

Development of BIOBOT System to Assist COVID Patient and Caretakers

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Abstract- All objects are now connected thanks to the technological advancements in the medical industry using IoT. IoT has been applied in a wide range of fields, including daily life. But the primary impact of IoT in healthcare is simply amazing. The project's suggestion is Notion of a health monitoring system that uses these sensors and a Raspberry Pi board to monitor patient metrics like temperature, heart rate, and needs before sending the data to the cloud. In the event of a problem, both the caregiver and the treating physician are promptly informed via a message on the mobile app. Security must come first and foremost when designing a successful remote monitoring system.

Index Terms- Internet Of Things, Patient Monitoring, Robot Care, Biobot, Covid

1. INTRODUCTION

To meet needs of the today's world, the technology sector has been expanding and developing quickly in the world of today [1-3]. Humans have found technology to be a trustworthy and dependable friend, and it never ceases to astound and surprise us with new inventions[2,3,4]. Additionally today, the recently discovered COVID-19 corona virus has spread globally, infecting millions of peoples and killing thousands of peoples[3,6]. Once more, technology is there to help us combat this fatal virus. as number of healthcare workers becoming infected by COVID-19 [7,8]has been rising, many countries have begun to look for a existing answer is to reduce the straight contact among healthcare[5,9-11] workers and COVID19 patients or get an substitute for healthcare workers to observe and care for COVID-19 patients. The International Council of Nurses found that healthcare workers globally account for 7% of all COVID-19 cases[12-15].

Humans must prioritise their health if they want to live better lifestyles. Unfortunately, there are a number of factors that contribute to the global health problem, including poor access to healthcare[16], a communication [17,18] gap between patients and doctors[19], and a lack of medical professionals during a patient's most difficult moment[20]. A paradigm employing the Internet of Things (IoT)[13,22] was therefore proposed by the healthcare industry to address all of these concerns, allowing doctors, relatives, caregivers[23], and patients to directly connect with one another even when a doctor is not there in hospital[24]. Additionally, the patient need not visit the hospital for a standard checkup[25]. This project uses a Raspberry Pi model[26], a temperature sensor, a variety of switches, and an internet-of-things-based patient health monitoring system[16,27]. The patient bed is equipped with all of these sensors and switches. Through the Raspberry Pi board[27], the gathered data was transmitted in an encrypted format to the server. On their computer or Smartphone[28], a doctor has access to real-time data whenever and wherever they are[29]. Additionally, the physician will issue a prescription based on the values that the sensors measured[30]. The patient's information can be kept in a database on a server for later use[31].

2. RELATED WORK

A wearable sensor-based health monitoring system developed by Vivek Pardeshi and colleagues using the Internet of Things and the Raspberry Pi tracks a person's temperature, blood pressure, heart rate, and electrocardiogram (ECG). The Raspberry Pi sends the same data to the server. With the use of MEMS technology, data acquisition in this case uses less energy. Ultra-low power processors also help a processing unit's energy efficiency. Additionally, adding radio transceivers inside SoCs enhances data transmission. Through GSM technology or the Internet, the specific person can be directly informed of any irregularities in their health status. [1]

Sonali Bhutad, Ashvini Kamble, Patient Health Monitoring System based on IOT with The article "Nested Cloud Security" described a zooming technique that helps the Health Monitoring System evolve with the goal of giving clinicians the crucial patient health history in real time. the doctors in the appropriate examination and treatment. Wearability, accuracy, low power consumption, and affordability of Remote Sensing make System reliable and efficient. [2]

"Developing IoT Based Wheelchair: the Biomedical Data Logging and Emergency Contingency Services," by Tahmidul et al. In order to provide medical care and rehabilitation for people with disabilities, features were gained by providing a module for heart rate sensor, proximity sensor, GPS, torque sensor, and posture detection systems for the patient. [3]

Dr. Intisar S. et al. "Home Telehealth by IoT," which makes use of an IoT network, enables doctors, hospitals, caregivers, and patients to interact actively and in real time. We'll employ synchronising and massaging the system. [4]

