

DEPARTMENT OF ELECTRONICS AND COMMUNICATION
EXPLORE, DREAM, DISCOVER

ISSUE 53

MONTHLY NEWSLETTER

JUNE 2022

GENESIS

IGNITING THOUGHTS

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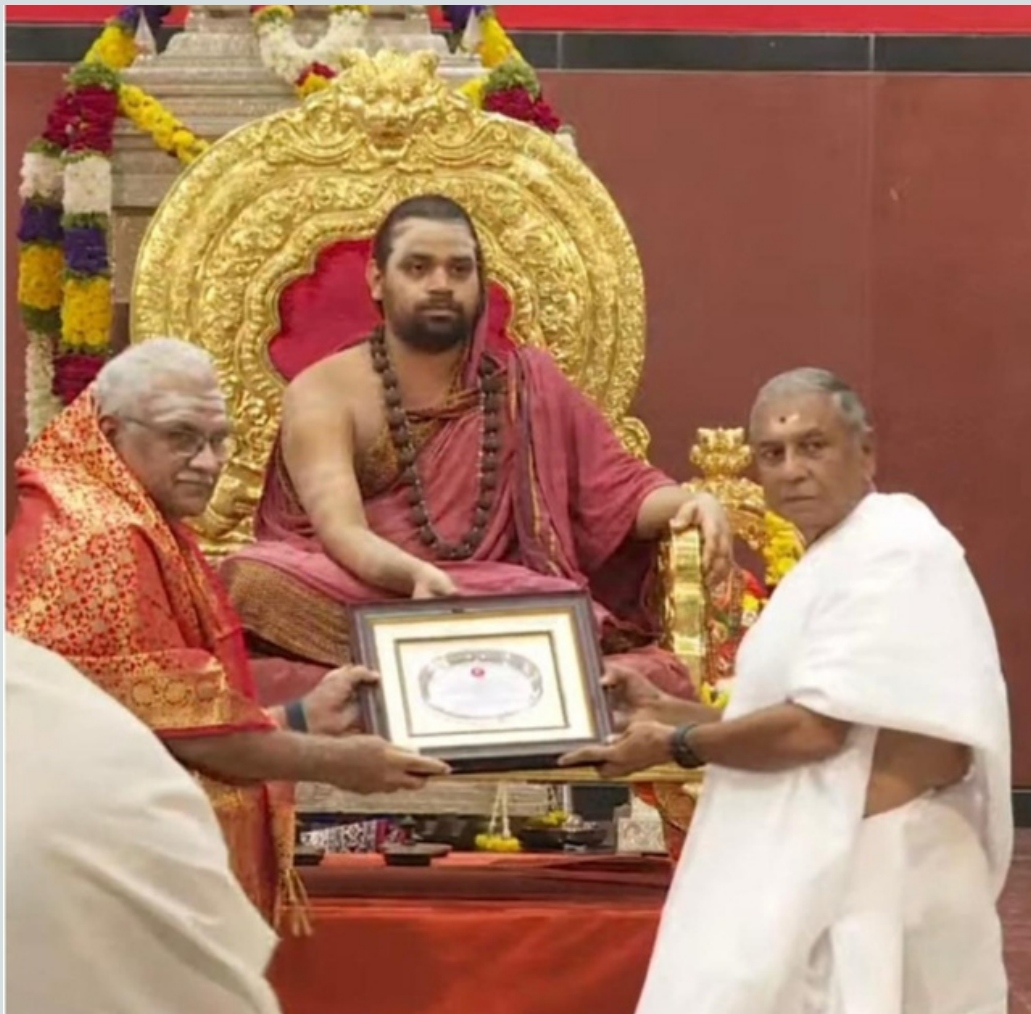
To be recognized at the national and international level for excellence in education and research in Electronics and Communication Engineering.

Mission:

- Inculcating leadership qualities, adaptability, and ethical values
- Imparting quality education in the field of electronics, communication, and related areas to meet the challenges in the industry, academia, and research
- Nurture the growth of each individual by providing a dynamic and conducive learning environment.

