



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 13, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Asperger's Syndrome Monitoring and Tracking System

¹Mrs V.Nithya, ²Ms .L.Pavithra, ³Mrs.S.Prabhavathy, ³Kaviya S, ⁴Sowmiya M

^{1,2,3}Assistant Professor, Department of Electronics and Communication Engineering, Christ the King Engineering College, Tamil Nadu, India

^{4,5}Student, Department of Electronics and Communication Engineering, Christ the King Engineering College, Coimbatore, Tamil Nadu, India

ABSTRACT: There is been different wireless technologies several recent trends have produced Passengers tracking systems to monitor the passengers performance. Along with the performance, passenger's movement tracking is also necessary since it concerns to safety measure. In that case the tracking will help airhostess to know where the student is. The main aim of this proposed scheme is to keep track of the passengers & if any unusual activity is found then the airhostess is informed with an alarm. With this project the airhostess will easily get to know where their passenger is. The whole project consists of two units; first one being the school unit where BLE (Bluetooth Low Energy) device is like a watch. The second one is the bus unit where a Mobile module with the App is placed. With the help of an Android application all the details of the passengers are sent to their airhostess respectively. A stress monitoring system tailored for individuals with Autism Spectrum Disorders (ASD) and developed for the educational institution is presented. ASD face problems with effective stress management due to their high self-perceived levels of stress, poor ability to cope with it, and difficulties with the accurate detection of the source of stress. The stress monitoring system including autonomic wearable device (wristband), both the electronics and mechanical part, as well as the software application for data analysis are shown. The wearable device includes sensors for measuring heart rate, skin resistance, temperature and movement.

KEYWORDS: Autism spectrum disorders, electronic sensors, stress management, stress monitoring, temperature sensor, voltage regulator.

1. INTRODUCTION

Stress is a significant factor affecting mental and physical health. It may lead not only to fatigue but also weaken our immune system. In Autism Spectrum Disorder (ASD) probably major treatable diseases of our time due to growing number of affected children's. Children with Autism Disorder need important backing from institutional, educational, clinical or medical and social system. Autism patient suffer in speech, difficulty in having interaction with social world, it also include the disorder development of brain which in turn affect the brain structural and functional capabilities. In recent years, ASD is increasing at a higher momentum which needs early diagnosis. Recently 59 children are affected by autism spectrum disorder patient. This disease occur in childhood but symptoms can be detected in adulthood. Our study aim is to estimate ASD at sooner possible time are increases more accuracy than previous research and reduce medical cost. Various impairments in social communication and interaction is caused by it if it is detected early the toddler can get improvement in his communication skill through therapy. It can be caused by various life events and stimuli as many possible stressors occur in daily activities. Some of them have a social background and relate to a variety of social interactions, e.g. communicating with other people, dealing with complicated tasks, group cooperation, functioning under time pressure. In American Psychological Association stress can be classified into acute stress, episodic acute stress and chronic stress. Acute stress is short-term stress associated with daily demands, recent, past or near-future events. Episodic acute stress occurs when individuals suffer from repetitive stressful challenges and anticipate near danger. Chronic stress involves ongoing long-term worries that seem to occur permanently and is the most critical and harmful form of this Phenomenon. ASD refers to the condition, where the patients face difficulties in social interactions and communication, show repetitive behavior, lack language

skills, and perform a limited range of activities. Some patients do not understand pain, and therefore, when they are angry, they get involved in self-destructive activities. Some people with ASD have a known difference, such as a genetic condition. People with ASD may behave, communicate, interact and learn in different ways from most other people. ASD begins before the age of 3 years and can last throughout a person's life, although symptoms may improve over time. Some children show ASD symptoms until 24 months of age or later. Some ASD children gain new skills or lose skills they had. ASD can sometimes be detected at 18 months of age or younger. The health condition of an ASD patient can be improved by providing constant care and appropriate therapies. Participants are trained to appraise the stressful events, develop effective skills and methods to deal with stressful situations, and learn how to use these skills. Many children with autism and others also able to live relatively normal lives. If autism is serious, it usually leads to severe problems, eventually may lead to normal or near-normal lives. There is no cure for ASD, and there is no one-size-fits-all treatment. The autism children speak only a few single words at most at age 4. By age 8, they can speak 70 percent. 30% of young children have less severe autism symptoms at age 6. ASD are neurodevelopmental disorders comprising of numerous difficulties with social communication, social interaction including social emotional reciprocity, repetitive patterns of behavior, interests or activities and hyper or hyperactivity to sensory input. Individuals with ASD respond faster to fear, often experience high self-perceived stress levels, find it difficult to cope with stressful situations in everyday life. They extracted the face from the background and detected happy, sad, surprise, neutral, and angry expressions with reasonable accuracy. They proposed an assistance system for caregivers of ASD patients in the form of a smart wearable device that can detect position, heartbeat, sound, and movement of the patient.