Ha Manh Do, Weihua Sheng, Minh Pham, and Yehenew Mengistu, This technology, called "Cloud-based Smart Home Environment for Home Healthcare," uses non-invasive wearable sensors to capture physiological signals and offers contextual information. Utilize this complete information to incorporate contextual data to health data.

recognise the state of health of the caregiver.[5]

Pranathi B S, et al Using an IoT-based programmable Smart Medicine Kit, the proposed system uses smartphone notifications, buzzers, and indications by LED on the kit's various elements. [6]

Designing of Low-Cost Miniature Robot for COVID-19 assistance, Nasopharyngeal Swab Sampling by Shuangyi Wang, et al. Offer a cheap, simply assembleable, and remotely controllable micro robot. Nasopharyngeal (NP) swab collection is a useful technique in our project for coronavirus illness diagnosis. [7]

"IoT Based HealthCare Monitoring System," by Siddhartha Haldar, et al. The suggested technology transmits data wirelessly while monitoring crucial health metrics. The intention was to handle patient protection, privacy, and authentication with a password-protected Wi-Fi module.[8]

Senthilkumar.J, Vigneshwar.R, and Kalaiselvi.V.K.G., "HEALTH ASSISTIVE DEVICE FOR MULTIPLE DISABLED PEOPLE," In this study, the body water level is determined using the MC-S-86 sensor, while the blood oxygen saturation, heart rate, and body temperature are determined by the SpO2 sensor.[9]

3. PROPOSED SYSTEM

This proposed system is intended to keep track of the patient's health[36] in a COVID[37] scenario. Without making physical touch, convey a message to the physician, a family member, and Caretaker[38].

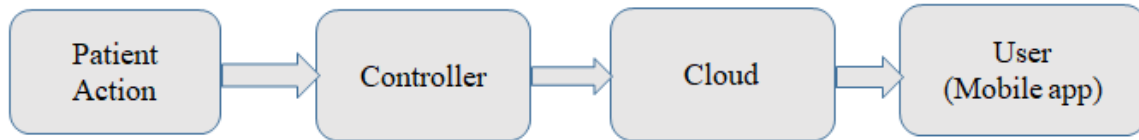


Figure 1 Process Flow Diagram

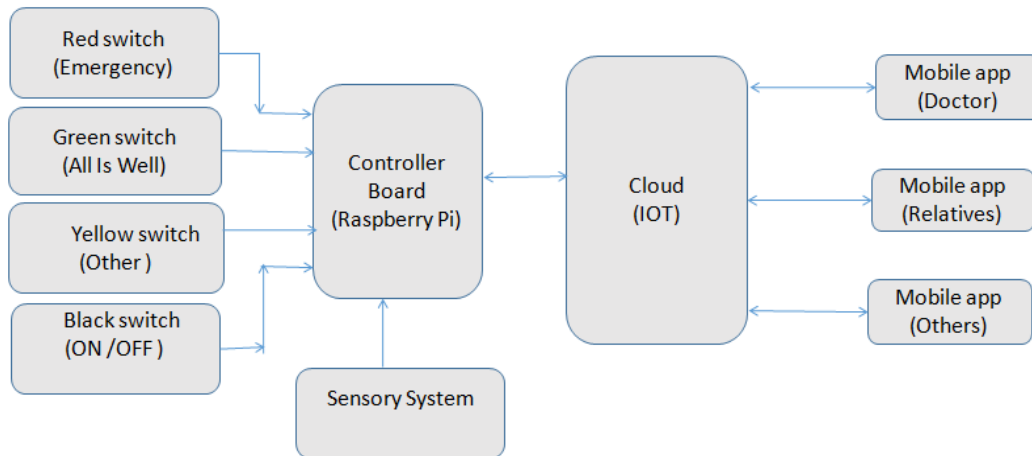
Proposed Architecture:

Figure 2. Proposed Architecture

In the suggested method, a doctor, caregiver, or relative would not frequently visit a COVID patient in a hospital ward. Patient requirements, patient stages, and patient temperature are continuously monitored using this technology. One box with three switches of various colors and a temperature sensor is located in the patient room and is used to continuously monitor the patient's temperature[27]. When a patient is ill, they should press the RED switch. When they are well, they should press the GREEN switch[28]. If they need medicine or lunch, they should press the YELLOW button[39]. A contactless temperature sensor is used to measure the patient's temperature. When a patient presses a switch, a message is sent to the controller via the cloud. We create mobile apps to track data coming from the cloud[40].