Sri Bharati Tirtha Puraskar

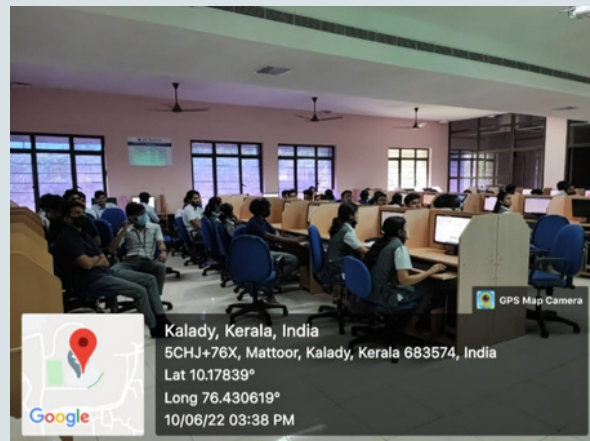
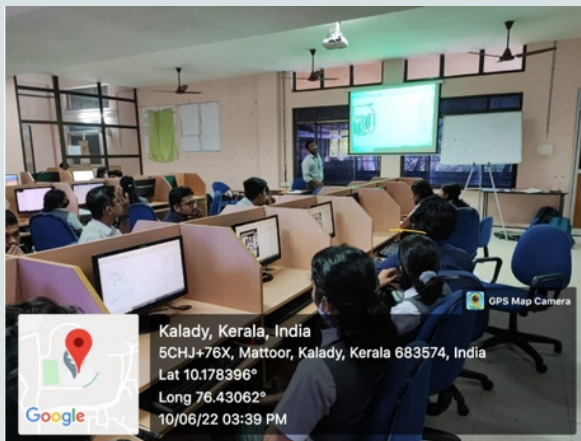
Our respected and Beloved Management Trustee Sri.K. Anand Sir is awarded with Sri Bharati Tirtha Puraskar. The award was conferred to him by his Holiness and our respected patron. Congratulations sir on your achievement.



DEPARTMENT ACTIVITIES

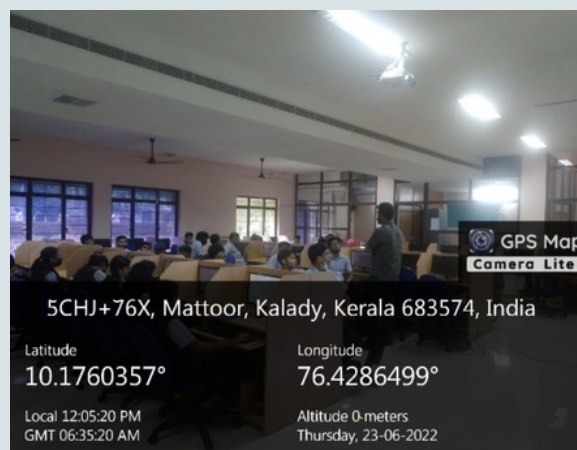
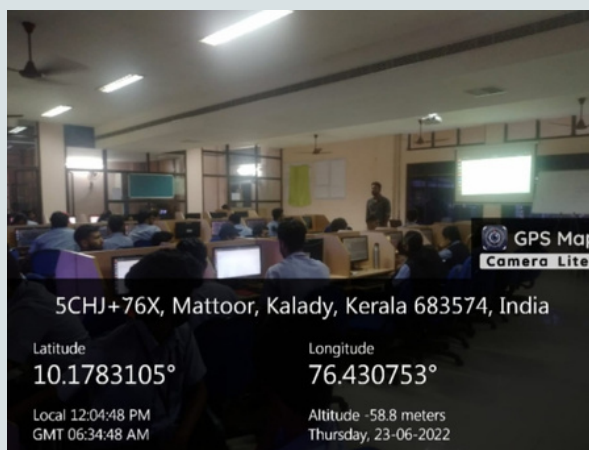
PCB WORKSHOP

Department of Electronics and Communication in association with IIC Cell and IEI Students Chapter conducted a workshop on "PCB DESIGN AND DEVELOPMENT" for S6 ECE students on 10/06/2022. The resource person for the training was Mr. Albins Paul, Assistant Professor, department of ECE. The participants learned the basics of PCB, its structure, and designing single sided PCB.



WORKSHOP ON PYTHON PROGRAMMING

As a part of the scheduled industry-oriented add-on courses for enhancing technical skills, the Department of Electronics and Communication organized a "Python Programming" workshop for second-year ECE students from 20/06/2022-24/06/2022 (5-day intense hands-on training). The training is by industry professionals from Aester India Pvt. Limited. Department of ECE has an MoU signed with the firm.



PROJECT EXHIBITION

Project exhibition for s8 ECE students was held at project lab on 1st July 2022. All the 19 batches of students took part in the exhibition. External assessment of the projects was done. Exhibition was open for the all the students. The different projects were: Brain tumor detection and classification using deep learning techniques, solar panel error detection system, DRISTHI, automated hospital management system, autonomous delivery robot, Med-Mate, a smart class with inbuilt chatbot and attention tracker, autonomous and manual control floor cleaning robot with sanitizing function and digital oscilloscope using FPGA from ECA and smart wearable child tracker, real time air quality monitoring and control system using machine learning , analysis and therapy shoes to help patients with gait disorders, intelligent real time crowd behavior recognition and monitoring during pandemics, assist a solution to blepharoptosis, malayalam sign language recognition using OpenCV, Vegdoc, Gm-C filter design for GNSS, complex IF filter design for GNSS applications from ECB.



