Augmented Reality Based Transformerfaultdetection and Indicating System

M.AntoBennet, S.Mahalakshmi, NarlaVenkata Vyshnavi, N.Haritha, K.Aishwarya

Abstract:*The augmented reality has become the advancement of technology and that we are utilizing it to boost the benefits of this work. It is renowned that the technological advancements are increasing at a quicker pace. However, the employment of technologies in numerous sectors is extremely low. It is common that individuals from EB stations notice it terribly troublesome to research the fault incidence in transformers. It become a tedious method for them to manually analyze the fault of the transformer. Thus, we employ the concept of augmented reality for detecting the fault of the transformer and displaying it on AR glasses.This work consists of two sections augmented glass section and transformer section.In the augmented section, tend to use the augmented glass for displaying the main points for the objects that user sees.The glass consists of the IR transmitter once it met with the IR receiver then through the microcontroller it'll evoke details from the receiver through ZIGBEE module.Within the transformer section the oil level device accustomed live the oil level within the transformer and voltage level are going to be measured by the voltage level device. The current device is employed live this passing through the cable.The temperature sensor is used for indicating the winding temperature & oil temperature of the transformer and also the buzzer or beeper is an audio signaling device, which is used to produce sound when it detects the high temperature inside the transformer.All the main points are unceasingly monitored by the microcontroller. If any values go abnormal then the microcontroller can send the main points to the user glass through the ZIGBEE module.By this technique, user can able to read the defect within the transformer through carrying the augmented glass.*

KEYWORDS: PowerSupply, ATMEGA 328, AR Glass, ZIGBEE, LevelSensor, Voltage Sensor, Current Sensor, Temperature Sensor, Buzzer, IR Transmitter & Receiver.

I.INTRODUCTION

POWER transformer is of great importance for transporting electricity. Therefore, its safe operation is mandatory for the reliability of the power grid. Transformer aging is a predominant factor for grid failures. As a result of aging, electrical, mechanical and thermal failures occur which can be categorized into three main failure types of transformer and the mechanical failure ranks first.

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M.AntoBennet, Professor,Department of Electronics and Communication Engineering ,Vel tech

S.Mahalakshmi, UG student,Department of Electronics and Communication Engineering ,Vel tech

NarlaVenkata Vyshnavi, UG student,Department of Electronics and Communication Engineering ,Vel tech

N.Haritha, UG student,Department of Electronics and Communication Engineering ,Vel tech

K.Aishwarya, UG student,Department of Electronics and Communication Engineering ,Vel tech

Therefore, health management (HM) for transformer which aims to predict the future condition of transformer is crucial. Improved reliability, reduction in transmission costs, potential for increased efficiency and durability, and more efficient control systems for power systems are most prominent of the promises by smart grid technology to cope with increasing energy demands and complexity of electric networks. Monitoring of assets has historically allowed for their better protection, control, operation and maintenance. Faults in transformers can cause huge damages in a very short time, which eventuate suspension of power supply resulting in financial losses for distribution companies in terms of billing, asset damages and suspension of daily life activities at the consumer end. To overcome these problems, methodology based on analysis of faults using intrusive and non-intrusive parameters is adopted and pattern recognition techniques are used to predict and locate the faults in transformers. The varying dynamics of distribution transformers has motivated some individual entities to reconsider their maintenance plans. The improved plans and schemes for transformer maintenance and monitoring need to have an on-field data acquisition systems and the processing units. Preventive monitoring of transformers for the faults before they eventuate can prevent their occurrence, which is costly to repair and cause the deprivation of power supply. Condition based health monitoring is the technique in which operational characteristics of transformer are monitored and changes observed in those operational characteristics are used for predictive maintenance. If transformer is working with normal conditions then it has long life and becomes less if they are overloaded[1-5]. Overloading of distribution transformer reduces system reliability. Now days, Distribution transformers are monitored manually for maintenance and recording parameter values. There are some faults in manual testing which are caused by oil and windings .This proposed system overcomes all disadvantages of manual testing and improves life of transformer. By this technique, user can able to read the defect within the transformer through carrying the augmented glass.The increasing electricity demand, together with thecomplex, dynamic and distributed electricity supplies,have caused serious power grid congestion issues in the futuresmart grid[6-12].

II.PROPOSED SYSTEM

Transformersplay a crucial role in power grid networks. It regulates the voltage levels for safe, reliable and stations to utility finish.It's necessary to monitor the condition of a transformer to avoid premature malfunction or breakdown.

