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Lung Abnormality Detection Using MR

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Abstract: Medical diagnosis is of pre-eminent importance in the case of health treatment. Yet with the advent of Technology, diagnosis still needs a lot of enhancement for a proper, legitimate result to be provided for a patient. From various surveys and experiments conducted globally, diagnosis error take up a huge probability than any curative blunders. In addition, the utilization of REALITY forms of visualization was never to the fullest .We had now proposed a basic system that makes use of Mixed Reality to obtain a 3D lung pattern of a patient by measuring the parameters that are associated with the lung functioning through sensors which concludes about the status (normal or unusual) in the form of design that is obtained on the screen providing accurate and rapid results. The pattern is movable in all three dimensions hence giving out a detailed picture when used along with endoscopic visualization in case of preoperative diagnosis or during surgery.

Keywords: Mixed Reality, 3D, Diagnosis, sensors, lung pattern.

I. INTRODUCTION

The preliminary diagnosis is the most anticipated process which takes up a massive time for scrutiny and surety to provide a conclusion on one's status of existence. Improper diagnosis could be the most undesirable mistake that a professional could ever commit as the further proceedings on health treatment is directly relied on it's result. Technology in health care sector needs to be cost effective and swift in addition to accuracy and quality. Our system by employing emerging engineering practices namely Mixed Reality and IoT rather than the traditional ones can improve the performance and precision of diagnosis by providing the results with necessary characteristics and with high availability.
Mixed Reality can be rendered as next iteration to Augmented Reality as it offers better information and visualization.MR bridges the gap between physical and digital world. The inputs for our proposed system are the analog values of one's body temperature and oxygen rate are measured through pulse oximeter and LM35 temperature sensor and output is a pattern of lung that is obtained depending upon the input value being measured. We interface these sensors to a PIC microcontroller to which the Node MCU is connected in order to put the user values to the cloud storage. The system uses MR vision camera along with unity engine to render the visual pattern. The technique can e implemented in three platforms: Windows PC, Apple iPad and a mobile phone.

OBJECTIVES OF THE PROJECT

The system is exclusively proposed to bring out a 3d visual of one's internal organ and diagnose for any abnormality via analyzing the result, thus obtained on the screen. To give out the results as quick, not letting the patients and others to suffer a mental agitation.To come into a 90% legitimate diagnostic conclusion based upon the pattern of one's organ thus obtained.User understandable representation is provided for the people to not to be fooled by centres indulging in fraudulence looting people's money providing fake conclusions. This in turn makes a true organization more trustworthy.Enables surgeons or doctors to interact with digital data and with real world in the same context and time frame.With further future extensions, one can achieve reduction in time and error in reconstructive surgery.Seamless recording / collection of distinct patient's medical records, comparison visuals, identity and much more information rather having to hold them manually or in some database which at times gets corrupted.

II. REVIEW OF LITERATURE

2.1 AR Technology and Its Application in Biomedical Engineering

With the development of ubiquitous computing, augmented reality (AR) technology has become an important research direction. For its unique properties, it can be used in many engineering areas, especially in biomedical engineering. In this article, we mainly summarized the technical feature and technological superiority of the AR technology, and gave some applications and effectiveness of AR-based biomedical Engineering. This will be helpful for those who are eager to use this brand new technology in medicine.

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2.2 Preliminary Study of VR and AR Applications in Medical and Healthcare Education

As technology advances, mobile devices have gradually turned into wearable devices, and Virtual Reality (VR), Augmented Reality (AR) as well as Mixed Reality (MR) have been applied more and more widely. For example, VR, AR and MR are applied in the medical fields like medical education and training, surgical simulation, neurological rehabilitation, psychotherapy, and telemedicine. Related research results have proved that VR, AR and MR ameliorate inconvenience of traditional medical care, reduce medical malpractice caused by unskilled operation, and lower the cost of medical education and training. Moreover, the application has enhanced effectiveness of medical education and training, raised the level of diagnosis and treatment, improved the doctor-patient relationship, and boosted efficiency of medical execution.