PLACEMENT



Adi Shankara
INSTITUTE OF ENGINEERING AND TECHNOLOGY



Department of Electronics & Communication Engineering

Congratulations!

For getting placed at
Kalkitech



**2018-2022
BATCH**



Nikhil Krishnan



Adi Shankara
INSTITUTE OF ENGINEERING AND TECHNOLOGY



Department of Electronics & Communication Engineering

Congratulations!

For getting placed at
Zoho Corporation



**2018-2022
BATCH**



Jagannath U

FELICITATIONS

BEST PAPER AWARD

Dr. Ajay Kumar, Associate Professor, Dept. of ECE and Hasna Hameed (S4 M Tech-CE) bagged best paper award for the paper titled "AN IOT- BASED SYSTEM FOR HEALTH MONITORING AND SURVEILLANCE IN POST-COVID LIFE" in Third International Conference on Materials, Computing & Communication Technology ICMCCT 2022 held at Annai Vailankanni College of Engineering, AVK Nagar, Pottalkulam.



Ph.D. DEGREE AWARDED

Dr. Prameela B has been awarded Ph.D from Cochin University of Science and Technology. Your strength and courage has led you to achieve this great accomplishment. It is the time to enjoy the fruits of your success and achievements. Congratulations to Dr.PRAMEELA B.



FELICITATIONS

ASIET felicitated students and faculty members for their outstanding performances. Sri K Anand Sir, Dr. M.R Muralidharan from IISc Bangalore, and Prof C.P. Jaisankar graced the occasion.

BEST NSS VOLUNTER AWARD : LAKSHMI NANDANA (2018-22 BATCH)



KTU FOOTBALL TEAM PLAYER : MANIKANDAN (2019-23 BATCH)



FELICITATIONS

KTU UNIVERSITY EXAM TOPPERS :

AVIN SONY, S4 ECA -SGPA(10)



ALEENA ANTONY, S4 ECA- SGPA(10)



FELICITATIONS

IEI ACTIVITY

As a token of appreciation for the active coordination and participation in the The Institution of Engineers (India) students chapter, a memento was presented to Jagannath(Chairman), Narayanan Seshan(Secretary) and Malavika (Treasurer)by the department IEI cell.



GRADUATION TEA- FAREWELL TO 2018-22 BATCH

Department of ECE family bid farewell to the outgoing students of 2018-2022 batch on 22/06/2022 . Students shared their memories regarding college and teachers.



PTA MEETING

PTA meeting for the current S6 batch (2019-23) , S4 BATCH (2018-22) was conducted on Jun 28, 2022, June 29th 2022 . Dr.Bobby Mathews ,Head of the department addressed the parents on academic matters, currently running placement activities, NBA re accreditation works going on the department. Parents met the course instructors and discussed the academic matters of their wards.



STAFF'S ZONE

WEARABLE SENSORS FOR HUMAN ACTIVITY RECOGNITION

Ms. Divya V Chandran Assistant professor, Department of Electronics and Communication



Recently, due to the development of microelectronic devices, wearable sensors are being used as an indispensable tool for the recognition of human actions. Wearable technology involves accessories and clothing that incorporate electronic devices that can be easily worn by individuals. Human action recognition is a crucial research domain due to its wide range of applications that include military, security, and medical applications. Applications of HAR include healthcare systems to monitor activities of daily living (ADL) (primarily due to the rapidly growing population of the elderly), security environments for automatic recognition of abnormal activities to notify the relevant authorities, and improve human interaction with the computer. The research in this field is set to grow tremendously in the future. The main advantages of using wearable sensors in action recognition include flexibility, cheap, light independency, occlusion independency, and miniature size.

Figure 1 shows the block diagram of activity recognition using wearable sensors. The main steps include the acquisition of data from wearable devices, feature extraction, and classification. The result of the classification step indicates the type of activity performed by the individual. The most commonly used wearable devices include accelerometer sensor, gyroscope sensor, magnetometer sensor, smartwatch, shimmer sensing platform, Xsens sensing device, and MTx tracker

