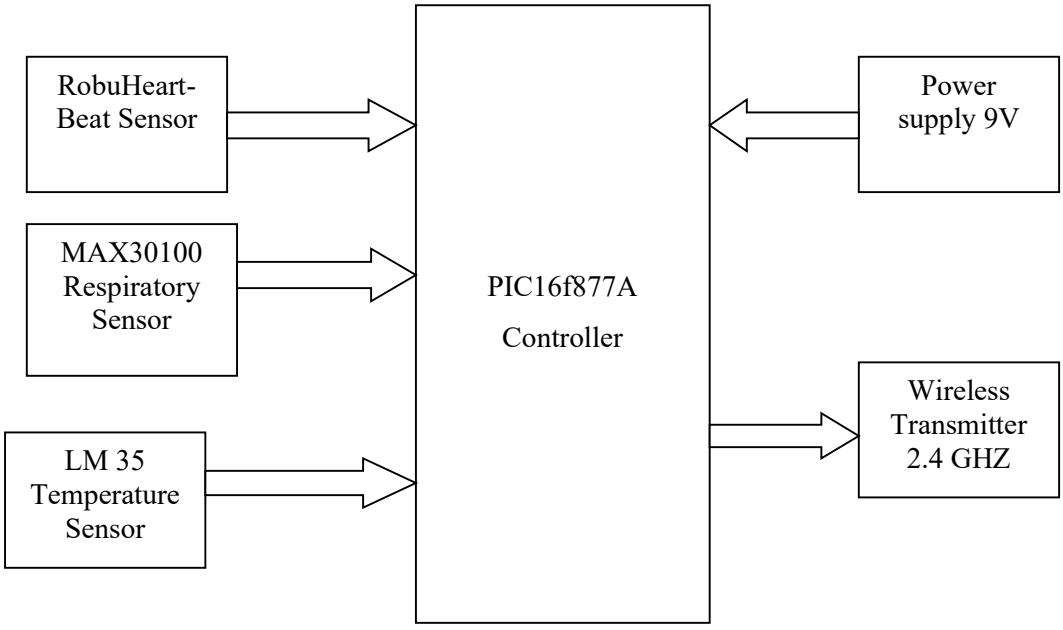

Figure 2. Transmitter block diagram

PIC microcontroller is a microcontroller that is compatible with the popular PIC microcontroller family. It is a low-cost microcontroller that has a single-chip microprocessor and a single-wire serial interface. It is one of the most widely used microcontrollers and has been used in many different applications including embedded systems, consumer electronics, medical devices, and aerospace devices. The PIC Microcontroller is a single-chip microcontroller developed by Texas Instruments in the late 1980s and early 1990s. The PIC Microcontroller is a microcontroller with a very small size and low power consumption. However, it has limitations in its functionality. The PIC Microcontroller has been used by many microcontrollers (e.g., PIC15F1804, PIC25F256K, PIC32F424, PIC15F256, PIC

Receiver Section:

Figure 3. Wireless Augmented Visualization Module HARDWARE USED:

PIC16f877a Controller Temperature Sensor Heartbeat Sensor Respiratory sensor

Wireless Transmitter 2.4GHz Wireless Receiver 2.4GHz IoT Board

SOFTWARE:

- MPLAB IDE
- Embedded C language

RESULTS AND DISCUSSION

Real-time data from hospital patients is collected through sensors attached to the patients in this study. Once the sensor has measured the parameters, the data is analyzed and wirelessly communicated to the physicians' augmented reality glasses, which informs them if an abnormal condition arises. The doctor can take the appropriate measures based on the patient's current health situation. Figure 4 and 5 shows the pulse rate and temperature variation of patient data in accordance with time respectively.