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There are various parameters of transformer to examine the condition of a transformer. These include breakdown voltage, current, temperature, oil level sensor. The main motive of this work is to overcome the day to day challenges faced by the EB persons.The power transformers are the important part of the power system which are used to step up and step down the power to make usable for electricity consumers.So this module helps them to detect the faults in the transformer easily and there won't be any complexity.Using the AR glass, EB persons can apparently identify the faults so that they do not need to strain their eyes much and also helps the person to finish the work on time.This work consists of two sections augmented glass section and transformer section.In the augmented sectionfig 2, tend to use the augmented glass for displaying the main points for the objects that user sees. The glass consists of the IR transmitter once it met with the IR receiver then through the microcontroller it'll evoke details from the receiver through ZIGBEE module.In transformer section fig1, the oil level device accustomed live the oil level within the transformer and voltage level are going to be measured by the voltage level device. The current device is employed live this passing through the cable.The temperature sensor is used for indicating winding temperature & oil temperature of the transformer and also the buzzer or beeper is an audio signaling device, which is used to produce sound when it detects the high temperature inside the transformer. All the main points are unceasingly monitored by the microcontroller. If any values go abnormal then the microcontroller can send the main points to the user glass through the ZIGBEE module.By this technique, user can able to read the defect within the transformer through carrying the augmented glass.

BLOCK DIAGRAM:

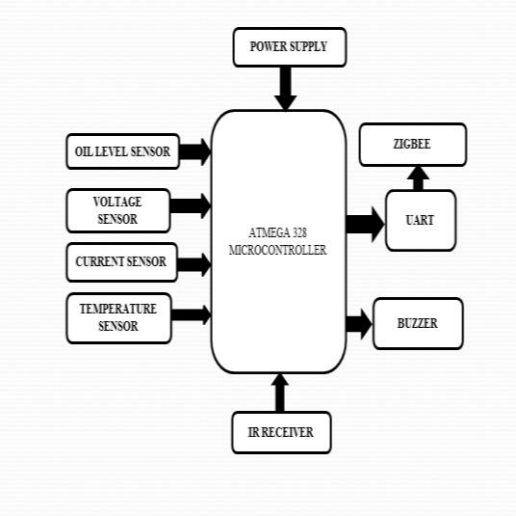

Fig 1:TRANSFORMER SECTION

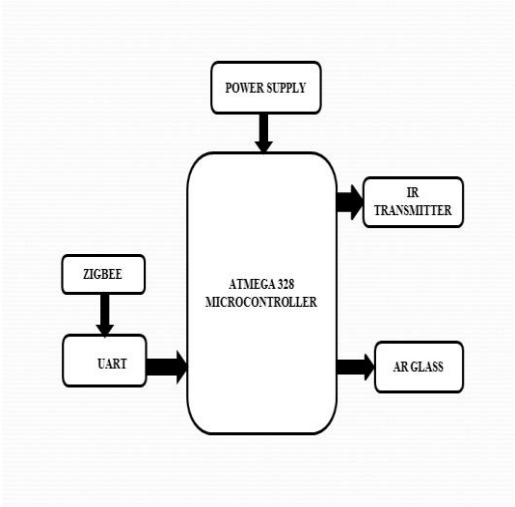

Fig 2: AR GLASS SECTION

VOLTAGE SENSOR:

The Voltage Sensor square fig 3, speaks to a perfect voltage sensor, that is, a gadget that changes over voltage estimated between two of an electrical circuit into a physical flag corresponding to the voltage. DC voltage Sensor works as indicated by Magnetic Modulation and is intended for DC voltage estimation. The yield flag of this sensor is relative to the info DC voltage. It very well may be utilized for nonstop dc voltage observing of the framework.

Fig3 : VOLTAGE SENSOR

CURRENT SENSOR:

The AC current sensor (ACS712) fig 4, can quantify DC present or high AC mains current is as yet secluded from the estimating part because of incorporated corridor sensor. The simple yield voltage is corresponding to the current estimated on the detecting terminals. Detecting terminal can even gauge current for burdens working at high voltages like 230V AC mains while yield detected voltage is segregated from estimating part. On-boardexactness small scale current transformer.On-board high-exactness operation amp circuit, to do precise examining and suitable remuneration and different capacities to flag.

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The module can quantify AC current inside 5A, relating yield simple can be balanced. Under perfect conditions, the information voltage VCC is 3-35V, as indicated by the potentiometer (change the intensification proportion, enhancement extend 0-100 times) to modify the required yield voltage, yet the yield (OUT) of the most extreme voltage does not surpass 1/2 VCC. The yield flag is the AC voltage flag, and the yield flag voltage does not surpass the most extreme 1/2VCC.

