NARAYANA ENGINEERING COLLEGE
GUDUR, Tirupathi Dist., AP
Estd : 2001
9912355502
9392901052
http://www.necg.ac.in/
principal@necg.ac.in

Department of Electronics and Communication Engineering

TECHCOM

VOLUME -12

Contents

JAN 2023- JUN 2023

Faculty Co-Ordinators

Mr. M V S S Babu
Assoc. Professor

Mr. S Brahmaiah
Asst.Professor

Student Co-Ordinators

Pitchikala Baby Aparna
(20F15A0408)

Gurijala Yaswanth
(20F11A0428)

Bobba Jyothsna
(19F11A0405)

Gopalam Madhu Sri
(20F11A04A3)

Vision of the Institute

To be one among the premier institutions of the country for professional Education in producing technocrats with Competent skills, Innovative ideas and Ethicsstrong to servethe nation.

Mission of the Institute

- To provide an environment most conducive to learning with state of the art infrastructure, well equipped Laboratories and research facilities to impart high quality technical education.
- To emphasize on innovative ideas and creative thinking and prepare them to meet the growing challenges of the industry.
- To inculcate the leadership qualities, multi-disciplinary approach, ethics and lifelong learning in graduates to serve the diverse societal needs of our nation.

Vision of the Department

To produce technically competent Electronics & Communication Engineers with a motiveto meet the needs of the industry and evolving society through advanced research, professional ethics and lifelong learning.

Mission of the Department

- To enrich the technical skills of the students through effective teaching-learning practices, continuous assessment methods and eminent faculty.
- To continuously enhance creative thinking, research ability and innovative skills of students through training on core and multidisciplinary technologies and skill enhancement programs.
- To inculcate leadership qualities, ethics, social responsibility and gratitude through outreach programs.

Program Educational Objectives (PEOs)

PEO-1: Attain the global and local opportunities and reach greater heights in their chosen profession by demonstrating technical expertise.

PEO-2: Gain recognition by exhibiting problem solving expertise for addressing significant problems of industry and society.

PEO-3: Become good leaderswith ethics and support, contribute and encourage diversity and inclusiveness in theirworkplace and society.

Program Specific Outcomes (PSOs)

PSO-1: Responsive to ideas: Apply the knowledge on core Electronics and Communication Engineering in orderto develop skillsto analyze, designand develop innovative solutions for the real worldproblems.

PSO-2: Domain Expertise: To develop interpersonal skills to demonstrate proficiency using the latest hardware and software solutions by maintaining professional and societal responsibilities.

Program Outcomes(POs)

PO-1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.

PO-10: Communication: Communicate effectively on complex engineering activities with the engineering community and withsociety at large,such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and giveand receive clearinstructions.

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.

PO-12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadestcontext of technological change.

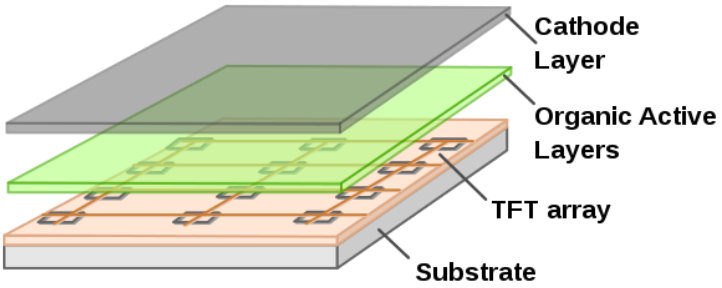
Professor's Desk

The major challenge for today's engineering educational institutions is to accommodate the ever varying aspirations of the younger generation because of increasingly changing demand and development in industries. We constantly put efforts to accommodate these aspirations by fine tuning the academics of college with innovative and practical oriented teaching - learning practices along with other developmental activities. Our goal is to change the world through education. It may sound idealistic, but this is precisely our long term goal. It is what motivates the work of everyone at the Narayana Engineering College, Gudur. It inspires our teaching and research. Our approach reflects the educational needs of the 21st century. We focus on our students by providing them with a world-class outcome based education and hands-on experience through research, training, and student forum activities etc. The success of our Electronics and Communication Engineering program is supervised by our eminent faculty, who continue to set the standard for excellence. There is continuous check on the implementation of planned academic activities with desired results in grooming our future generation for employment and for higher studies in India and abroad. A research culture has taken shape in the institute through enhanced R & D activities. Our Institute results and placement speaks about our excellence with many of our students bringing laurel to the college by getting highest ranking in university exams and huge number of students are placed in national & multinational companies, moreover our student's creativity and determination is evident by this continuous success in various fields. Our institute stands by its core values, mission of churning out well-rounded individuals and thorough professionals.