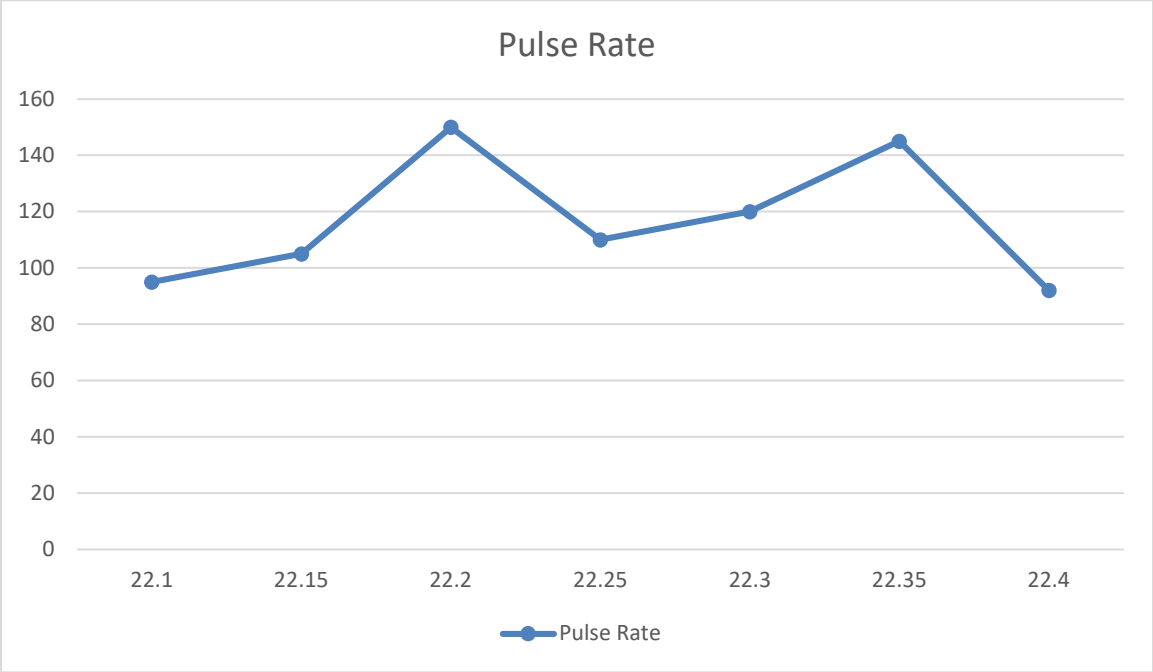

Figure 4. Pulse Rate

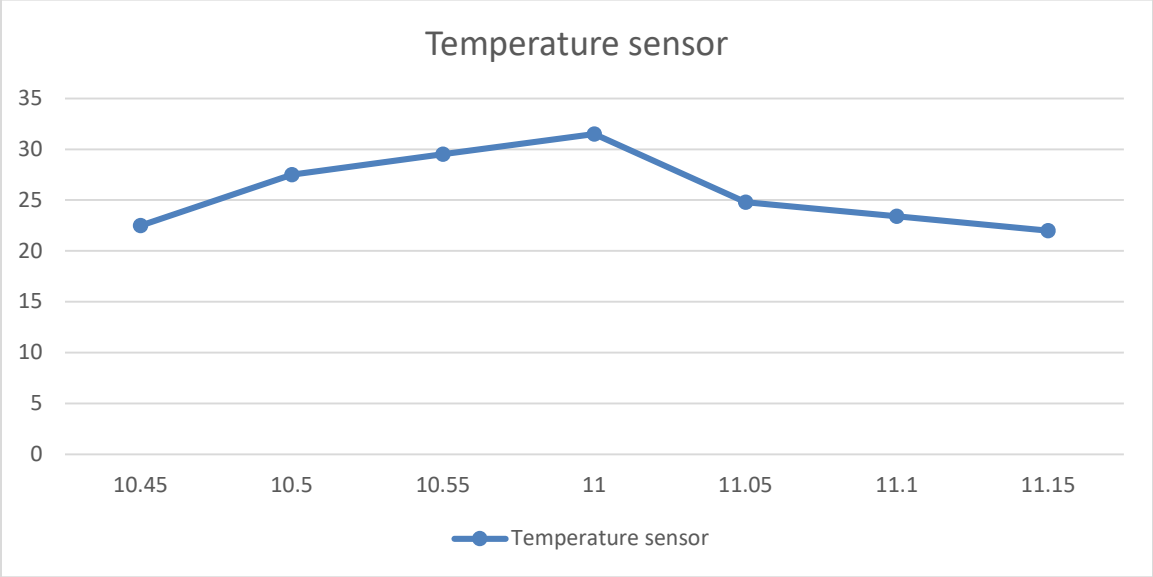

Figure 5. LM 35 sensors

Recent advances in Augmented Reality (AR) have shown various opportunities to improve patients' and physicians' telehealth experiences. However, due to their limited mobility and high cost, most current AR technologies are focused on medical procedure training and, as a result, have little conformity to patient uptake. Figure 6 shows the AR doctor.

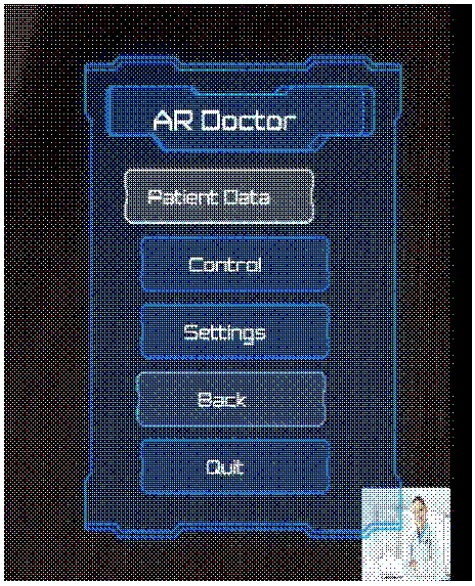

FIGURE 6. AR doctor

Since the 1980s, Augmented Reality (AR) has been actively researched. It is defined as a field in which 3D virtual components are blended in real time into a 3-D actual reality. Basic enabling technologies such as tracking, displays, and input devices were developed beginning in the 1990s, with early prototypes, tools, and applications such as augmented reality (AR) are used in combat helicopters to overlay critical info over the operator's point of view of the surrounding world. Augmented reality (AR) has seen a substantial surge in commercial areas such as medicine, industrial, transportation, computing, teaching, and amusement in current history. Just a few applications are healthcare, transportation and advertising, and schooling. Figure 7 shows the AR module.