Fig4: CURRENT SENSOR

OIL LEVEL SENSOR:

water/oil tank fluid dimension sensor with loads of capacity fig 5, for example, fluid dimension control, warming, oil suction, oil return, temperature arm, fuel channel, balance box for gaseous tension and security. Fundamentally utilized for oil/water/sewage nonstop sign and alert. Oil sensors and analyzers are utilized in car and modern applications to assemble or send significant data. They can extend from a basic, skim sort oil level marker to a complex, in-line laser molecule counter and everything in the middle. This article will plot the distinctive sorts of oil level sensors, demystify how they work and clarify the outcomes they come back to the client.

Fig5: OIL LEVEL SENSOR

TEMPERATURE SENSOR:

The LM35 arrangement fig 6, are accuracy coordinated circuit temperature sensors, whose yield voltage is straightly relative to the Celsius (Centigrade) temperature. The LM35 in this way has favorable position over straight temperature sensors aligned in ˚ Kelvin, as the client isn't required to subtract an expansive consistent voltage from its yield to get advantageous Centigrade scaling. The LM35 does not require any outside alignment or cutting to give run of the mill correctness's of ±1⁄4˚C at room temperature and ±3⁄4˚Cover a full −55 to +150˚C temperature extend. Minimal effort is guaranteed by cutting and alignment at the wafer level. The LM35's low yield impedance, straight yield, and exact natural adjustment make interfacing to readout or control hardware particularly simple.

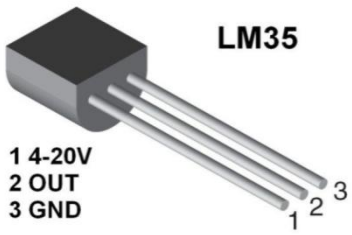

Fig 6: TEMPERATURE SENSOR

BUZZER:

A ringer or beeper fig 7, is a flagging gadget, normally electronic, regularly utilized in autos, family machines, for example, a microwave, or diversion appears. It most normally comprises of various switches or sensors associated with a control unit that decides whether and which catch was pushed or a preset time has passed, and ordinarily enlightens a light on the proper catch or control board, and sounds a notice as a constant or irregular humming or blaring sound. At first this contrivance trusted associate mechanical device framework that was indistinguishable to an electrical ringer while not the metal gong (which makes the ringing commotion). demonstrate that a catch has been squeezed are a ring or a blare. A few frameworks, for example, the one utilized on Jeopardy!, make no commotion by any stretch of the imagination, rather
utilizing light.

Fig 7: BUZZER.

ATmega-328& ARDUINO:

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ATmega-328 fig 8, is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the info up to eight (8) bits. ATmega-328 has 32KB internal builtin memory. This micro-controller has a lot of other characteristics. ATmega 328 has 1KB Electrically eradicable Programmable browse solely Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply.Other characteristics will be explained later. ATmega 328 has many completely different options that build it the foremost fashionable device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. ATmega328 is an eight (8) bit micro-controller. It will handle the info sized of up to eight (8) bits. It is an AVR based micro-controller. Its built in internal memory is around 32KB. It operates ranging from 3.3V to 5V.

Fig 8: ATmega-328

ZIGBEE:

This is a FSK Transceiver module fig 9, which is planned utilizing the ChipconIC(CC2500). It is a genuine single-chip handset, It depends on 3 wire advanced sequential interface and a whole Phase-Locked Loop (PLL) for exact nearby oscillator age .so the recurrence could be setting. It can use in UART/NRZ Manchester encoding/deciphering. It is an elite and minimal effort module.It gives 30 meters range with locally available reception apparatus. In a run of the mill framework, this trans recipient will be utilized together with a microcontroller. It gives broad equipment backing to parcel dealing with, information buffering, burst transmissions ,clearchannel evaluation, interface quality sign and wake on radio . It tends to be utilized in2400-2483.5 MHz ISM/SRD band frameworks. (eg. RKE-two approach Remote keyless Entry, remote caution and security frameworks, AMR-programmed Meter Reading ,Consumer physical science, Industrial perceptive and management, Wireless Game Controllers, Wireless Audio/Keyboard/Mouse). It could without much of a stretch to structure item requiring remote network. It tends to be utilized on remote security framework or explicit remote-control capacity and others remote framework.

Fig 9: ZIGBEE

IR SENSOR:

An infrared sensor fig 10, is an electronic device, that emits in order to sense some aspects of the surroundings. An IR detector will live the warmth of associate degree object additionally as detects the motion. These forms of sensors measures solely actinic ray, instead of emitting it that's known as as a passive IR detector. Usually within the spectrum, all the objects radiate some form of thermal radiations. These kinds of radiations square measure invisible to our eyes, which will be detected by associate degree infrared detector. The electrode is solely associate degree IR LED (Light Emitting Diode) and also the detector is solely associate degree IR photodiode that is sensitive to IR lightweight of identical wavelength as that emitted by the IR LED. When IR lightweight falls on the photodiode, The resistances and these output voltages, modification in proportion to the magnitude of the IR lightweight received.