The objective of the System

1. Study and understanding hospitalized COVID patients and caretakers.
2. Analysis and Selection of parameters of action.
3. Design of front end systems.
4. Design of back end systems.
5. Integration, testing and validation of systems.

4. RESULTS

a. IOT Hardware Design

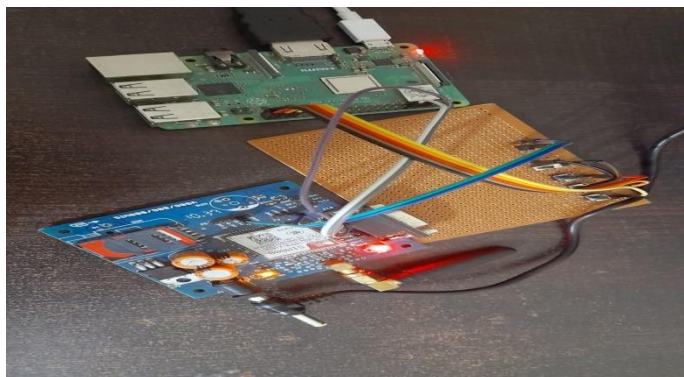


Figure 3. IOT Hardware Design

Figure3 shows the IOT Hardware design.

b. GSM Module

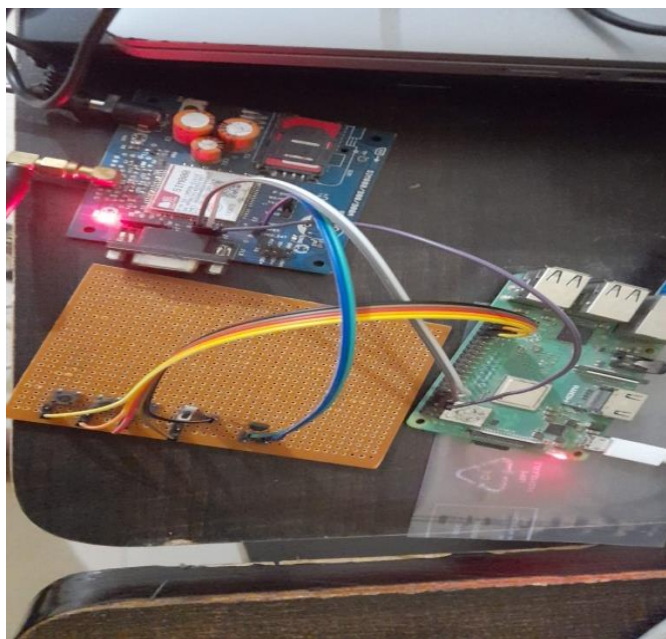


Figure 4. GSM Module

Figure 4 above Shows the GSM Module.

c. Temperature of Patient in App

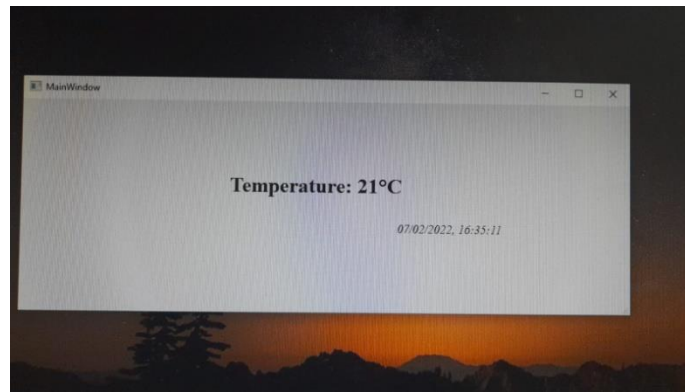


Figure5. Temperature in App

Figure 5 above shows the temperature is displayed in the application window.

5. CONCLUSION

The impact of the technological revolution in medicine is simply enormous. Additionally, the system & communication tools have significantly enhanced the execution of medical practices. The goal of the health monitoring system put forth in said project, to instantly give doctors, family members, and caregivers access to vital patient health information. This can aid doctors in performing the proper analysis and treatment.