II. LITERATURE SURVEY

Autism Spectrum Disorder (ASD) is quite a wide-spread and complex health problem. The American Academy of Pediatrics recommends screening all children for autism. [8] The word spectrum is used because there is a wide variety of symptoms and their severity. Some examples of autistic behavior had appeared in literature long before scientists named it. The Talk of Martin Luther describes a 12-year-old boy who has definite autistic symptoms. Finding a resolution to the controversy is particularly important in light of the suggested changes for the forthcoming diagnostic and statistical manual of mental disorders [12]. Donald Triplet was the first patient with an official diagnosis of autism. He first was examined by Kanner in 1938. The paper described various cases, including those 11 children with a common unusual behaviour model [9].

The general term Autism Spectrum Disorder replaced some other names in 2013. That update of classification helped to reach consensus among scientists, physicians, other specialists. Adults with the disorder need to pay special attention in child planning, high planning risk that kid would have autistic disorder too. The number of reported cases of ASD increased significantly over past 20-30 years. This is a global tendency. [15]

Diagnosing young children is often a two-step process. General development screening and further examination, especially if the child is seriously at risk. [6] The contribution of different Arab countries to international prevalence studies of ASD is scarce. In the Sultanate of Oman, prevalence was 1.4 cases per 10,000 children where in United Arab Emirates (UAE), from a representative random sample of 3-year-old UAE national children, 29 per 10k of children had autism [3].

III. PROPOSED METHODOLOGY

In this work, we are proposing a system consisting of a smart wrist band (SWB), an interactive monitor, and a camera device attached to the monitor for monitoring ASD patients. These devices will be connected to a mobile application to continuously monitor and keep them in a learning environment all day long without caregivers. The SWB consists of an accelerometer, gyroscope, magnetometer, GPS tracker, heart rate sensor, pedometer, and temperature sensor. Accelerometer senses vibration to detect acceleration. Gyroscope is used for measuring angular movement, and a magnetometer is used to locate the position about the north pole. GPS is widely used to track a person by providing geographical coordinates. These sensors will be attached with a microcontroller, esp8266, and a sim card module. When Wi-Fi is available, esp8266's built-in Wi-Fi module will send sensor data to the mobile server. In the case of non-availability of Wi-Fi, the GSM module will be used to transfer data to the mobile application. This device collects data from its inbuilt heart rate sensor, pedometer, and temperature sensor and will send the patient's condition to the mobile server. An ambient temperature sensor will be set up in the corner of the room for continuous monitoring of the room.

There will be some toys and counting objects in the room. RFID will be attached to them to detect its touching. The output device will be a sound box and a computer screen, which will contain a camera to take the images of the patient for emotion analysis in every 5 min. All the devices described in this system will send data to the mobile server, and data will be stored for around 20 days. The processed data will be sent to the server from the mobile device. Our AI models will analyze the health condition of the autistic individual and operate through some visuals and sounds. Figure 1 depicts the proposed AI-based system for the ASD patients. The children will have a routine for playing, learning, and sleeping. The

AI-powered application will be installed on the mobile. It will produce some relaxation music during sleeping, show visuals during teaching, and help them. Some of the parameters mentioned above can be easily measured using available devices eg. body temperature.

