International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Doctors Assistive System Using Augmented Reality to Enhance Medical Operations

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ARTICLEINFO

Article History:

Accepted: 05 April 2023
Published: 27 April 2023

Publication Issue
Volume 10, Issue 2
March-April-2023

Page Number
660-664

ABSTRACT

Surgeons are regularly on the lookout for technologies that will enhance their operating environment. They are often the early adopters of technologies that allow their field to offer a better surgical and patient experience. The continuing enhancement of the surgical environment in the digital age has led to a number of innovations being highlighted as potential disruptive technologies in the surgical workplace. Augmented reality (AR) is rapidly becoming increasingly available, Augmented reality (AR) is a promising tool to conveniently provide needed information and may thus overcome the limitations of existing approaches. To this end, a prototypical AR application was developed to guide the insertion of needles to spinal targets using the mixed-reality glasses Microsoft HoloLens. The system's registration accuracy was attempted to measure and three guidance visualization concepts were evaluated concerning achievable in-plane and out-of-plane needle orientation errors in a comparison study. Results suggested high registration accuracy and showed that the AR prototype is suitable for reducing out-of-plane orientation errors. AR is the addition of artificial information to one or more of the senses that allow the user to perform tasks more efficiently. We propose a system in which important information for the doctors is displayed on semi-transparent glasses included in an AR headset and therefore are mixed with the real-world view

Keywords—Augmented Reality (AR), PIC Microcontroller, heartbeat sensor, temperature sensor, respiratory sensor, Lora transmitter

I. INTRODUCTION

You pull a helmet over your head, and suddenly, you're inside an Augmented world that seems completely lifelike. You can run around, fight, race, and fly, doing things gamers have never done before. What was once the
stuff of Hollywood fantasy is now becoming a reality. A startup called Oculus VR is creating personal Augmented-

reality goggles called the Oculus Rift for everyone to use. Augmented reality isn't new. There have been attempts to
create Augmented worlds since the '60s, and the idea really took off in the '90s, spawning games that were clunky and heavy, like Nintendo's 1995 disaster Augmented Boy. But it wasn't until the Oculus Rift that Augmented reality became something attainable and, perhaps more importantly, desirable for consumers. The headset fits over the eyes, completely covering the wearer's field of vision. Unlike the Augmented reality headsets of the past, it's light, with a screen that's easy to look at (even for extended gaming sessions), since it's set up to appear exactly as if the Augmented world was being seen in real life. And, happily, the Oculus Rift website insists it's designed to be affordable for the average consumer.

Palmer Lackey, the founder of Oculus, developed the idea of creating a new head-mounted display that was both more effective than what is currently on the market, and inexpensive for gamers. For developers, the Oculus Rift platform is a playground, allowing them to put themselves into any Augmented world they can imagine, whether it's a favorite game like Skyrim (Warning: NSFW language up ahead) or simply a situation you'll likely never experience in real life.

Augmented Reality can be defined as an environment that is simulated by a computer system. The environment can mimic the “real” world, or it can be a simulation of a completely imaginary world. The term Augmented (or Artificial) Reality is attributed to Myron Krueger, an American computer artist in the 1970s. It has been recorded as far back as 1938 however, by the French artist Antonin Arnaud, who coined the phrase while discussing his theatre shows. The first Augmented reality equipment, which attempted to physically realize the concept, was developed by Morton Heilig in the 1950s. He created the Sensorama machine, which contained a moving seat, along with 3-D moving images, smell, sound, and even wind.

II. Implementation

We propose a system in which important information for the doctors is displayed on semi-transparent glasses included in an AR headset and therefore are mixed with the real-world view. In this project, the real time data of patients in hospital collected by the sensors attached to patients once the sensor measured the values then it is processed and sends to doctors augmented reality glass through wireless and alert if abnormal condition occurs.

The doctor can take appropriate action based on the patient’s current health condition.

- Compared to existing approaches, no external tracking hardware or other devices are needed.
- In particular, the achievable operation orientation accuracy and subjective measures were examined.
- Thus, the user study simultaneously evaluated the accuracy of the overall navigation system and compared the proposed AR guidance visualization concepts.

Block Diagram of this System

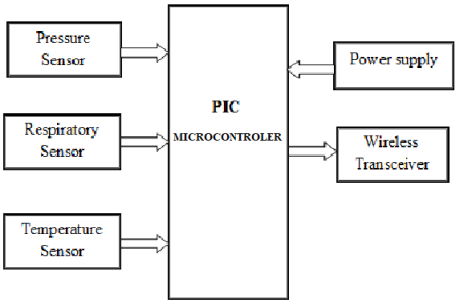


Figure.1. Transmitter section

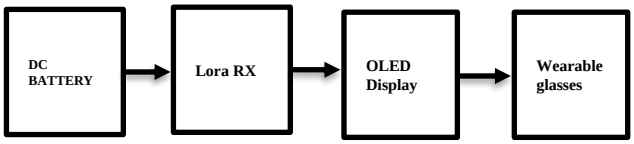


Figure.2. Receiver section

III. WORKING

Arduino board is connected to external power supply. Then the heartbeat sensor, Humidity sensor,