REFERENCES

- [1]. Vivek Pardeshi, Saurabh Sagar, Swapnil Murmuwar, Pankaj Hage, "Health Monitoring System using IoT and Raspberry Pi-A Review," International Conference on Innovative Mechanism for Industry Application (ICIMIA 2017).
- [2]. "Hybrid optimum model development to determine the Break", Journal of Multimedia Technology & Recent Advancements, 2022, vol 9, issue 2, pp. 24 - 32
- [3]. Ashvini Kamble, Sonali Bhutad, "IOT based Patient Health Monitoring System with Nested Cloud Security", 4th International Conference on Computing Communication and Automation (ICCCA)-2018.
- [4]. Tahmidul Ashraf, Nadia Islam, Shanto Lawrence Costa, Md. Shamsul Arefin, A.K.M. Abdul Malek Azad, "Developing an IoT Based Wheelchair: Biomedical Data Logging & Emergency Contingency Services" IEEE International Conference on Consumer Electronics (ICCE)-2021.
- [5]. Dr. Salah S. Al-Majeed, Dr. Intisar S. Al-Mejibli, Prof. Jalal Karam. "Home Telehealth by Internet of Things (IoT)", IEEE 28th Canadian Conference on Electrical and Computer Engineering Halifax, Canada, May 3-6, 2015.
- [6]. Kazi Kutubuddin sayyad Liyakat, "Nanotechnology Application in Neural Growth Support System", Nano Trends: A Journal of Nanotechnology and Its Applications, 2022, Vol 24, issue 2, pp. 47 - 55
- [7]. "A novel Design of IoT based 'Love Representation and Remembrance' System to Loved One's", Gradiva Review Journal, 2022, Vol 8, Issue 12, pp. 377 - 383.

- [8]. Minh Pham, Yehenew Mengistu, Ha Manh Do and Weihua Sheng, “ Cloud-based Smart Home Environment for Home Healthcare” ,International Journal of Engineering Research & Technology (IJERT)2018.
- [9]. Abijna Rao, Pranathi B S, Adapa Shivani, Rajasekar Mohan “ IoT-based Smart Medicine Kit” ,International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 1, January 2015.
- [10]. Shuangyi Wang , Kehao Wang , Ruijie Tang, Jingzhe Qiao, Hongbin Liu, “ Design of a Low-Cost Miniature Robot to Assist the COVID-19 Nasopharyngeal Swab Sampling” , IEEE TRANSACTIONS ON MEDICAL ROBOTICS AND BIONICS, VOL. 3, NO. 1, FEBRUARY 2021.
- [11]. Kazi Kutubuddin Sayyad Liyakat, “Predict the Severity of Diabetes cases, using K-Means and Decision Tree Approach”, Journal of Advances in Shell Programming, 2022, Vol 9, Issue 2, pp. 24-31
- [12]. Shreyaasha Chaudhury, Debasmita Paul, Ruptirtha Mukherjee, Siddhartha Halder, “ Internet of Thing Based HealthCare Monitoring System” , IEMECON.2017 . 16
- [13]. Kalaiselvi.V.K.G , Senthilkumar.J, Vigneshwar.R, “ HEALTH ASSISTIVE DEVICE FOR MULTIPLE DISABLED PEOPLE” , International Conference on Power, Energy, Control an, Apr 2020.
- [14]. Wale Anjali D., Rokade Dipali, et al, “Smart Agriculture System using IoT”, International Journal of Innovative Research In Technology, 2019, Vol 5, Issue 10, pp.493-497.
- [15]. Kazi K. S., “Significance And Usage Of Face Recognition System”, Scholarly Journal For Humanity Science And English Language, 2017, Vol 4, Issue 20, pp 4764-4772.
- [16]. Miss. A. J. Dixit, et al, “Iris Recognition by Daugman’s Method”, International Journal of Latest Technology in Engineering, Management & Applied Science, 2015, Vol 4, Issue 6, pp 90-93.
- [17]. Pankaj R Hotkar, Vishal Kulkarni, et al, “Implementation of Low Power and area efficient carry select Adder”, International Journal of Research in Engineering, Science and Management, 2019, Vol 2, Issue 4, pp. 183-184.
- [18]. Karale Nikita, Jadhav Supriya, et al, “Design of Vehicle system using CAN Protocol”, International Journal of Research in Applied science and Engineering Technology, 2020, Vol 8, issue V, pp. 1978-1983, <http://doi.org/10.22214/ijraset.2020.5321>.
- [19]. Kutubuddin Kazi, “Lassar Methodology for Network Intrusion Detection”, Scholarly Research Journal for Humanity science and English Language, 2017, Vol 4, Issue 24, pp.6853-6861.
- [20]. Salunke Nikita, et al, “Announcement system in Bus”, Journal of Image Processing and Intelligent remote sensing, 2022, Vol 2, issue 6
- [21]. Kazi Kutubuddin, “Model for Agricultural Information system to improve crop yield using IoT”, Journal of open Source development, 2022, vol 9, issue 2, pp. 16 – 24.
- [22]. Kutubuddin, “Reverse Engineering’s Neural Network Approach to human brain”, Journal of Communication Engineering & Systems, 2022, vol 12, issue 2, pp. 17 – 24.
- [23]. Madhupriya Sagar Kamuni, et al, “Fruit Quality Detection using Thermometer”, Journal of Image Processing and Intelligent remote sensing, 2022, Vol 2, issue 5.
- [24]. Shweta Kumtole, et al, “ Automatic wall painting robot Automatic wall painting robot”, Journal of Image Processing and Intelligent remote sensing, 2022, Vol 2, issue 6
- [25]. Kadam Akansha, et al, “Email Security”, Journal of Image Processing and Intelligent remote sensing, 2022, Vol 2, issue 6
- [26]. Satpute Pratiksha Vaijnath, Mali Prajakta et al. “Smart safty Device for Women”, International Journal of Aquatic Science, 2022, Vol 13, Issue 1, pp. 556- 560