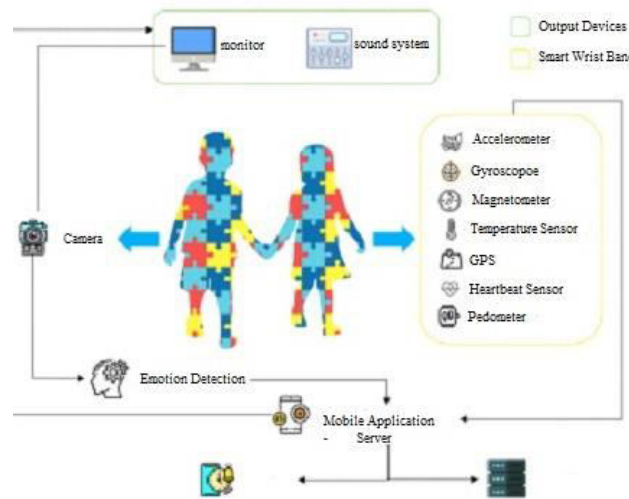


Figure 3.1 A Monitoring System for Patients of Autism Spectrum Disorder

3.1 MEASURING SYSTEM

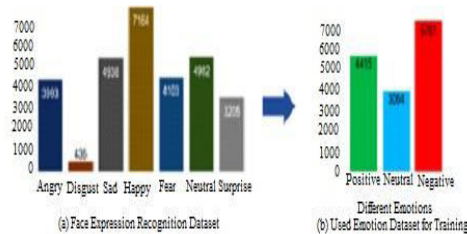
The body's response to psychological stress is the result of a number of neuro hormonal changes. They depend on the activation of the hypothalamic-pituitary-adrenal axis, brainstem nor adrenergic neurons, sympathetic adrenomedullary system, and parasympathetic system. The evolutionary goal of activating these systems is to adopt the body into a "fight or flight" situation. As a result, there are changes in several body functions, including among others:

- increased heart rate,
- increased blood pressure,
- increased temperature,
- skin neuro endocrine system stimulation
- Skin sweat glands

The ambient temperature sensor will try to alarm the other members when the room temperature gets too hot or too cold. The attached heart rate sensor and temperature sensor in the smart band will provide a way of monitoring his health status. An AI model will be deployed to analyze his sleeping pattern, heart rate data, and temperature data collected from the band. It will then alarm parents through a text message and app notification. If the child goes outside without telling anyone, he can easily be found out using the location tracked by the GPS attached in the SWB. The whole architecture will monitor the child's concentration, health condition, and activity continuously.



3.2. EMOTION DETECTION MODEL



dataset for training

The automatic emotion recognition domain main brings new methods and technologies might be used to enhance therapy of children with autism patient regarding representation models, the basic emotion of the basic and most frequently recognized especially happiness, fear and sadness. Qualitative analysis are revealed the important clues on the participant group construction are the most common combination in the modalities and the methods. All the channel are reported to be in the prone to some disturbance and as a result information with a specific symptoms of emotions might be temporarily or permanently unavailable.

Typically performed by measuring various human body parameters or electric impulses in the nervous system and analysis the changes. The most popular techniques are the electroencephalography, skin resistance measurements, blood pressure, heart rate, eye activity, and emotion analysis. Individuals with autism frequently fail to react appropriately to emotions of the other and research has suggested the impairment and emotion expression.

Convolution is done by multiplying filters with the image pixels to find new features. It is also necessary to match dimensionality with input block as it is mandatory to have the same dimension in input and output for residual operation. As the number of filters increases, residual networks tend to die. So, residual activation is scaled to in between 0.1 and 0.3 in Inception-ResNetV2. The wrist unit was designed from scratch to specifically suit the needs of children with developmental disorders. It is comprised of an electronic system with sensors, signal processing components and a battery power supply housed in a rigid protective case, equipped with anelastic wristband for comfortable and safe use. The system is dedicated to the observation and registration of the value of physiological parameters indicative of stress related reaction in individuals with developmental disorders.

IV. SYSTEM DESIGN AND IMPLEMENTATION

The main part of the device is an embedded system build around a system-on-a-chip integrated circuit PSoC6 from Cypress, targeted to wearable devices containing dual-core CPU subsystem: 150 MHz Arm Cortex-M4F CPU with Floating-Point and Memory Protection Unit and a 100 MHz Cortex M0 + CPU. The digital part of the system also contains 1MB application Flash memory, 288KB of on-chip SRAM, I2C controller, UART, real-time clock, watchdog and timer. The PPG and temperature sensors have been connected using I2C bus, while the skin resistance sensor has been constructed using available on-chip analog and mixed-signal blocks: operational amplifier, trans impedance amplifier, analog multiplexers, A/D and D/A converters.