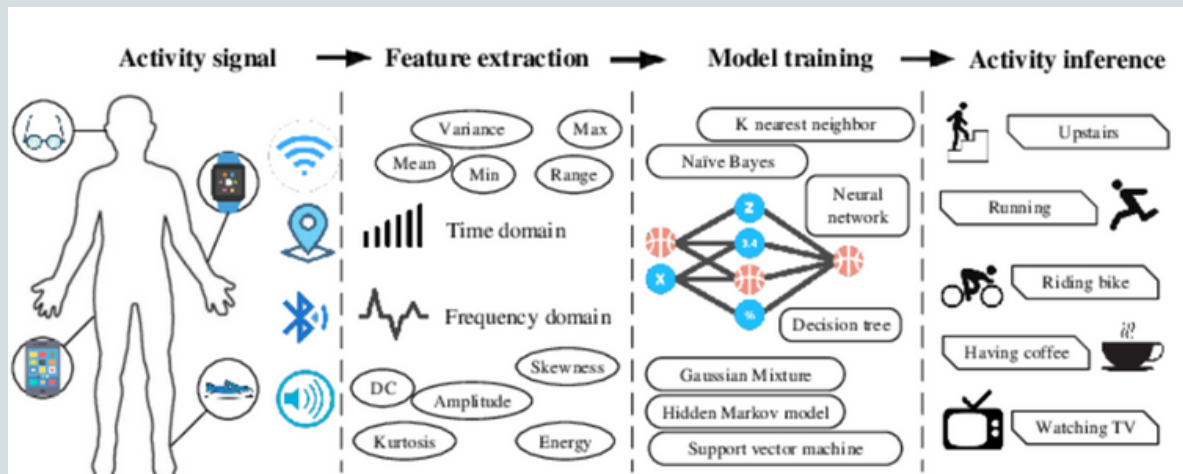


Figure 1

In the HAR system (HARS), the signals obtained through wearable sensors are approximately more desirable than the signals obtained by video cameras, for the following reasons.

- (i) Wearable sensors overcome the environmental and stationary constraints that cameras often suffer from (limitation of vision in cameras due to their fixed position).
 - (ii) Placing multiple sensors in the body leads to more accurate and efficient use of the signal in the human body.
 - (iii) In wearable sensors, the signals received are for a specific purpose, while the signals received by the camera may contain information from other non-target people in the scene.
 - (iv) Wearable sensors observe privacy more than cameras. Video recorders continuously record the entire body during daily life activities.
 - (v) Supervisors should stay in the environment specified by the location and capabilities of the cameras throughout the day.
 - (vi) The complexity and cost of video processing are other challenges in using video.
- However, some wearable sensor challenges include personal satisfaction, appearance, size and comfort rate, development and support, online data acquisition and processing, energy consumption, and privacy issues.

Accelerometer sensor

The accelerometer sensor (Figure 2) is used for measuring the inertial body motions along three axes (i.e., x-,y-, and z-axes). This sensor is popularly being employed in human action recognition as it offers rich information about human movements. Further, the accelerometer data can be acquired with minimal expense due to the wide availability and low cost of the sensor.

The accuracy of classification from the signals acquired by the accelerometer sensor is high since each action creates a unique acceleration signal pattern. Thus, by learning these signal patterns, diverse human actions can be easily categorized using suitable machine learning algorithms.

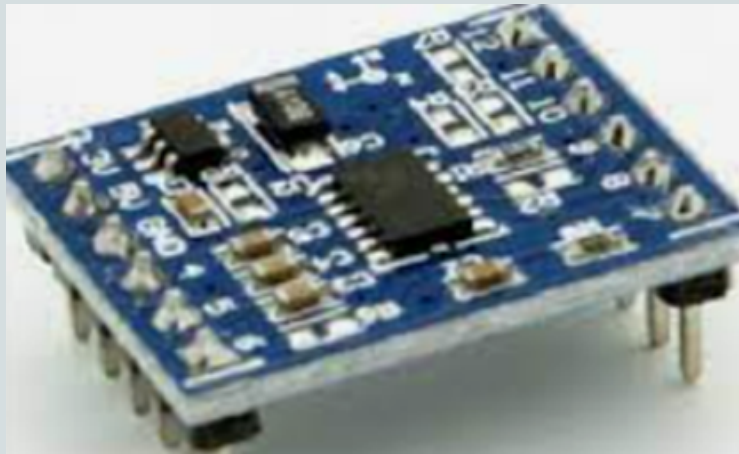


Figure 2

Gyroscope sensor

The gyroscope sensor (Figure 3) is used for measuring the angular velocity of a moving object. This sensor is also capable of identifying the lateral orientation of an object. The gyroscope sensors are also called angular rate sensors or angular velocity sensors. These sensors are installed in applications where the orientation of the object changes rapidly. Apart from measuring the angular velocity, these sensors are also capable of measuring the motion of an object. Thus, gyroscope sensors can be effectively used for robust and accurate classification of human actions.



Figure 3

Magnetometer sensor

The magnetometer sensor is used for measuring the magnetic induction or magnetic field intensity. It computes the strength and direction of the magnetic field in the vicinity of the instrument. Magnetometers are widely used in applications like aircraft, spacecraft, defense, aerospace, medicine, agriculture, etc. These sensors have the capability to be operated under severe and limited conditions. Based on the reference model of the earth's magnetic field and the local magnetic field, the angle information of the individual motion can be obtained. This information is used in the identification of action performed by the individual.