Temperature sensor are connected with the Arduino. These sensor collects the values from the patient. LCD display is connected with Arduino which displays temperature values it will alert if temperature cross threshold range. Then all sensor value is transmitted by the wireless transmitter. The microcontroller is connected to temperature, heartbeat and pressure sensor. The microcontroller is connected to an external power supply. These are placed near the patient bed. As soon as the patient gets admitted the details are input to the microcontroller through the sensors. The information is recorded in the microcontroller and sent to the doctor's goggles through wireless transmitter. The information is received through the WIFI receiver placed at the doctor goggle. When the doctor enters the patient ward with the google as soon as he goes near the patient the information gets transmitted using this information the doctor can analyze the critical patients and treat them first. Then the transmitted data is received by wireless receiver then the data will be displayed on AR glass. During surgery it continuously monitors the patient's health condition and sent Real time data to Surgeons. AR innovation can help surgeons to treat, diagnose and to perform surgery on their patients accurately giving real-time data of patient's information faster and more precisely. These sensors are attached with the patient during surgery. The WIFI transmitter collects the patient's information about the patient and transmits to the goggle. The doctor now sees the information about the patient through the goggle. On analyzing the patient information, the doctors decide whether the patient is critical or normal. If normal the doctor moves to other patient otherwise the doctor takes more attention to the patient. The OLED lens display the temperature, pressure, and heart beat information about the patient Body parameters like heartbeat, temperature and pressure are measured using the sensors. The analog outputs from the sensors are given as inputs to the Arduino UNO microcontroller and processed. This AR glass can wear during surgery it is semi-transparent glass which make surgery simple, easy it provides new innovation to medical fields. The processed digital outputs are transmitted to the wireless transceiver through WIFI protocol using Arduino software. The receiver section consists of a 9V battery powered VR glass, adjusting mirror and the LoRa receiver. Now the VR reality ray falls on the adjusting mirror and reflects on the OLED. The output is displayed on the wearable glass using augmented technology

IV. Components

- Pressure Sensor
- Respiratory Sensor
- Temperature Sensor
- PIC Microcontroller
- Power supply
- Wireless Transceiver
- AR Glass

Heartbeat Sensor

Figure. 3. heartbeat sensor

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e., the speed of the heartbeat. Monitoring body temperature, heart rate, and blood pressure are the basic things that we do in order to keep healthy. Heartbeat sensors are designed to give digital output heartbeat when a finger is placed on it. When the heartbeat detector starts working, the light emitting detector (LED) blinks simultaneously for every heartbeat.

Respiratory Sensor

Figure.4. Respiratory sensor

The respiration sensor is a sensitive girth sensor worn using an easy-fitting high durability woven elastic band fixed with a length adjustable webbing belt. It detects chest or abdominal expansion/contraction and outputs the respiration waveform.

Temperature Sensor

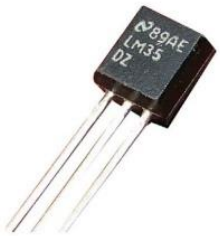


Figure. 5. Temperature sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device is rated to operate over a –55°C to 150°C temperature range, while the LM35C device is rated for a –40°C to 110°C range (–10° with improved accuracy). The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of lm35 over the thermistor is it does not require any external calibration.

PIC microcontroller

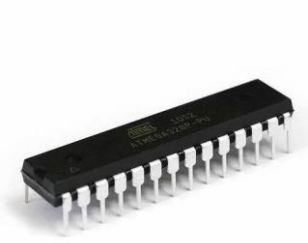
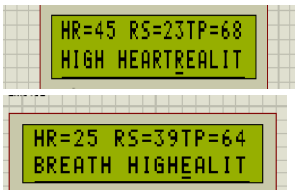


Figure.6. PIC microcontroller

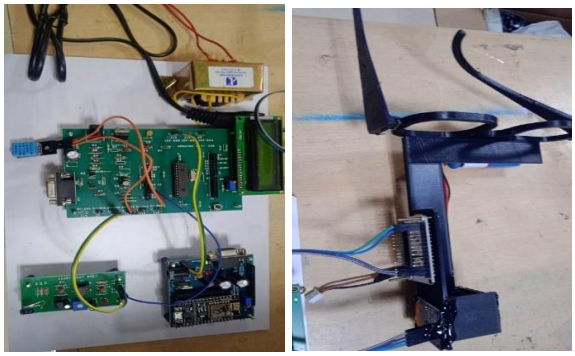
PIC is a family of microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller and is currently expanded as Programmable Intelligent Computer. The first parts of the family were available in 1976; by 2013 the company had shipped more than twelve billion individual parts, used in a wide variety of embedded systems. The PIC was originally intended to be used with the General Instrument CP1600, the first commercially available single-chip 16-bit microprocessor. The manufacturer supplies computer software for development known as MPLABX, assemblers and c/c++ compiler the MPLAB and PICKit series. Third party and some open-source tools are also available. Some parts have in-circuit programming capability; low-cost development programmers are available as well as high-volume production programmers.

V. Simulation output



In this project, we used the MPLABX software to display the output. This is the simulation output of heartbeat rating and breathing rate.

VI. Hardware outputs



6(a) 6(b)

Figure.6 Receiver diagram

Its displays the output of heartbeat sensor, respiratory sensor, temperature sensor

VII. Conclusion

This project presented the development and evaluation of an AR instrument navigation prototype to support the detection of planned operations using AR-based Glass. Using the mixed reality glasses HoloLens, visualization approaches and a method in which important information for the doctors are displayed on semi-transparent glasses included in an AR headset and therefore are mixed with the real-worldview. The accuracy estimation results and statistically significant results regarding the comparison of visualization concepts constitute a promising base for further development.

VIII. Future scope

In the future, AR glass will make a big impact in the medical field. A doctor will perform important surgery comfortably through AR glasses.

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Cite this article as :

K. Gowri, D. Branan, A. Nirmal George, M. Kavimani, S. Veda, "Doctors Assistive System Using Augmented Reality to Enhance Medical Operations", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 10 Issue 2, pp. 660-664, March-April 2023.

Journal URL : https://ijsrset.com/IJSRSET23102109