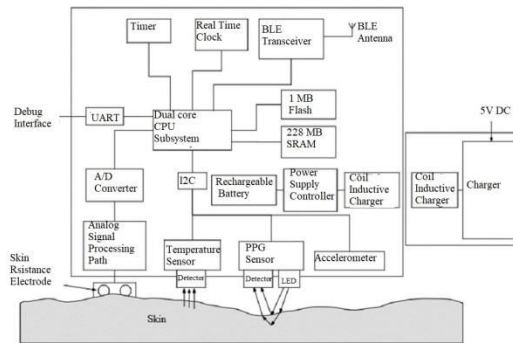


Figure 4.1 Block diagram of sensor

The system was physically realized on the two separate PCBs and one of them including micro controller, sensors, memory, and power supply control unit while second including inductive charger sub circuitry with connectors to a battery and main board. The main board is a 4-layer PCB with a total thickness of 0.41mm and a 20mm × 30mm size. Two inner layers are used mainly as power supply, external layers are used for signals routing. It includes both a low dropout linear voltage regulator for the system power supply as well as a single-cell charger unit with overcharge, over-discharge and over-current protection. The measurements are stored in an on-chip flash-based database. The main board is equipped with Bluetooth Low Energy (BLE) transmitter, which enables the transmission of measurements in real-time and export of the contents of the on-chip database to a Personal Computer (PC) system. The BLE transceiver built into the PSoC6 chip is used with the antenna made of copper layer on the PCB circuitry.

4.1 .MODEL FOR THE STRESS DETECTION

People with autism spectrum disorder often have the difficulties in communication and social interaction resulting typical information processing and abnormalities in the sensory integration. The stress are individuals with autism spectrum disorder is evaluated by the questionnaires or sometimes by saliva biomarkers. We should believe that stress evaluation should benefit from the objective continue measures of stress. Real time detection of stress needs the continuous monitoring. To assess the stress in daily life, we also need the portable device. The algorithm of the excitation calculation is based on a heuristic rule-based on system with the following main assumptions, where in case of stress:

1. Decrease in resistance is observed at Δt after a pulse increase,
2. Temperature decrease is observed at Δt after a resistance decrease,
3. Temperature reduction is observed at $2\Delta t$ after a pulse increase,

where Δt is an experimentally evaluated of constant.

Parents of the children with ASD report higher levels of parental stress than do both parents of children with other DD. Children with ASD generally are withdrawn in the social situations, are less likely to make eye contact with others and less likely to behave in other socially normative ways compared to the children without disabilities. This architecture was most successful in classifying positive emotions. Autistic children don't understand the importance of washing hands or putting on masks, and he cannot understand what he should do in this tough time. . Detection of the child's stress episode is based on the temporal differences between current measurements and the respective reference values. The child will be prompted to do some easy physical activities such as hand raising, spreading, and so on. The system will keep the patient busy with engaging content and generate an alert in times of unusual behaviors.

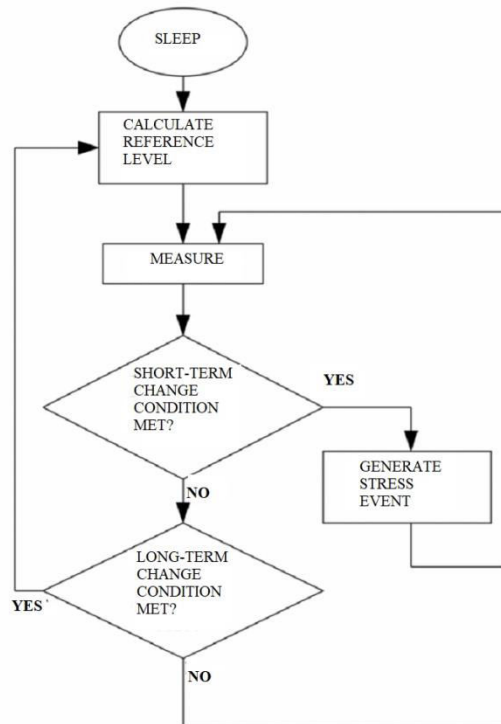


Figure 4.1.1 Algorithm for measuring values: pulse, skin resistance and body temperature.

4.2 .EYE TRACKERS

Individual diagnosed with ASD have been observed in the exhibit different gaze patterns that are evident as they look at the socially salient stimuli such as faces.the pattern of increased attention at the mouth relative to eyes is more pronounced in the natural social setting experiment most of these studies were designed for early ASD screening,while some were aimed to facilitate intervention and the improvement in behaviors.Driven by the availability of general use eye gaze trackers,there are contributions in the category as compared to the others.We divide the section according to desktop-based, head-mounted eye tracker, and eye tracking glasses.A miniature, rigid housing has been manufactured for the electronic systems. Its shape was designed to fit into an opening in the elastic band to securely attach this module to the complete device. The electronic module contains an inductive (contact less) battery charging system, with the receiver coil located on the outer face of the module - farthest from the wrist. A more recent eye tracking study by our group examined 40 children with ASD and 39 children with other developmental condition(3 to 8 years old).