Figure 4

Smartwatch

Smartwatches are widely employed as wearable devices due to their unique advantages, including portability, reliability, stability, universality, and low environmental dependence. The smartwatches are equipped with a tri-axial accelerometer and a tri-axial gyroscope sensor. The sampling rate of the smartwatch is usually fixed at 25 Hz. These watches are worn around the wrist of the individuals as shown in Figure 5. They are especially suitable for the classification of sports activities that involve the movement of the hands. In addition to action classification, smartwatches are also employed in the monitoring of health indicators such as human heart rate.



Figure 5

Shimmer sensing platform

Shimmer sensing devices are the popularly used wearable devices for applications like remote health monitoring and fall detection. It is a small, low-weight, and low-power wireless wearable sensing platform. The shimmer sensing platform (Figure 6) includes a tri-axial accelerometer, a triaxial gyroscope, a tri-axial magnetometer, and electrocardiography sensors. These devices have the ability to transfer the sensor data in wireless mode using a Shimmer Bluetooth link. Similar to any wearable device, Shimmer needs to be recharged regularly, and since it targets mainly healthcare applications, it may be quite critical if its battery becomes very low.



Figure 6

Xsens sensing device

Xsens sensing device is a wearable platform that ensures accurate time synchronization. This device (Figure 7) has an internal sampling rate of 1000 Hz along with a buffer duration of 10s. It has an overall battery lifetime of 6 hours. This device has a weight of 16g and can be operated in the temperature range of 0°C to 50°C. The Xsens sensing device can be operated up to 20m in free space. The applications of this sensing device include ergonomics, sports, virtual reality, and human-machine interaction.



Figure 7

MTX tracker

The MTx trackers are 3-DOF orientation trackers that include a tri-axial accelerometer, a tri-axial gyroscope, and a tri-axial magnetometer. The MTx motion tracker (Figure 8) is programmed via an interface program called MT Manager to capture the raw or calibrated data with a sampling frequency of up to 512 Hz. The accelerometers of MTX trackers can sense up to $\pm 5g$. The gyroscope units in the MTx trackers can sense up to $\pm 1200^\circ/s$. The magnetometer in the MTx tracker function as a compass and can sense magnetic fields in the range of $\pm 75\mu T$.

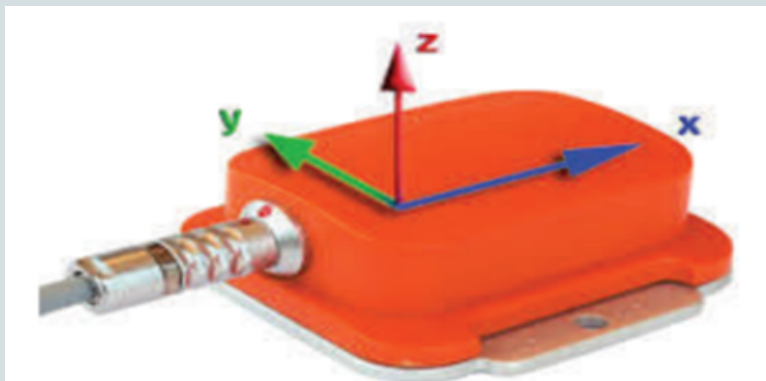


Figure 8

Applications of HAR

(i) E-health includes remote care and control of the person (such as the elderly), physical and mental rehabilitation, activity examination, respiratory biofeedback system, mental stress assessment, rehabilitation system, weight training exercises, real-time vision, movement, and posture. An e-healthcare system can enable individuals with disabilities to live longer independently. Using “a simple button for sudden anxiety and fear,” “personal alarm devices for the elderly,” and “cell phones with a panic button” can provide psychological peace for the elderly and security for family members and friends.

(ii) E-emergency includes monitoring people in dangerous places like earthquakes, landslides, and fires.

(iii) Training assistance to athletes focuses on e-fitness programs, health, organizational systems for fitness clubs, and athlete health.

(iv) Security environments include monitoring, intrusion detection, and automatically recognizing abnormal activities.

(v) E-entertainment is mainly related to human and computer interaction aimed at face recognition, situation, gesture, and real-time HAR.

(vi) E-factory includes monitoring operations, worker protections, and cooperation between workers.