-- Mrs. Ch. Padmavathi

Active-Matrix Organic Light-Emitting Diode

AMOLED (Active-Matrix Organic Light-Emitting Diode) is a type of OLED display device technology. OLED describes a specific type of thin-film-display technology in which organic compounds form the electroluminescent material, and active matrix refers to the technology behind the addressing of pixels. Since 2007, AMOLED technology has been used in mobile phones, media players, TVs and digital cameras, and it has continued to make progress toward low-power, low-cost, high resolution and large size applications. An AMOLED display consists of an active matrix of OLED pixels generating light (luminescence) upon electrical activation that have been deposited or integrated onto a thin-film transistor (TFT) array, which functions as a series of switches to control the current flowing to each individual pixel. Typically, this continuous current flow is controlled by at least two TFTs at each pixel (to trigger the luminescence), with one TFT to start and stop the charging of a storage capacitor and the second to provide a voltage source at the level needed to create a constant current to the pixel, thereby eliminating the need for the very high currents required for passive-matrix OLED operation. TFT backplane technology is crucial in the fabrication of AMOLED displays. In AMOLEDs, the two primary TFT backplane technologies, polycrystalline silicon (poly-Si) and amorphous silicon (a-Si), are currently used offering the potential for directly fabricating the active-matrix backplanes at low temperatures (below 150 °C) onto flexible plastic substrates for producing flexible AMOLED displays.



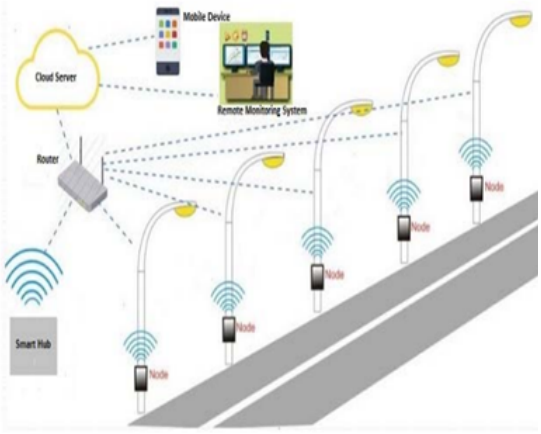
Manufacturers have developed in-cell touch panels, integrating the production of capacitive sensor arrays in the AMOLED module fabrication process. In-cell sensor AMOLED fabricators include AU Optronics and Samsung. Samsung has marketed its version of this technology as "Super AMOLED". Researchers at DuPont used computational fluid dynamics (CFD) software to optimize coating processes for a new solution-coated AMOLED display technology that is competitive in cost and performance with existing chemical vapor deposition (CVD) technology.

--RAVI TEJA K (21F11A0433)

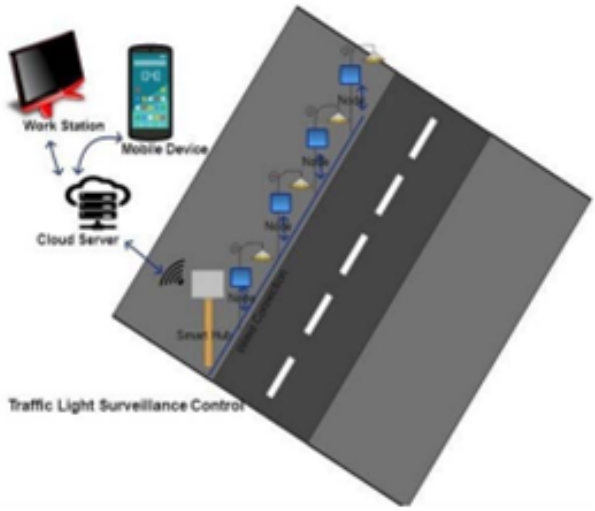
IOT based Electrical Device Surveillance and Control System

With every enhancement in Internet in terms of speed and bandwidth, IOT (Internet Of things) is taking the market on a new node and knocking the door with new opportunities of inventions. This article talks about an energy saving electrical device Surveillance and Control system based on IOT. A large amount of energy is consumed by lighting appliances, so making improved efficiency and quick fault detection is a significant challenge. For small areas or confined premises IEEE 802.11 wireless technology is used where all the appliances is connected to a common Wi-Fi network. In the second model like street lamp pole where number of appliances grows only in one direction, wired configuration is used to avoid range issue. It consists of street lamps, sensors to detect flow of current, relay to control the on/off of the device and a 5 v power supply converter and node MCU at the slave end (electrical device).

Sensors are used to control electrical appliance and send the analog signal of the environment to the system and perform the related task. Master end consists of Raspberry Pi 3 controller connected to Internet connection. The purpose of microcontroller is to take the data from all the street lamps through Wi-fi connection and convert them into serial communication. The signal is transferred through the sensors to NodeMCU which in turns transmit the signal wirelessly to master control terminal. Master controller detects the signal and perform appropriate task in case there is detection of failure of street lamps. The transmission system comprises of NodeMCU at electrical device end which receives information though sensors attached to the device. At the other end, master controller (Raspberry Pi) which receives information wirelessly and send the data to a central monitoring system. Web application presents the graphical representation of the received data from the electrical devices.



This is the case of traffic street lamps which grow in number in one direction. So this is different from the on premise as here we have challenge of communication range.



