International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 3 Volume No.7 May - June – 2023
DOI:10.46647/ijetms.2023.v07i03.025 ISSN: 2581-4621

Li-Fi BASED HEALTH MONITORING SYSTEM FOR INFANTS

[1]M. Abinaya,[2]Akash Lal,[3]Anandhu.V,[4]S.Kathiravan,[5]Krishnaraj.K
[1]Assistant Professor, Biomedical Engineering, Paavai Engineering College, Namakkal, Tamil Nadu
[2]U G, Biomedical Engineering, Paavai Engineering College, Namakkal, Tamil Nadu
[3]U G, Biomedical Engineering, Paavai Engineering College, Namakkal, Tamil Nadu
[4]U G, Biomedical Engineering, Paavai Engineering College, Namakkal, Tamil Nadu
[5]U G, Biomedical Engineering, Paavai Engineering College, Namakkal, Tamil Nadu

Abstract - The objective of the project is to design an infant health monitoring system based on LI-FI Technology. In this project we are continuously monitoring an infant through LI-FI Technology, it transmits data faster than WI-FI. The patient parameters are quickly transmitted via LI-FI transmitter, and it is received by LI-FI Receiver. For each parameter different sensors are used to monitor patient health in real time. We are transmitting and receiving data via LI-FI Technology. The sensors like SpO2 sensor for monitoring patient's blood oxygen saturation and pulse level, temperature sensor is used to monitor patient body temperature, All these parameters are stored in Arduino microcontroller and then it will be uploaded and Receiver receive a data from LI-FI transmitter and it will be displayed, In case of emergency doctor can provide treatment for the particular infant based on the parametric value. This method is efficient than conventional systems. The main advantage of this project is implementation of LI-FI technology for faster data transmission and to avoid the presence of electromagnetic radiations.
Keywords – **Blood Oxygen Saturation, Light Fidelity, Global System for Mobile communication**

INTRODUCTION

In this 21st century their bis a drastic change in technology as well as in the field of wireless network and automation, which seems to be a huge wave before decades. Lifi is an advanced technology in the field of wireless network. Lifi is a far advanced technology on comparing with the conventional communicational technologies. Hereby we are introducing this technology in the health care system. In this project we are utilizing Li-Fi technology to ensure more safe and secure health monitoring for infants in an environment like incubator and ICU.Through this model we can over come the limitations of conventional data transmission methods and we can ensure contactless monitoring of infants. In this model the vital parameters like oxygen saturation, heart beat rate and the temperature of the infants are measured in real time with respective sensors. Then these data are transferred to the display section via Li-Fi technology. As a result, the caretaker does not want to come in contact with the infants for the monitoring and the doctor can take necessary action.

Li-Fi TECHNOLOGY

Li-Fi (light fidelity) is similar to Wi-Fi technology, and it is one of the advanced wireless communication techniques. The main feature of Li-Fi includes fully networked, bidirectional and high-speed wireless communication. Nowadays, the most trending domain in wireless communication is Wi-Fi and internet users are also being increased every year. For obtaining better speed, efficiency, bandwidth, Li-Fi technology has evolved. The data transmission in this technology can be done using light because the light intensity changes quicker than the human eye for capturing. The range of data transmission in Li-Fi is faster 100 times than Wi-Fi. The operating concept of Li-Fi is very simple and clear if LED is on the signals are being transmitted, if it is of then the signal is not transmitted

HOW Li-Fi WORKS

Li-Fi is a VLC (visible light communications) system, and the speed of this system is very high. Li-Fi uses normal LEDs to allow the data to transfer and increase the speed up to 224 Gigabits/sec. The

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 3 Volume No.7 May - June – 2023
DOI:10.46647/ijetms.2023.v07i03.025 ISSN: 2581-4621

data transmission of this technology can be done via illumination. The essential devices of this system are the bright light emitting diodes. The ON/Off activity of LEDs permits a type of data transmission in the form of binary codes but the human eye cannot recognize this transform & the bulbs appear with a stable intensity.