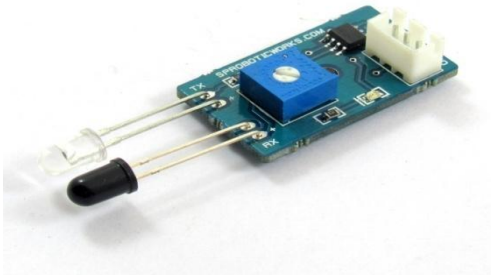

Fig 10: IR SENSOR

UART:

The UART fig 11, full structure is "Widespread Asynchronous Receiver/Transmitter", and it is an inbuilt IC inside a microcontroller dislike a correspondence convention (I2C and SPI). The primary capacity of UART is to sequential information correspondence. In UART, the correspondence between two gadgets should be possible in two different ways in particular sequential information correspondence and parallel information correspondence.

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The UART square outline comprises of two segments to be specific the transmitter and beneficiary that is appeared as follows. The transmitter segment incorporates three squares to be specific transmit hold register, move register and furthermore control rationale. Similarly, the recipient segment incorporates a get hold register, move register, and control rationale. These two segments are ordinarily given by a baud-rate-generator. This generator is utilized for producing the speed when the transmitter area and collector segment needs to transmit or get the information. The hold register in the transmitter involves the information byte to be transmitted. The move enrolls in transmitter and beneficiary move the bits to one side or left till a byte of information is transmitted or got. A read (or) compose control rationale is utilized for advising when to peruse or compose. The baud-rate-generator among the transmitter and the recipient creates the speed that ranges from 110 bps to 230400 bps. Commonly, the baud rates of microcontrollers are 9600 to 115200.

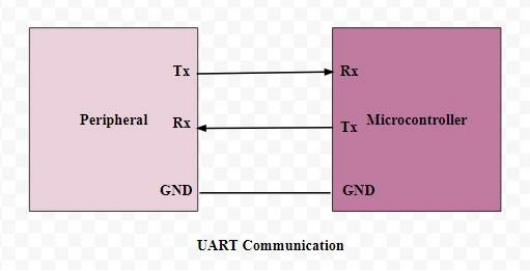

Fig 11: UART

AR GLASSES:

Enlarged the truth is essentially experienced by means of a wearable glass gadget, head-mounted gadget, or through Smartphone applications. Expanded reality overlays advanced substance over this present reality. In this manner fig 12, AR improves the client's involvement in reality as opposed to supplanting it.

Fig 12: AR GLASS

III.EXPERIMENTAL RESULTS

This proposed module is utilized to quantify the voltage, current, temperature and oil level in the transformer then the yield from those sensors will be simple flag and after that it will be changed over in to advanced flag then the flag will be intensified and given to Atmega - 328 microcontroller then the information from the microcontroller will be exchanged to the zigbee module utilizing the UART protocol.As UART will send the information in sequential starting with one gadget then onto the next device.So that, the zigbee transmitter in the transformer area will send the information to zigbee beneficiary in the AR section.Then again utilizing UART convention the information will be exchanged to microcontroller,through that the information will be shown in AR glass shown in fig 13&14.

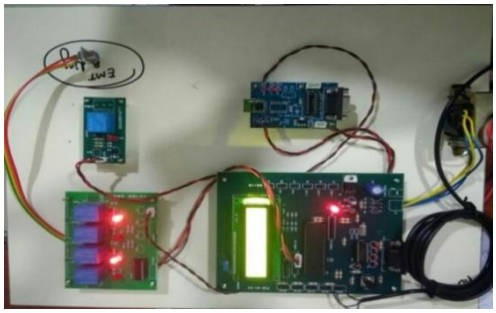

Fig 13: TRANSFORMER SECTION

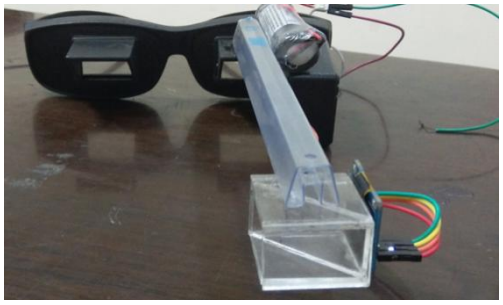

Fig 14: AR SECTION

IV.CONCLUSION

In the Augmented segment, we utilized the augmented glass for showing the central matters for the articles that client sees. The microcontroller will get the message from the zigbee module. All are persistently observed by the microcontroller. In the event that any qualities go unusual, at that point the microcontroller can send the central matters to the client glass through the ZIGBEE module. By this method, client can ready to peruse the imperfection inside the transformer through conveying the augmented glass.

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