(vii) E-sociality includes recognizing emotions and pressure to discover social relations between people

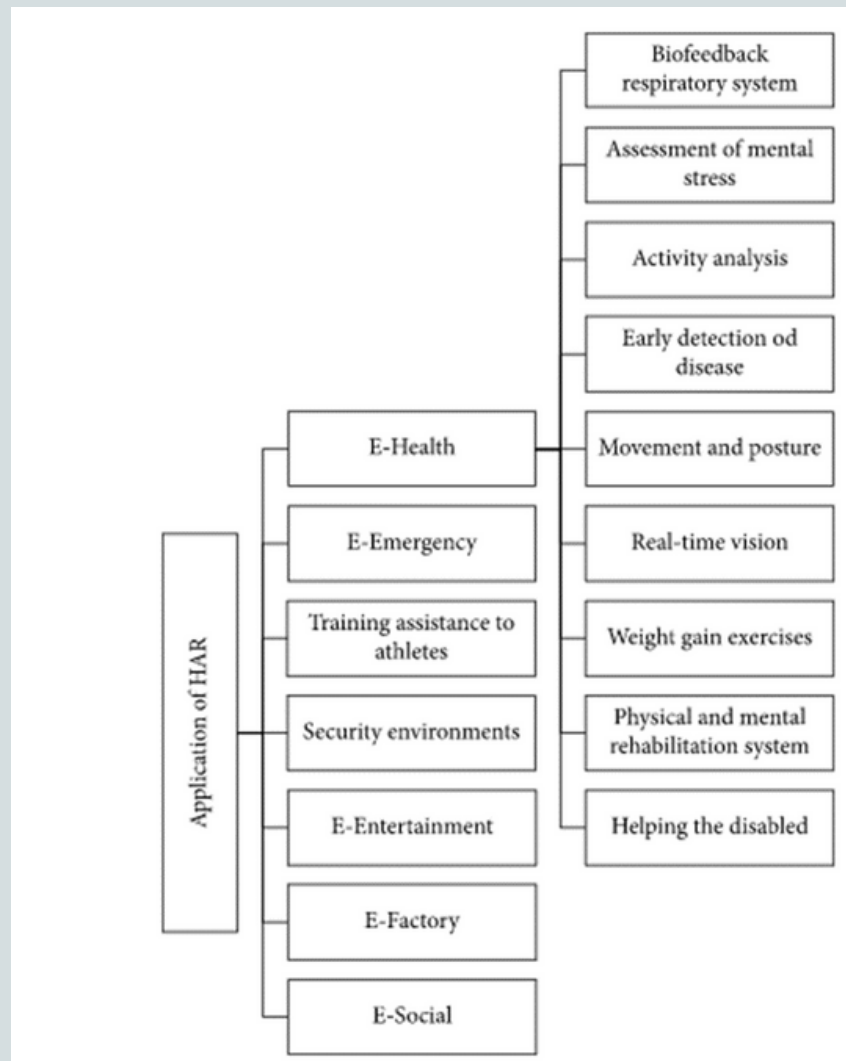


Figure 9

Summary and Discussions

In this article, the main highlights of wearable devices employed in action recognition and different applications of HAR were discussed. Employment of wearable sensors for human action recognition has become unavoidable in various fields including health care, surveillance, automation, sports, etc. Even though there are potential gains in using wearable sensors for action recognition there are still challenges in terms of technological advancements to design wearable sensors that are easy to use and comfortable for the wearer.



Advanced Wireless Communication Technologies for Energy Internet

Aleena Antony, S4- ECA

Introduction

With the rapid improvement of computing power and large-capacity data storage technology, the energy system has the engineering conditions for the application of AI technology. Wireless communication technology has changed the operation and management mode of energy systems, and a remarkable phenomenon is the emergence of the concept of the energy Internet. Energy Internet technology promotes the deep integration of energy and communication infrastructure and creates an open and shared Internet ecosystem. The energy Internet theory has been not only applied to the industrial field but also developed to be used in the agricultural field. The smart grid communication standard has been established, and the emerging technology of smart grid communication became a research hotspot in the field of smart grids. A worrying problem is that cyberattacks may undermine the security of the power grid. The dispatching system adopts optical fiber communication systems for ensuring the safety and stability of energy systems, while the billing services and island areas still adopt wireless communications. Applications of 5G technology in energy systems are novel and important, and low-delay grid control business is a good application scenario.

Smart Grid Communications

Smart grid communications provide fast, secure, and reliable communications for energy Internet, which enables energy system intelligence, security, and load balancing. The communication network includes the optical fiber backbone network and distribution communication network, which is an important infrastructure supporting energy network control. It should be noted that users who are not connected to the energy network have wireless communication needs. Electric vehicle drivers, residential users, new energy operators, and other prosumers interact with the power grid through mobile phones to control their energy consumption or production, so as to complete demand-side response or power market transactions, as shown in . Considering that, in an energy Internet, thousands of prosumers interact with the power grid, and the count of communication terminals will be particularly huge.

Large-scale machine communication is a new application scenario of multiple access technology in an energy Internet. The number of machine terminals is particularly huge, which will be hundreds of times higher than that of 5G mobile communications. The business type of power communication terminals is mainly information reporting, which is obviously different from human-oriented interactive communication.