Feature	Li-Fi	Wi-Fi
Full Form	Light Fidelity	Wireless Fidelity
Spectrum Used	Visible light	Radio Frequency (RF)
Operation	With the benefits of LED bulbs Li-FI transmit data using light	With the support of router or modem, Wi-Fi communicates information utilizing electromagnetic radiations
Interference	Li-Fi doesn't have or lesser interference from other devices	The operation of the Wi-Fi network can be hampered by several radio interface sources
Data Transfer Speed	Very High Speed (1Gbps)	150 Mbps
Data density	Li-Fi works in highly dense environment	Work in less dense settings due to problems linked interference
Range of Distance Coverage	About 10 meters based on the intensity of the light	Can be up to 32 meters depending upon the Radio propagation and interference
Cost	Cheaper than Wi-Fi as spectrum of light waves in a free band that requires zero license as it utilize light	As Wi-Fi use Radio spectrum, it is expensive in comparison with Li-Fi
System Components	The complete Li-Fi system can be made up of the lamp pilot, LED bulb and photodetector	Wi-Fi uses Wi-Fi routers and subscribing stations

ANALOGY BETWEEN Li-Fi AND Wi-FI

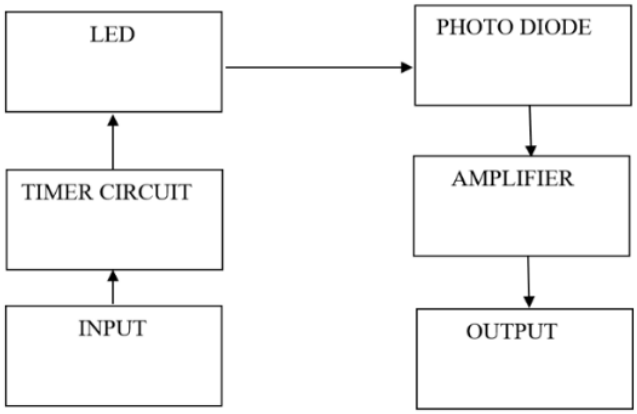
BLOCK DIAGRAM AND DESCRIPTION OF Li-Fi SYSTEM

Li-Fi system mainly includes two parts namely the transmitter and receiver. The input signal at the transmitter section can be modulated with a specific time period then send the data using LED bulbs in 0's and 1's form. Here, the flashes of LED bulbs are denoted with 0's and 1's. At the receiver end, a photodiode is used to receive the LED flashes strengthens the signal & gives the output.

The block diagram of Li-Fi system is shown below, and the transmitter section includes the input, timer circuit, an LED bulb. The input of the transmitter can be any kind of data like text, voice, etc. The timer circuit in this section is used to provide the necessary time intervals among every bit, and these are transmitted to the receiver end in the form of LED flashes.The receiver section includes photodiode as well as amplifier. Here, photodiode receives the LED bulb flashes then changes the

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 3 Volume No.7 May - June – 2023
DOI:10.46647/ijetms.2023.v07i03.025 ISSN: 2581-4621

flashes into electrical signals. Finally, the amplifier receives the signals from the photodiode and amplifies to Provide the output



COMPONENTS AND WORKING PRINCIPLE

The patient monitoring using the Li-Fi is done with the help of sensors. The sensors that are used in this model are temperature, heartbeat and SpO2 and it will perform its necessary function. The sensed data are converted into the digital form using the analog to digital converter which is inbuilt in the microcontroller Arduino uno r3. The data is then transmitted in the form of light through the Li-Fi module. Then blinking of light indicates the presence and the absence of the information. Rapid pulses are generated by the flickering of these LEDs which produces string of 0s and 1s.The light is detected in the receiver side bythe photo detector. The receiver section contains Arduino nano microcontroller this process the data and then it is displayed on the LCD display. In case of any abnormality the alarm will buzz.

Components are:

Temperature sensor

The temperature sensor that is used in the proposed modelis LM35. It is a thermistor that is used to measuretemperature of patient. The electrical output is proportional tothe temperature in Celsius. With the current variations the temperature of the patient is measured.

Heartbeat sensor

It consists of a bright red LED and a light detector. When the finger is placed close to the sensor a certain amount of light passes through the finger and depending upon the intensity of the light detected in the detector the current is produced accordingly. When no finger is placed brighter light intensity is detected by the detector. So based on the current variations the pulses are recorded and data is obtained

ATmega328

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, 3 flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and 5 software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts. The device achieves throughput approaching 1 MIPS/MHz.