III. PROBLEM STATEMENTS AND PRELIMINARIES

Our proposed system involves the generation of MR code for every individual by taking their age, photograph, name, lung scan (at normal circumstances) and their blood group as input. It also involves the real time measurement of one's oxygen rate and centigrade of body temperature as a parameter to check for their health status. The parameter depends upon every internal organ for which the system is proposed.
Unity 3D software along with the MR vision camera is used to obtain the pattern on screen. The pattern thus acquired is based on real time value (here: oxygen, temperature) being measured and hence our values are made available to the Node MCU which establishes the connection with the unity software via cloud. In this system, for one's perusal, the normal lung pattern is indicated in green coloured format and for the undesirable lung pattern, the green is restyled to red.
The visual's movement in all three dimensions is possible and hence not remaining as a monotonous stationary picture. This model enables updating and tracking of people's health statuses and the motile image based output substantiates the level of haleness. The hardware and software requirement for our model is as low, making use of modern practices rather clinging to the traditional engineering applications. Besides many diagnostic tools and software's came into existence this is for the very first time merging the idea of visualization and diagnosis under one roof.

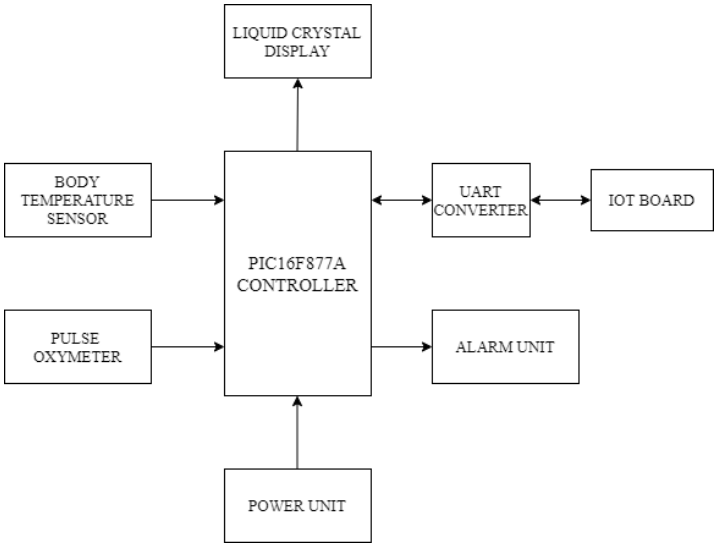

FIG 3.1 BLOCK DIAGRAM OF THE PROPOSED SYSTEM

IV.HARDWARE REQUIREMENTS

4.1 PIC BOARD

In this project we used a PIC16f877A microcontroller. This board is specially designed for connecting digital and analog sensors which have input voltage range 5 or 12V DC as well as it can be interfaced with serial communication devices, relay boards etc. The output can be monitored in LCD as well as PC. Data EEPROM is used to store data defined by the user in PCB design.

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FIG 4.1 PIC BOARD

4.2 LCD BOARD

The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply.The 16 x 2 intelligent alphanumeric dot matrix displays are capable of displaying 224 different characters and symbols. A full list of the characters and symbolsis printed on pages 7/8 (note these symbols can vary between brand of LCD used).

FIG 4.2 LCD BOARD

4.3 TEMPERATURE SENSOR

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range.

FIG 4.3 TEMPERATURE SENSOR(LM-35)

4.4 NODE MCU

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having TensilicaXtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it idealfor IoT projects.

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NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