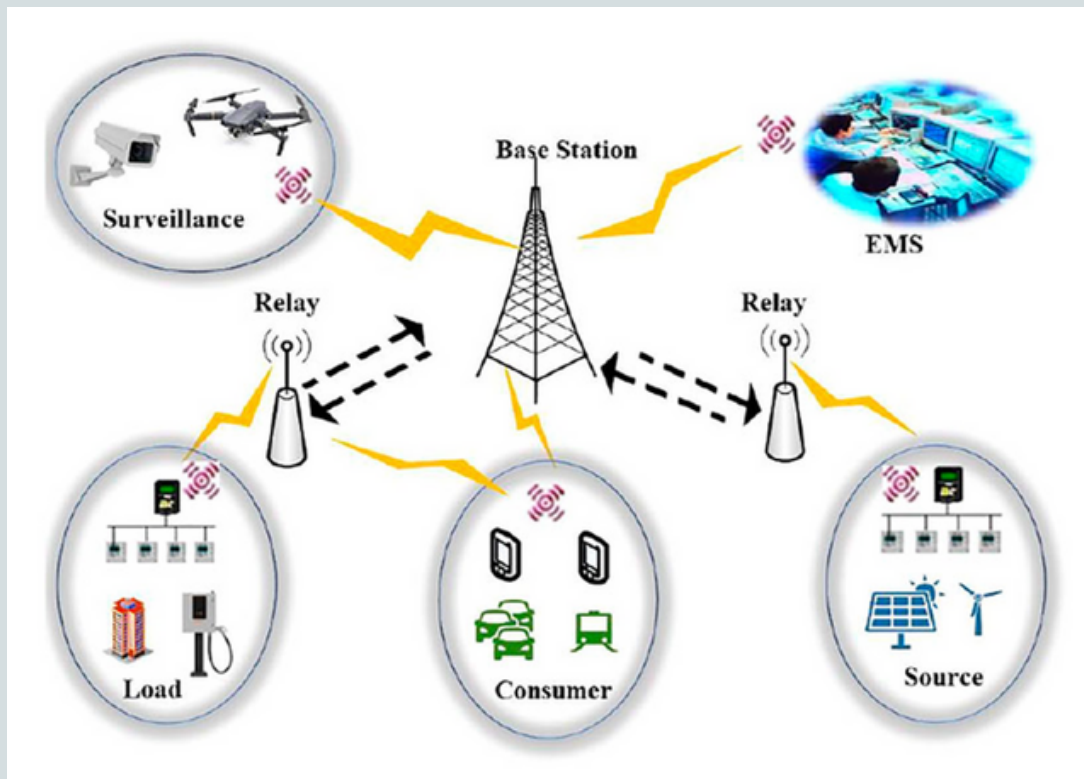


FIGURE 1. The architecture of an energy Internet communication network.

Advantage Feature

Different from the existing connection states in 4G mobile communications, the low-delay large-scale access of mass terminals requires a class connection state with simple bearing function, low maintenance cost, and fast establishment on demands. The 5G wireless communication network adopts orthogonal multiple access schemes, including frequency division multiple access, time division multiple access, code division multiple access, and orthogonal frequency division multiple access. It should be noted that the count of communication terminals in the energy Internet will increase tens of times compared with that in the traditional power grid. 6G wireless communication network schemes such as multi-user superposition coding, multi-user share access, pattern division multiple access, and sparse code multiple access have potential advantages in meeting the requirements of massive machine-type communications in an energy Internet. The advantages of establishing a fast connection state can be included as follows:

- 1) Potential large-scale access user identification design and allocation and acquisition methods break through the bottleneck of extreme underdetermination of user orthogonal representation, and they realize the low-dimensional representation of high-dimensional users.
- 2) The potential terminal asynchronous random-access technology supports a reliable and fast transmission under the condition of limited timing information.
- 3) It provides random access with low-rate data transmission.

Application Scenario

5G can achieve full coverage of application scenarios in an energy Internet by virtue of its technical characteristics, such as ultra-high bandwidth, ultra-low delay, and large-scale connection. First, it can be applied to differential protection. By using the 5G ultra-low time delay characteristic, one can replace optical fiber with advanced wireless communications on some occasions. Thus, the deployment of optical fibers can be greatly reduced, and the difficulty and cost of the communication infrastructure for energy Internet deployment can be reduced. Second, it can be applied to unmanned patrol inspection. Taking advantage of the 5G large bandwidth characteristics, which might get up to Gbps, the use of 5G can return a high-definition video in real-time in scenes of substation robot patrol inspection. Unmanned patrol inspection can greatly improve the efficiency of patrol inspection while reducing labor costs and safety risks. Third, it can be applied to advanced metering. The 5G large connection feature can be used to connect a large number of smart meters to provide users with personalized services such as demand-side management.