POWER SUPPLY

The Arduino/Genuino Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC to DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm

center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

LCD DISPLAY:

A **liquid crystal display** (**LCD**) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs does not emit light directly.They are used in a wide range of applications including computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube(CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronicallymodulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

Buzzer:

A **buzzer** or **beeper** is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

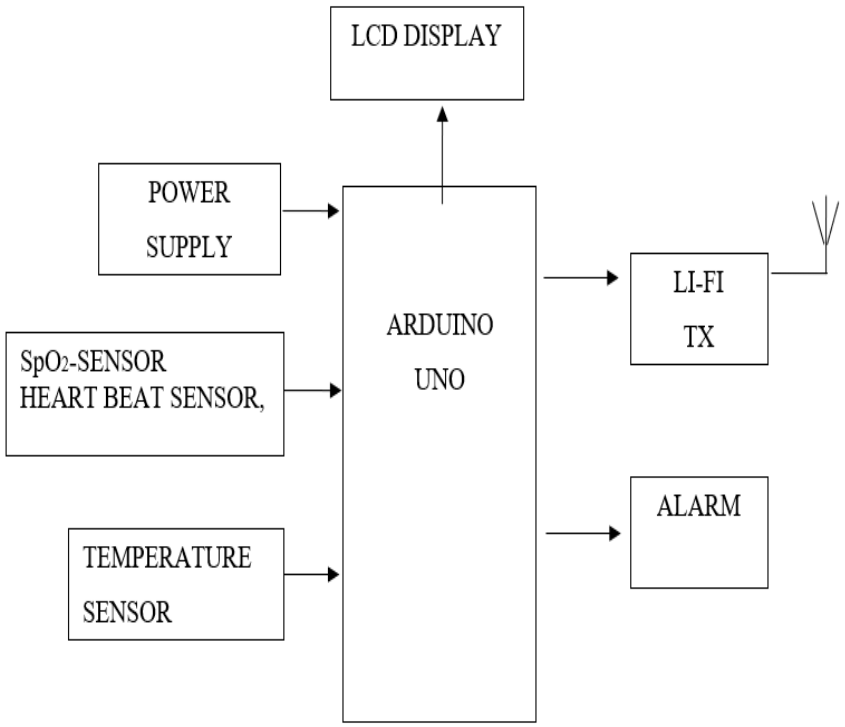
BLOCK DIAGRAM AND WORKING METHODOLOGY

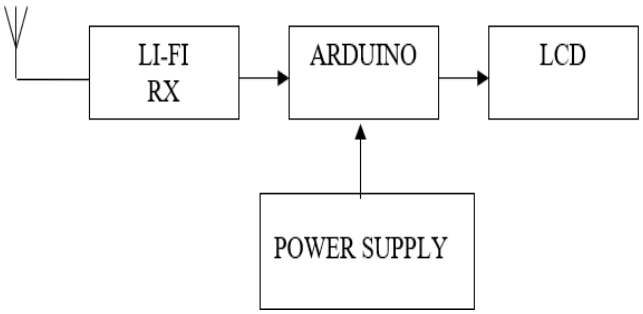
In this system the sensors like SpO2 sensor and temperature sensor acquires the vital parameters of the infants. The parameters of patient quickly transmitted via LI-FI Transmitter, and it will quickly receive by LI-FI Receiver. For each parameter different sensors are used to monitor patient health level in real time we are transmitting and receiving data via LI-FI Technology. We are using sensor like spo2 sensor for monitoring patient heartbeat and blood level, temperature is used to monitor patient body temperature, all these parameters are stored in Arduino microcontroller and then it will be uploaded and Receiver receive a data from LI-FI transmitter and it will monitor by PC in case of emergency doctor he will prevent the treatment for the particular patient.

In this way efficient to monitor patient health real-time. The main advantage of this project is using LI-FI Technology we are quickly receive a data regarding patient health and it will help in emergency time to patient to give a perfect treatment on time. Generally, in Hospital Nurseries, nurses are taking care of abnormalities and the health of the newborn babies but they may not be available for taking care of the Infants 24×7. So, sometimes in the absence of care taker it may happen that health of the Infant becomes critical. Wireless technologies used by different Infant Monitoring Systems contain

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 3 Volume No.7 May - June – 2023
DOI:10.46647/ijetms.2023.v07i03.025 ISSN: 2581-4621

radiations that are highly harmful for the Infants. So, under these critical conditions, we have proposed an Automatic Wireless Li-Fi based Advanced Infant Monitoring System which continuously measures the intensive parameter of the child's health using wearable sensors, if any abnormal condition occurs, it will indicate a notification.