- [27]. "Application of Nanotechnology in Neural Growth Support System", Nano Trends: A Journal of Nanotechnology and its Applications, 2022, vol 24, issue 2, pp. 47 - 55
- [28]. Miss. Priyanka M Tadlgi, et al, "Depression Detection", Journal of Mental Health Issues and Behavior (JHMIB), 2022, Vol 2, Issue 6, pp. 1-7
- [29]. Kutubuddin Kazi, "Multiple object Detection and Classification using sparsity regularized Pruning on Low quality Image/ video with Kalman Filter Methodology (Literature review)", 2022
- [30]. Waghmare Maithili, et al, "Smart watch system", International journal of information Technology and computer engineering (IJITC), 2022, Vol 2, issue 6, pp. 1- 9.
- [31]. Divya Swami, et al, "Sending notification to someone missing you through smart watch", International journal of information Technology and computer engineering (IJITC), 2022, Vol 2, issue 8, pp. 19-24
- [32]. Shreya Kalmkar, Afrin, et al., " 3D E-Commers using AR", International journal of information Technology and computer engineering (IJITC), 2022, Vol 2, issue 6, pp. 18-27
- [33]. Kutubuddin Kazi, "Smart Grid energy saving technique using Machine Learning" Journal of Instrumentation Technology and Innovations, 2022, Vol 12, Issue 3, pp. 1 – 10.
- [34]. M Pradeepa, et al, "Student Health Detection using a Machine Learning Approach and IoT", 2022 IEEE 2nd Mysore sub section International Conference (MysuruCon), 2022.
- [35]. Nilima S. Warhade, Rahul S. Pol, Hemlata M. Jadhav, Altaf O. Mulani, " Yarn Quality detection for Textile Industries using Image Processing", Journal Of Algebraic Statistics, 2022, Vol 13, Issue 3, pp. 3465-3472
- [36]. Rahul S. Pole, Amar Deshmukh, Makarand Jadhav, et al, " iButton Based Physical access Authorization and security system", Journal of Algebraic Statistics, 2022, Vol 13, issue 3, pp. 3822-3829.
- [37]. A. O. Mulani and G. N. Shinde, "An approach for robust digital image watermarking using DWT PCA", Journal of Science and Technology, 2021, Vol.6, Special Issue 1.
- [38]. U. P. Nagane and A. O. Mulani, "Moving Object Detection and Tracking Using Matlab", Journal of Science and Technology, 2021, Vol.6, Special Issue 1
- [39]. Mulani, Altaf O., and P. B. Mane. "Watermarking and cryptography based image authentication on reconfigurable platform." Bulletin of Electrical Engineering and Informatics 6.2 (2017): 181-187.
- [40]. Jadhav, Makrand M. "Machine Learning based Autonomous Fire Combat Turret." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12.2 (2021): 2372-2381.
- [41]. Swami, Shweta S., and Altaf O. Mulani. "An efficient FPGA implementation of discrete wavelet transform for image compression." 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS). IEEE, 2017.
- [42]. Shinde, Ganesh, and Altaaf Mulani. "A robust digital image watermarking using DWT-PCA." International Journal of Innovations in Engineering Research and Technology 6.4 (2019): 1-7.
- [43]. Kulkarni, Priyanka R., Altaaf O. Mulani, and P. B. Mane. "Robust invisible watermarking for image authentication." Emerging Trends in Electrical, Communications and Information Technologies. Springer, Singapore, 2017. 193-200.
- [44]. Bhanudas Gadade and Altaf Mulani, "Automatic System for Car Health Monitoring", International Journal of Innovations in Engineering Research and Technology, 57–62, 2022
- [45]. Pratima Amol Kalyankar, Altaf O. Mulani, Sampada P. Thigale, Pranali Gajanan