Discussion

6G Mobile Communications

Random access and data transmission are the basic processes of mobile communication systems. Its design idea is to make a compromise between implementation complexity and transmission efficiency. In terms of 5G mobile communications, orthogonal frequency division multiple access, and multiple input, multiple outputs are core technologies of large-capacity and high-speed data transmission.

Multiple access technology includes random access and multiple access transmission, which, respectively, serve the initial access process and data transmission process in wireless communication. In terms of 6G mobile communications, it is believed that the multiple access technology scheme may be a solution. Multiple access technology can play an important role in an energy Internet. Through this technology, a larger number of energy consumer communication devices can be connected to the wireless network at the same time, which effectively ensures the capacity of wireless communication systems.

For the communication control requirements of a large number of consumers in the energy Internet, multiple access technology needs to be further evolved in the 6G mobile communications. Non-orthogonal multiple access technology and its corresponding enhancement technology can be adopted to improve the use dimension of air interface resources and effectively improve the success rate of access and transmission.

Cyberattacks

The number of global cyberattacks against the energy sector has soared. Power grids have become a victim of cyberattacks. In the environment of the energy Internet, the safe operation of energy networks largely depends on the correctness of monitoring commands. These command channels can be attacked by the hacker, and then power outages may occur. The attack of wireless networks is easier to achieve than that of optical fibers. The transmission environment of the wireless communication network is easily affected by the external environments, and the transmission channel is unstable to the spatial and temporal variation of users. The instability of the traditional wireless channel results in poor signal quality, and communication interruption may occur from time to time. The outage probability of the wireless network seriously affects the safe operation and control of an energy Internet. Hackers are familiar with the wireless communication transmission protocol, so can steal the information of energy users and inject false data. At present, there are two different ways to deal with cyberattacks. The first is proposed by energy scholars, and the second is proposed by communication scholars. Power scholars believe that, on the premise of protecting some communication nodes, the model established by power system knowledge can be used to identify false data. Instead of establishing an energy model, scholars in information technology have proposed a series of communication security measures, including network isolation, identity authentication, transmission encryption, and permission control. Advanced wireless communication technology makes the energy system more intelligent than before, but it also brings security risks such as network attacks.

Conclusion

Wireless communication technology has played a great role in the energy Internet and improved the intelligent level of energy network control. The major functions of wireless communication equipment include convenience, positioning, remote communication, and control. Wireless communication can improve the efficiency of power grid operation and maintenance. With the wireless communication system for energy, the transmission lines and distribution facilities can be monitored through ultra-high-definition cameras, so as to find hidden faults in time and save manpower and material resources for on-site inspection. The characteristics of advanced wireless communication systems with large bandwidth, low delay, wide connection, and high reliability fully meet the communication needs of an energy Internet. When the sixth generation of mobile communication is applied to electric robots, unmanned aerial vehicles, intelligent patrol inspection, and accurate load sharing control, the interconnection ability of energy systems will be drastically improved. Energy Internet brings development opportunities for communication energy. One can make full use of wireless communication technology to develop new solutions, which can meet customer needs successfully in energy networks with high penetration of prosumers.

STAFF ACHIEVEMENTS

Dr. Prameela B Associate Professor

Sukanya M G and Dr. Prameela B presented a paper at the ACT 22 conference ON 26.06.2022 at The IDES and the Association of Computer Electrical Electronics and Communication Engineers (ACEECOM)

Dr. Ajay Kumar Assoc. Professor

Was Recourse Person for Internet of Things-A network layer perspective on 26.5.2022 at SCMS, karukutty

Mr. Prajeesh P A , Assistant Professor

Published Research Paper titled "Design of automated stethoscope using AI,IOT and Signal processing "published in Springer Lecture series on 3/6/2022 at International conference ESIC 2021, Publisher Name Springer, Singapore Print ISBN 978-981-16-9487-5 Online ISBN 978-981-16-9488-2.

Ms. NEETHA K, Assistant Professor

Reviewer for IEEE CONFERENCE ON APPLIED INTELLIGENCE AND COMPUTING (AIC 2022), Rajkia Engineering College, Sonabadra, India.

STUDENT ACHIEVEMENTS

BATCH	NAME	EVENT	ORGANIZERS	DATE
2019-23	ABHINAV A S	Cyber security and ethical hacking	IEI	5/20/2022
2019-23	ARJUN MANI	Cyber security and ethical hacking	IEI	5/20/2022
2021-25	NAZILA K N	Cyber security and ethical hacking	IEI	5/20/2022
2019-23	ABHINAV A S	Kerala innovation week	Fablab Kerala	5/28/2022
2021-25	PARVATHY V	Back-end Development Using Javascript	DevTown	6/16/2022
2021-25	PARVATHY V	Bootcamp On Server Authentication Using Express And NodeJS	DevTown	6/25/2022
2020-24	ANUSREE A R	Volunteer of Thalam & AutoM8	Brahma 2022	5/20/2022

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