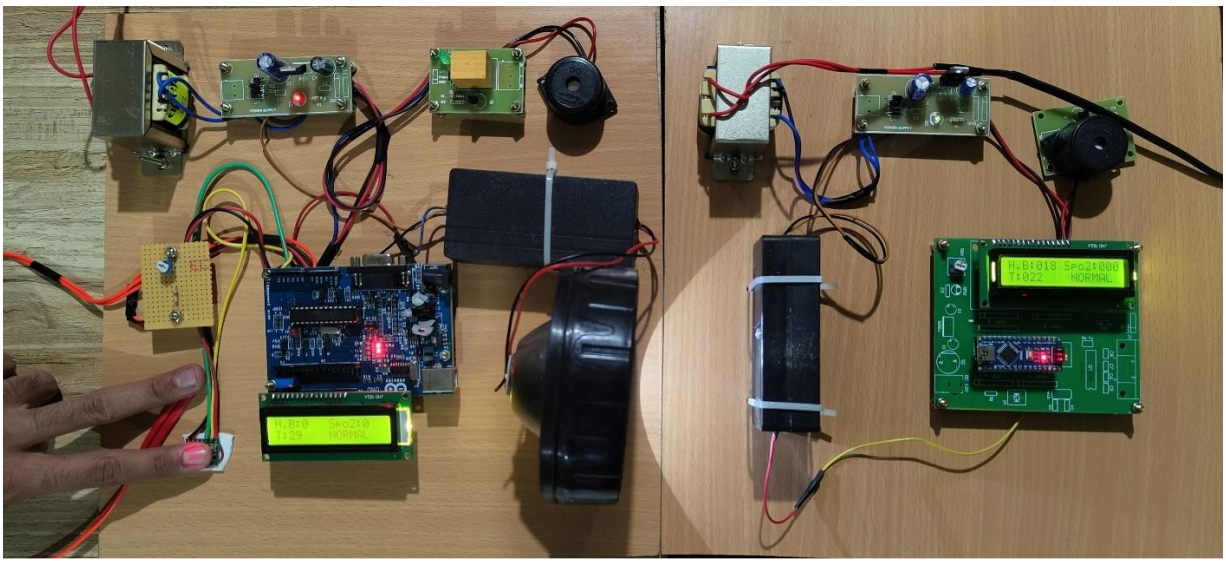




RESULT

Sl. No	Vital Parameter	Normal Range	Output
1	Temperature	36.4-37°C	35°C
2	Heart Rate	100-150bpm	89
3	SpO2	93-97%	96%

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 3 Volume No.7 May - June – 2023
DOI:10.46647/ijetms.2023.v07i03.025 ISSN: 2581-4621



CONCLUSION

In this effective way I developed a health monitoring system using LIFI technology. Li-Fi is used for higher accuracy to monitor infant. We are using Different sensors for monitoring infant. All these parameters are stored in Arduino microcontroller and then it will be uploaded and Receiver receives the data from LI-FI transmitter and it will be monitored by the doctor or nurse. The main advantage of this project is monitoring patient using LI-FI it will Transmits data of patient health faster than WIFI and it don't emit any electromagnetic radiation like WIFI. Every human life is important, health monitoring plays an important role in providing adequate medical service. For that we designed this project to lend a support for the health system.

REFERENCES

1. Vo Ngoc Mai Anh; Hoang Kim Ngoc Anh; Vo Nhat Huy; Huynh Gia Huy; Minh Ly. "Improve Productivity and Quality Using Lean Six Sigma: A Case Study". *International Research Journal on Advanced Science Hub*, 5, 03, 2023, 71-83. doi: 10.47392/irjash.2023.016
2. R. Devi Priya, R. Sivaraj, Ajith Abraham, T. Pravin, P. Sivasankar and N. Anitha. "MultiObjective Particle Swarm Optimization Based Preprocessing of Multi-Class Extremely Imbalanced Datasets". International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems Vol. 30, No. 05, pp. 735-755 (2022). Doi: 10.1142/S0218488522500209
3. Swathi Buragadda; Siva Kalyani Pendum V P; Dulla Krishna Kavya; Shaik Shaheda Khanam. "Multi Disease Classification System Based on Symptoms using The Blended Approach". *International Research Journal on Advanced Science Hub*, 5, 03, 2023, 84-90. doi: 10.47392/irjash.2023.017
4. Susanta Saha; Sohini Mondal. "An in-depth analysis of the Entertainment Preferences before and after Covid-19 among Engineering Students of West Bengal". *International Research Journal on Advanced Science Hub*, 5, 03, 2023, 91-102. doi: 10.47392/irjash.2023.018
5. Ayush Kumar Bar; Avijit Kumar Chaudhuri. "Emotica.AI - A Customer feedback system using AI". *International Research Journal on Advanced Science Hub*, 5, 03, 2023, 103-110. doi: 10.47392/irjash.2023.019
6. Rajarshi Samaddar; Aikyam Ghosh; Sounak Dey Sarkar; Mainak Das; Avijit Chakrabarty. "IoT & Cloud-based Smart Attendance Management System using RFID". *International Research Journal on Advanced Science Hub*, 5, 03, 2023, 111-118. doi: 10.47392/irjash.2023.020
7. Minh Ly Duc; Que Nguyen Kieu Viet. "Analysis Affect Factors of Smart Meter A PLS-SEM Neural Network". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 288-301. doi: 10.47392/irjash.2022.071