FIGURE 7. AR module

CONCLUSIONS

Recent advances in Augmented Reality (AR) have shown various opportunities to improve patients' and physicians' telehealth experiences. However, due to their limited mobility and high cost, most current AR technologies are focused on medical procedure training and, as a result, have little conformity to patient uptake.

Applications for their use in surgeons are already being investigated whether in anatomy, intraoperative surgery, or post-operative rehabilitation. The addition of artificial information to one or more of the senses to aid the user in executing activities more successfully is referred to as augmented reality (AR). We provide a method for doctors to view critical information on semi-transparent glasses that are incorporated into an AR-headset and therefore combined with the real-worldview. This low-cost, extremely portable augmented consulting equipment may be readily set up at the patient's home and the clinician's office with minimum disruption to the person's everyday routine. This will not only give patients with an excellent and comprehensive telemedicine consulting environment, but it will also assist doctors in explaining complex medical problems to patients through imagery and modeling.

REFERENCES

[1]. S. Wang, M. Parsons, J. Stone-Mclean, P. Rogers, S. Boyd, K. Hoover, O. Meruvia-Pastor, M. Gong, and A. Smith, 2017, Augmented reality as a telemedicine platform for remote procedural training, *Sensors*. **17(10)**, pp.1-21.

[2]. M. Danciu, M. Gordan, A. Vlaicu, and Alexandruantone, 2011, A survey of augmented reality in health care*, Acta Technica Napocensis*, **52(1)**, pp.13–13.

[3]. M. Billinghurst, A. Clark, and G. Lee, 2015, Foundations and Trends® in Human-Computer Interaction **8**, pp.73–272.

[4]. P. Milgram and F. Kishino, 1994, A taxonomy of mixed reality visual displays, *IEICE Trans. Information and Systems* **77(12)** pp. 1321-1329.

[5]. E. Zhu, A. Lilienthal, L. A. Shluzas, I. Masiello, and N. Zary, Design of Mobile Augmented Reality in Health Care Education: A Theory-Driven Framework, 2015, *JMIR medical education* **1**, pp. 4443– 4443.

[6]. V. Ferrari, G. Klinker, and F. Cutolo, 2019, Augmented reality in healthcare, *J. of Healthcare Eng*., **2019**, pp.1-2.

[7]. E Midwives, 2013. Guidelines for Telehealth On-Line Video Consultation Funded Through Medicare. *Australian Nursing Federation. Australia,* pp-1-24.

[8]. D. W. F. V. Krevelen and R. Poelman, 2010, A Survey of Augmented Reality Technologies, Applications and Limitations, *Int. J. Virtual Real,* **9 (2)**, pp:1-20

[9]. A. S. Pillai and P. S. Mathew, 2019, Impact of virtual reality in healthcare: a review, *Virtual and Augmented Reality in Mental Health Treatment, pp.* 17–31.

[10]. K. I. Adenuga, O. Rahmat, A. Adenuga, P. E. Ziraba, and Mbuh, 2019, *Proc. of the 2019 8th Int. Conf. on Software and Information Eng*. pp. 71–74.

[11]. J. Kim, Chan, C. Sagunasaguna, K. Åhlund, and Mitra, 2021, Augmented Reality-Assisted Healthcare System for Caregivers in Smart Regions, *IEEE Int. Smart Cities Conf. (ISC2),* pp. 1-7

[12]. Mehta, H. Vishesh, and P. Banerjee, 2018, Applications of augmented reality in emerging health diagnostics: A survey, *Int. Conf. on Automation and Computational Eng*. (ICACE), pp.45–51.

[13]. S. Amini and M. Kersten-Oertel, 2019, Augmented reality mastectomy surgical planning prototype using the HoloLens template for healthcare technology letters, *Healthcare Tech. Letters* 6, pp. 261–261.

[14]. A. Corvino, Rita, M. Elpidio, P. Garzillo, A. Arena, M. G. Cioffi, L. Monaco, and M. Lamberti, 2018, "Augmented reality for health and safety training program among healthcare workers: An attempt at a critical review of the literature," in *Int. Conf. on Human Systems Eng. and Design: Future Trends and Applications* (Springer, 2018), pp. 711–715.

[15]. M. Bonham, 2019, *Proc. of the 24th Int. Conf. on Intelligent User Interfaces: Companion,* pp.161–162.

[16]. B Pattanaik, and S. Murugan, 2017, "Cascaded H-Bridge Seven Level Inverter using Carrier Phase Shifted PWM with Reduced DC sources." *Int. J. of MC Square Scientific Res.* **9(3)**, pp. 30-39.