- Chavhan and Makarand M. Jadhav, "Scalable face image retrieval using AESC technique", Journal Of Algebraic Statistics Volume 13, No. 3, p. 173 – 176, 2022
- [46]. A. O. Mulani and G. N. Shinde, "An approach for robust digital image watermarking using DWT- PCA", Journal of Science and Technology, Vol.6, Special Issue 1, 2021 DOI: <https://doi.org/10.46243/jst.2021.v6.i04.pp59-62>
- [47]. U. P. Nagane and A. O. Mulani, "Moving Object Detection and Tracking Using Matlab", Journal of Science and Technology, Vol.6, Special Issue 1, 2021 DOI: <https://doi.org/10.46243/jst.2021.v6.i04.pp63-66>
- [48]. Priyanka Kulkarni and A. O. Mulani, "Robust Invisible Digital Image Watermarking using Discrete Wavelet Transform", International Journal of Engineering Research & Technology (IJERT), Vol. 4 Issue01, pp.139- 141, Jan.2015
- [49]. Mulani, Altaf O., and Pradeep B. Mane. "High-Speed Area-Efficient Implementation of AES Algorithm on Reconfigurable Platform." Computer and Network Security (2019): 119.
- [50]. Deshpande, Hrushikesh S., Kailash J. Karande, and Altaaf O. Mulani. "Area optimized implementation of AES algorithm on FPGA." 2015 International Conference on Communications and Signal Processing (ICCSP). IEEE, 2015.
- [51]. Godse, A. P., and A. O. Mulani. Embedded systems. Technical Publications, 2009.
- [52]. Mulani, Altaf O., and P. Mane. "Secure and area efficient implementation of digital image watermarking on reconfigurable platform." Int. J. Innov. Technol. Explor. Eng.(IJITEE) 8.2 (2018): 1.
- [53]. Rahul G. Ghodake and A. O. Mulani, "Microcontroller Based Drip Irrigation System", Techno-societal 2016, International conference on advanced technologies for societal applications, pp. 109–115.
- [54]. Amruta Mandwale and A. O. Mulani, "Different Approaches For Implementation of Viterbi decoder", IEEE International Conference on Pervasive Computing (ICPC), Jan. 2015.
- [55]. Amruta Mandwale and A. O. Mulani, "Implementation of Convolutional Encoder & Different Approaches for Viterbi Decoder", IEEE International Conference on Communications, Signal Processing Computing and Information technologies, Dec. 2014.
- [56]. Amruta Mandwale and A. O. Mulani, "Implementation of High Speed Viterbi Decoder using FPGA", International Journal of Engineering Research & Technology (IJERT), Feb. 2016
- [57]. D. M. Korake and A. O. Mulani, "Design of Computer/Laptop Independent Data transfer system from one USB flash drive to another using ARM11 processor", International Journal of Science, Engineering and Technology Research, 2016.
- [58]. Rahul G. Ghodake and A. O. Mulani, "Sensor Based Automatic Drip Irrigation System", Journal for Research, 53-56, 2016.
- [59]. Rahul Shinde and A. O. Mulani, "Analysis of Biomedical Image", International Journal on Recent & Innovative trend in technology (IJRITT), July 2015
- [60]. Rahul Shinde and A. O. Mulani, "Analysis of Biomedical Image using Wavelet Transform", International Journal of Innovations in Engineering Research and Technology (IJIERT), July 2015
- [61]. A. O. Mulani and P. B. Mane, "Area optimization of cryptographic algorithm on less dense reconfigurable platform,"2014 International Conference on Smart Structures and Systems (ICSSS), Chennai, 2014, pp. 86- 89