5. RESULT

The study aims to analyze and classify the data set of ASD in adult and child patients.in first stage data set is used in this study their characteristics is explained. The first group includes 30 adult patients with ASD(15male and 15female) and 36 adults without ASD(17 male and 19female).The second group includes 14 child patients with ASD(9male and 5female)and 22 children without ASD(12 male and 10 female).All the datasets were used in the age range of 4 to 60 years.

The graphic module is the central part of the application that allows the presentation of the analyzed results and sensors. The information management of the module has 3 functions: entering the information about a given child in the database (‘Add’ button), editing existing child data (corrections, data updates -‘Edit’ button) and deleting child’s data from the database (‘Remove button). The next functionality controls are the download of data from the wearable device (‘Connect band’ button). The database management module allows to copy the entire database to any location, so the backup can easily be made use or data can be forwarded to other users. It is also possible to import/load a

previously saved database with the system. It will optimize the method of learning based on the patient's mood so that the burden is not imposed on them. The key functionality of the application is the possibility of correlating the stress incident of two or more children in terms of simultaneous stimulation incidents. The tool's primary target use is to detect stress accidents which can be referred to external stress or sources in the environment around the monitored group of children. This, in turn, can help reduce the number of negative stimuli and improve the well being of both the children and caretakers. The basis of the algorithm is the time window - the period of time - in which a joint response to some stimulus was determined. Another key element is the collection of notifications, ordered by chronology of their occurrence. The time window is passed over the set of notifications and checks if all the children are included in it.



Figure 5.1 Wristband model containing electronic components and electrode device.

Technically, the time window is the queue. It is supplemented with the notifications from the set according to the chronology. Each time the size of the time window is tested. When the first and last notification times are too distant, the queue is reset to be nil. Items are removed until the time window size does not exceed the same limit. The next step is testing whether the time window and contains the notification corresponding to all the children. The number of notifications in the queue is checked, if it is smaller than the number of children involved, then the whole process is restarted. Another notification is added to the queue until the notification set is exhausted. Autism often brings the condition as epilepsy, disrupted sleep, feeding issues, overeating, lack of exercise, mental health condition and anxiety. Unlike a simple GPS tracker for kids or GPS watch or autism tracking bracelet with the Theora connect wearable parents have GPS tracking and also direct way audio and cellular communication may indicate distress.

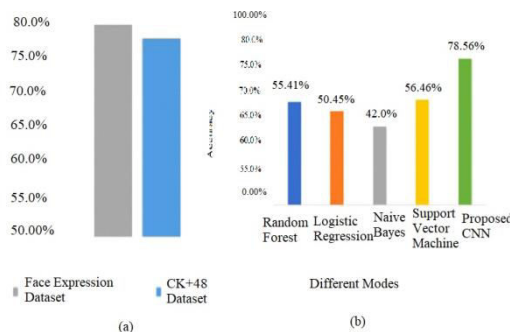


Figure 5.1.1 Comparison of testing accuracies for two different datasets for the proposed model.

However, if the number of notifications is the same or greater as the number of children, the content of the entire queue is checked. When there are notifications for all the children, a correlated notification is added, the queue is cleared and the process restarts again.

VI. CONCLUSION

In recent years, technologies are offering considerable assistance to every sectors. The patients with ASD are mentally and physically unstable. Their response to any sudden event around them is extreme and this phenomenon needs proper attention. That is why environment near them should be as stable as possible. We are using an AI based emotion recognition system to evaluate their sudden Change in emotional state and finding out the cause of it by using the proposed architecture's sensor data. We have proposed the use of different sensors that help the system to provide decisions accordingly. The emotion detection model offers a good indication of the mood and unusual behavior of the patient. Based on them, the level of the learning games and tasks are modified, and there ward System is developed. This way, the patients never get bored with the therapy. Therapists explained to the students what a wristband was and what the reason to put it on was. However, not all participants understood the purpose of wearing the device, which was caused by their deficits and developmental disorders. The span of a single test was predefined as a 5-hour session of continued use (a typical school day). To conduct a comparison with system indications, each stress level increase detection was also confirmed by the therapist during the observation, who registered a stress situation whether it has occurred in the examined group. Each decision to classify a certain situation occurred as stressful was based on such symptoms as children's' behavior, gesture, interaction, voice, and facial features.