8. Lely Novia; Muhammad Basri Wello. "Analysis of Interpersonal Skill Learning Outcomes in Business English Students Class". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 302-305. doi: 10.47392/irjash.2022.072
9. Ms. Nikita; Sandeep Kumar; Prabhakar Agarwal; Manisha Bharti. "Comparison of multi-class motor imagery classification methods for EEG signals". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 306-311. doi: 10.47392/irjash.2022.073
10. Aniket Manash; Ratan Kumar; Rakesh Kumar; Pandey S C; Saurabh Kumar. "Elastic properties of ferrite nanomaterials: A compilation and a review". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 312-317. doi: 10.47392/irjash.2022.074
11. Prabin Kumar; Rahul Kumar; Ragul Kumar; Vivek Rai; Aniket Manash. "A Review on coating of steel with nanocomposite for industrial applications". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 318-323. doi: 10.47392/irjash.2022.075
12. Twinkle Beniwal; Vidhu K. Mathur. "Cloud Kitchens and its impact on the restaurant industry". *International Research Journal on Advanced Science Hub*, 4, 12, 2022, 324-335. doi: 10.47392/irjash.2022.076
13. V.S. Rajashekhar; T. Pravin; K. Thiruppathi , "Control of a snake robot with 3R joint mechanism", International Journal of Mechanisms and Robotic Systems (IJMRS), Vol. 4, No. 3, 2018. Doi: 10.1504/IJMRS.2018.10017186
14. T. Pravin, C. Somu, R. Rajavel, M. Subramanian, P. Prince Reynold, Integrated Taguchi cum grey relational experimental analysis technique (GREAT) for optimization and material characterization of FSP surface composites on AA6061 aluminium alloys, Materials Today: Proceedings, Volume 33, Part 8, 2020, Pages 5156-5161, ISSN 2214-7853, https://doi.org/10.1016/j.matpr.2020.02.863.
15. Pravin T, M. Subramanian, R. Ranjith,Clarifying the phenomenon of Ultrasonic Assisted Electric discharge machining, "Journal of the Indian Chemical Society", Volume 99, Issue 10, 2022, 100705, ISSN 0019-4522, Doi: 10.1016/j.jics.2022.100705
16. M. S. N. K. Nijamudeen, G. Muthuarasu, G. Gokulkumar, A. Nagarjunan, and T. Pravin, "Investigation on mechanical properties of aluminium with copper and silicon carbide using powder metallurgy technique," Advances in Natural and Applied Sciences, vol. 11, no. 4, pp. 277–280, 2017.
17. T. Pravin, M. Sadhasivam, and S. Raghuraman, "Optimization of process parameters of Al10% Cu compacts through powder metallurgy," Applied Mechanics and Materials, vol. 813-814, pp. 603–607, 2010.
18. Rajashekhar, V., Pravin, T., Thiruppathi, K.: A review on droplet deposition manufacturing a rapid prototyping technique. Int. J. Manuf. Technol. Manage. 33(5), 362–383 (2019) https://doi.org/10.1504/IJMTM.2019.103277
19. Rajashekhar V S, Pravin T, Thirupathi K, Raghuraman S.Modeling and Simulation of Gravity based Zig-zag Material Handling System for Transferring Materials in Multi Floor Industries. Indian Journal of Science and Technology.2015 Sep, 8(22), pp.1-6.
20. Shoeb Ahmed Syed; Steve Ales; Rajesh Kumar Behera; Kamalakanta Muduli. "Challenges, Opportunities and Analysis of the Machining Characteristics in hybrid Aluminium Composites (Al6061-SiC-Al2O3) Produced by Stir Casting Method". International Research Journal on Advanced Science Hub, 4, 08, 2022, 205-216. doi: 10.47392/irjash.2022.051
21. Nirsandh Ganesan; Nithya Sri Chandrasekar; Ms. Gokila; Ms. Varsha. "Decision Model Based Reliability Prediction Framework". International Research Journal on Advanced Science Hub, 4, 10, 2022, 236-242. doi: 10.47392/irjash.2022.061
22. Vishnupriya S; Nithya Sri Chandrasekar; Nirsandh Ganesan; Ms. Mithilaa; Ms. Jeyashree. "Comprehensive Analysis of Power and Handloom Market Failures and Potential Regrowth Options". International Research Journal on Advanced Science Hub, 4, 10, 2022, 243-250. doi: 10.47392/irjash.2022.062