- [62]. A.O.Mulani, M. M. Jadhav and Mahesh Seth, "Painless Non- invasive blood glucose concentration level estimation using PCA and machine learning" in the CRC Book entitled Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications, 2022.
- [63]. Kamble, Akshata, and A. O. Mulani. "Google Assistant based Device Control." *Int. J. of Aquatic Science* 13.1 (2022): 550-555.
- [64]. Pathan, Atik N., et al. "Hand Gesture Controlled Robotic System." *Int. J. of Aquatic Science* 13.1 (2022): 487-493.
- [65]. Kolekar, Supriya D., et al. "Password Based Door Lock System." *Int. J. of Aquatic Science* 13.1 (2022): 494-501.
- [66]. Swapnil Takale, Dr. Altaaf Mulani, "Video Watermarking System", *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, Volume 10, Issue III, Mar-2022.
- [67]. J. P. Patale et al. "Python Algorithm to Estimate Range of Electrical Vehicle", *Telematique*, Volume 21, No. 1, 2022.
- [68]. Jayshri Prakash Patale, A. B. Jagadale, A. O. Mulani, and Anjali Pise. "A Systematic Survey on Estimation of Electrical Vehicle". *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)* ISSN : 2799-1156, vol. 3, no. 01, Dec. 2022, pp. 1-6, doi:10.55529/jecnam.31.1.6.
- [69]. Kashid, M.M., Karande, K.J., Mulani, A.O. (2022). IoT-Based Environmental Parameter Monitoring Using Machine Learning Approach. In: Kumar, A., Ghinea, G., Merugu, S., Hashimoto, T. (eds) *Proceedings of the International Conference on Cognitive and Intelligent Computing. Cognitive Science and Technology*. Springer, Singapore. https://doi.org/10.1007/978-981-19-2350-0_5
- [70]. Swapnil Takale, and Dr. Altaaf Mulani. "DWT-PCA Based Video Watermarking". *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)* ISSN : 2799-1156, vol. 2, no. 06, Nov. 2022, pp. 1-7, doi:10.55529/jecnam.26.1.7.
- [71]. A. O. Mulani and Dr. P. B. Mane, "High throughput area efficient FPGA implementation of AES Algorithm", in the *Intech Open Access Book* entitled *Computer and Network Security*, Feb. 2019.
- [72]. Jadhav, H.M., Mulani, A. and Jadhav, M.M. (2022). Design and Development of Chatbot Based on Reinforcement Learning. In *Machine Learning Algorithms for Signal and Image Processing* (eds D. Ghai, S.L. Tripathi, S. Saxena, M. Chanda and M. Alazab). <https://doi.org/10.1002/9781119861850.ch12>
- [73]. V. B. Utpat, Dr. K. J. Karande, Dr. A. O. Mulani, "Grading of Pomegranate Using Quality Analysis", *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, Volume 10 Issue II Feb 2022.
- [74]. Aasawari Boxey, Anushri Jadhav, Pradnya Gade, Priyanka Ghanti, & Dr.A.O. Mulani. (2022). Face Recognition using Raspberry Pi. *Journal of Image Processing and Intelligent Remote Sensing (JIPIRS)* ISSN 2815-0953, 2(04), 15–23. <https://doi.org/10.55529/jipirs.24.15.23>