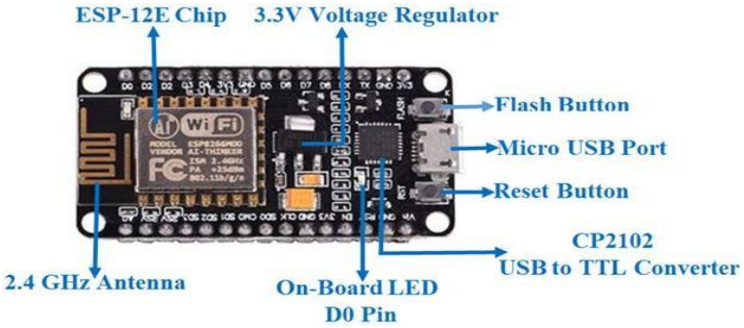

FIG 4.4 NODE MCU

4.5 PULSE OXIMETER

The oximeter works on the principle that the oxygenated blood is a brighter color of red than the deoxygenated blood, which is more blue-purple. First, the oximeter measures the sum of the intensity of both shades of red, representing the fractions of the blood with and without oxygen. The oximeter detects the pulse, and then subtracts the intensity of color detected when the pulse is absent. The remaining intensity of color represents only the oxygenated red blood. This is displayed on the electronic screen as a percentage of oxygen saturation in the blood.

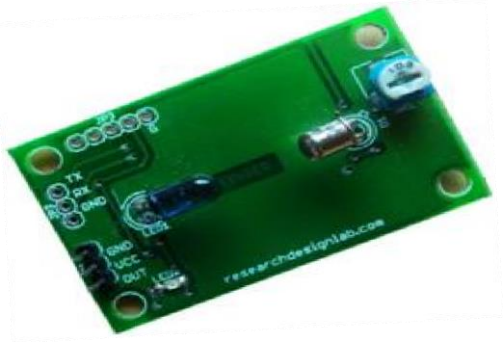

FIG 4.3 PULSE OXIMETER

4.6 MR VISION CAMERA

Fundamentally, mixed reality works by taking a real-world camera and a virtual, “in-game” camera, and completely synchronizing them in terms of position, rotation, field of view, etc. Then, using whatever data you have on both worlds, you combine the two so that the real and virtual worlds appear as one.

FIG 4.6 MR VISION CAMERA

V.RESULT OF THE STUDY

5.1 OR NORMAL USER

The pattern for the normal user is said to be green in color as we do not involve the usage of actual lung patterns but a programmer designed one.This normal pattern is the one obtained initially for a user.

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FIG 5.1 PATTERN FOR NORMAL USER

5.2 FOR CRITICAL USER

As soon as an abnormal value is measured from the user's side, the buzzer goes high and the pattern which was then green is changed to red.

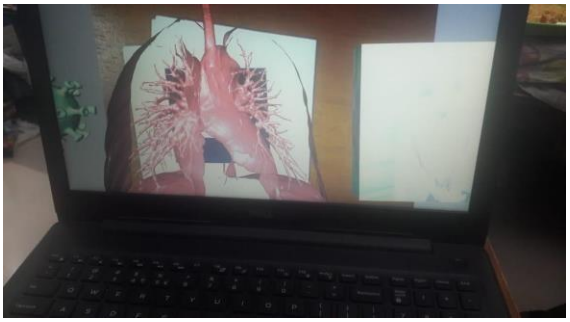

FIG 5.2 PATTERN FOR CRITICAL USER

VI. CONCLUSION

Broadening in the sector of medical facilities is the most salient need of the hour than in any other gadgetry arena as the existence of humanity is directly relied on. With expanding population and certain rise of much contemporary illness, itis a must for mankind to give up on the aged engineering techniques and adapt new practices to meet the future difficulties. Swiftness and accuracy are the desirable scales of efficiency that modern day requires especially in the caseof medication. The process of diagnosis, viral detection, preoperative detection etc... are still under a pathetic situation as they fail to meet the above requirements as nearly every upcoming or then came illness depict no difference in their symptoms till the crucial stage thus leading to a considerable percentage of diagnostic error.

It is of concern that people are in zeal when it comes to the domain of AI or IoT but exploration in reality has still not had its incline, with many researchers till date were least cared about the technology as it is evident from our difficulty on finding the research thesis related to mixed reality. It is a must for everyone out in the world to realize that we still have a long way to sail in the ocean of technology.

Upcoming engineers have to pave their attention on how to integrate the modern engineering practices to any sector out there to provide a common understandable, interactive (driving out the sole less non-attractive results) , error free, cost effective results for the sake of people as techno makes common life easy ,not difficult.

We believe, our work would serve as a base for many future endorsements and accomplishments in any cardinal sector, providing a new dimension and creating a whole new world of safer technology.

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