23. Ashima Saxena; Preeti Chawla. "A Study on the Role of Demographic Variables on Online Payment in Delhi NCR". International Research Journal on Advanced Science Hub, 4, 08, 2022, 217-221. doi: 10.47392/irjash.2022.052
24. Vishnupriya S; Nirsandh Ganesan; Ms. Piriyanga; Kiruthiga Devi. "Introducing Fuzzy Logic for Software Reliability Admeasurement". International Research Journal on Advanced Science Hub, 4, 09, 2022, 222-226. doi: 10.47392/irjash.2022.056
25. GANESAN M; Mahesh G; Baskar N. "An user friendly Scheme of Numerical Representation for Music Chords". *International Research Journal on Advanced Science Hub*, 4, 09, 2022, 227-236. doi: 10.47392/irjash.2022.057
26. Kakali Sarkar; Abhishek Kumar; Sharad Chandra Pandey; Saurabh Kumar; Vivek Kumar. "Tailoring the structural, optical, and dielectric properties of nanocrystalline niobate ceramics for possible electronic application". International Research Journal on Advanced Science Hub, 5, 01, 2023, 1-7. doi: 10.47392/irjash.2023.001
27. Pavan A C; Somashekara M T. "An Overview on Research Trends, Challenges, Applications and Future Direction in Digital Image Watermarking". *International Research Journal on Advanced Science Hub*, 5, 01, 2023, 8-14. doi: 10.47392/irjash.2023.002
28. Pavan A C; Lakshmi S; M.T. Somashekara. "An Improved Method for Reconstruction and Enhancing Dark Images based on CLAHE". *International Research Journal on Advanced Science Hub*, 5, 02, 2023, 40-46. doi: 10.47392/irjash.2023.011
29. Subha S; Sathiaseelan J G R. "The Enhanced Anomaly Deduction Techniques for Detecting Redundant Data in IoT". *International Research Journal on Advanced Science Hub*, 5, 02, 2023, 47-54. doi: 10.47392/irjash.2023.012
30. Nguyen Kieu Viet Que; Nguyen Thi Mai Huong; Huynh Tam Hai; Vo Dang Nhat Huy; Le Dang Quynh Nhu; Minh Duc Ly. "Implement Industrial 4.0 into process improvement: A Case Study in Zero Defect Manufacturing". *International Research Journal on Advanced Science Hub*, 5, 02, 2023, 55-70. doi: 10.47392/irjash.2023.013
31. Gyanendra Kumar Pal; Sanjeev Gangwar. "Discovery of Approaches by Various Machine learning Ensemble Model and Features Selection Method in Critical Heart Disease Diagnosis". *International Research Journal on Advanced Science Hub*, 5, 01, 2022, 15-21. doi: 10.47392/irjash.2023.003
32. Nirsandh Ganesan; Nithya Sri Chandrasekar; Ms. Piriyanga; Keerthana P; Mithilaa S; Ms. Jeyashree. "Effect of Nano Reinforcements Tio2 And Y2O3 on Aluminium Metal Matrix Nanocomposite". *International Research Journal on Advanced Science Hub*, 5, 01, 2023, 22-32. doi: 10.47392/irjash.2023.004
33. Nur Aeni; Lely Novia; Mr. Muhalim; Nur Fitri. "Incorporating Secret Door in Teaching Vocabulary for EFL Vocational Secondary School Students in Indonesia". *International Research Journal on Advanced Science Hub*, 5, 01, 2023, 33-39. doi: 10.47392/irjash.2023.005