A complex stress monitoring system consisting of the autonomic wearable device and data analysis software environment allows not only to observe and record stress level increase incidents in children with Autism Spectrum Disorders but also to generate reports to help evaluate therapeutic effects based on quantifiable information. It enables (while maintaining proper metro logical parameters) accurate measurement of the physiological parameters, such as heart rate, skin resistance and temperature, the values of which change when a stressful situation occurs. The system exhibited a satisfactory capability for self - calibration to the physiological bias of various individuals different base heart rate, local vacuum forming from liquid phase polymers, allow for low-cost manufacturing of sensory units in scalable numbers, ranging from small series up to mass production. The correct functioning of the system was verified and successful detection of stress in a group of individuals was confirmed. The operational tests of the wristband were performed on a group of users, as well as data transfer and analysis using the dedicated software application. This system can help the clueless parents in finding some space to get themselves sorted. In the future, more compact design and features like augmented reality will be incorporated with this proposed system. A human activity recognition model will be incorporated with this existing model as well.

REFERENCES

- [1] S. T. Surulivel, R. Alamelu, and S. Selvabaskar, "A study on workplace stress and its management—A structural equation model (SEM) approach," in *Proc. Int. Conf. Sci. Eng.*
- [8] P. M. Lehrer, R. L. Woolfolk, and W. E. Sime, Eds., *Principles and Practice of Stress Management*. New York, NY, USA: Guilford Press, 2007.
- [9] E. Nagy, S. C. Paton, F. E. A. Primrose, T. N. Farkas, and C. F. Pow, "Speeded recognition of fear and surprise in autism," *Perception*, vol. 47, no. 12, pp. 1117–1138, Dec. 2018.
- [10] *Diagnostic and Statistical Manual of Mental Disorders DSM-5*, 5th ed., Amer. Psychiatric Assoc., Amer. Psychiatric Publishing, Washington, DC, USA, 2013.
- [11] L. Bishop-Fitzpatrick, N. J. Minshew, C. A. Mazefsky, and S. M. Eack, "Perception of life as stressful, not biological response to stress, is associated with greater social disability in adults with autism spectrum disorder," *J. Autism Develop. Disorders*, vol. 47, no. 1, pp. 1–16, Jan. 2017.
- [12] Xia-an Bi, Yingchao Liu, Qi Sun, Xianhao Luo, Haiyan Tan, Jie Chen, et al., "The Genetic-Evolutionary Random Support Vector Machine Cluster Analysis in Autism Spectrum Disorder", *IEEE Access*, vol. 7, no. 30527 - 30535, March 2019.
- [13] KaziShahruckh Omar, ProdiptaMondal, Nabila Shahnaz Khan, RezaulKarimRizvi and MdNazrul Islam, "A Machine Learning Approach to Predict Autism Spectrum Disorder".
- [14] Nithya Shree T and A. Grace Selvarani, "Virtual Reality based System for Training and Monitoring Fire Safety Awareness for Children with Autism Spectrum Disorder", *IEEE Xplorer 5th International Conference on Devices Circuits and Systems (ICDCS)*, 2020.
- [15] V. Balaji and S. KanagaSuba Raja, "Recommendation Learning System Model for Children with Autism", *Intelligent Automation And Soft Computing*, vol. 31, no. 2, pp. 1301-1315, 2022.



- [14] V. Muralidharan, S. Prabhavathy, L. Pavithra, V. Nithya, "IoT Based Smart Monitoring and Controlling System for Gas Leakage in Industries", 2022, SSRG International Journal of Electrical and Electronics Engineering, vol. 9, pp. 38– 46, 2022.
- [15] Mr. Suresh Babu V, An Efficient Method to Extract Digital Text from Scanned Image Text, International Journal of Engineering Research & Technology, Volume 6, 2017.
- [16] Dr.A.Kingsly Jabakumar, IoT Based Detection Of Snoring event For the Treatment of Obstructive Sleep Apnea, International Journal of Advanced Research in Basic Engineering Sciences and Technology, Vol.7, Issue.4, pp.285-292



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details