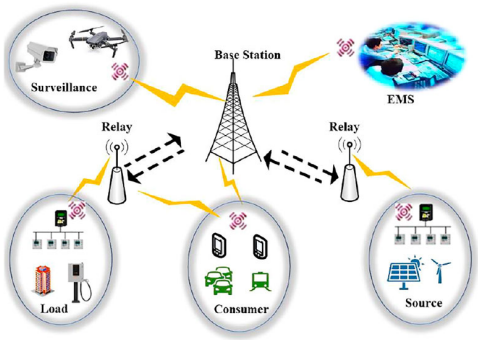
As wireless connection range (router or Node MCU) is in meters, so it is not possible to use in cases where Wi-Fi connection is require in Kilometers. Moreover, to make the system reliable wired connection is used to connect Master Controller Raspberry Pi to the street lamp device. This Pi is turn is connected to Cloud server and web application.

--K GIRI BABU (20F11A0444)

Advanced Wireless Communication Technologies for Energy Internet

The modern energy system has undergone great changes compared with traditional energy systems. The first is the rapid deployment of renewable energy, which has become an important source of modern energy systems. The global goal of reducing carbon emissions is the fundamental reason for countries to develop renewable energy. On the source side, we use wind power, photovoltaic generation, hydrogen energy, and natural gas to replace fossil energy; on the demand side, we use electric vehicles instead of fuel vehicles. Considering that natural gas power generation is more controllable than wind power and photovoltaic, natural gas has become a key issue of national energy security. As a green, low-carbon secondary energy, the potential development of hydrogen energy is pending the cost reducing. A cutting-edge technology for hydrogen production by electrolysis renewable energy sources, and the economy and low carbon of the energy system have been improved .

The second is the application of artificial intelligence (AI) technology in the energy system. 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. The integration of photovoltaic and wind power turbines has brought uncertainty problems to the operation and planning of power networks. Statistical machine learning has become an effective method to deal with the characteristics of variability and uncertainty of renewable energy systems. Last but not least, 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. concluded that both communication and energy systems required safety technology to prevent cyberattacks. Hence, strengthening the security infrastructure construction of energy information and communication system is the key to the realization of an energy Internet. Applications of 5G technology in energy systems are novel and important, and low-delay grid control business is a good application scenario.

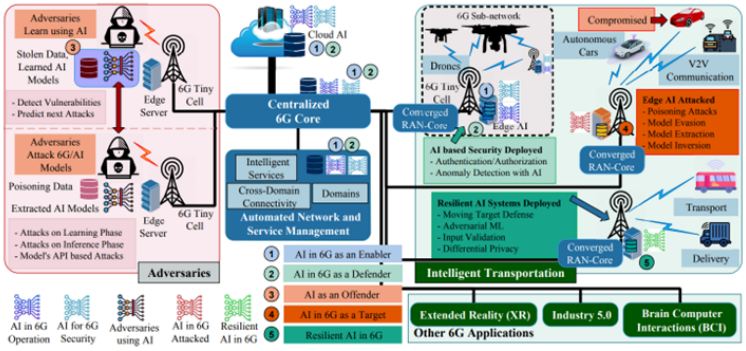
-- G SAI SANGEETHA (20F11A04A4)

AI and 6G Security

As the realization of digital transformation expected with 5G networks has already begun and continue to evolve over this decade, the 6G communication era envisions how humans will interact with the digital virtual worlds beyond
2030. Future networks must possess novel technologies that enable the digital virtual worlds with connected intelligence, to address the communication and networking challenges beyond 2030. While the conventional applications such as multimedia streaming will remain, literature envisions new application domains for 6G systems such as multisensory extended reality (XR)applications, Connected Robotics and Autonomous Systems (CRAS), and wireless Brain-Computer Interactions (BCI). Holographic telepresence, eHealth including in-body networks are a few other 6G use cases that demand extremely high data rates, ultra-low latency and ultra-reliability.

The evolution of 6G application domains calls for an innovative network architecture beyond current network designs. An open and distributed reference framework for 6G architectural building blocks defined by Nokia Bell Labs comprises four major interworking components. These are platform, functional, specialized, and orchestration, covering the physical layer to the service layer with the following distinguishing features. The “het-cloud” is a heterogeneous cloud environment that eases the creation, placement and scaling of dynamic cloud services. 5G core network service-based architecture will extend to the Radio Access Network (RAN), named “RAN-core convergence”. It will harmonize the RAN and core functions to create simpler networks. Even smaller “sub-networks” such as in-body networks will emerge, which generally operate in a standalone fashion while benefiting from the wide area network.

6G will take the network softwarization/cloudification into network intelligentization, revolutionizing wireless networks from connected things to “connected intelligence”. Hence, AI becomes an integral part of the network, which plays a crucial role. The distributed heterogeneous networks require ubiquitous AI services to ensure the fulfilment of 6G goals. Intelligent wireless communications, closed-loop optimization of networks, big data analytics for 6G emphasize the use of AI in diverse aspects of 6G networks.



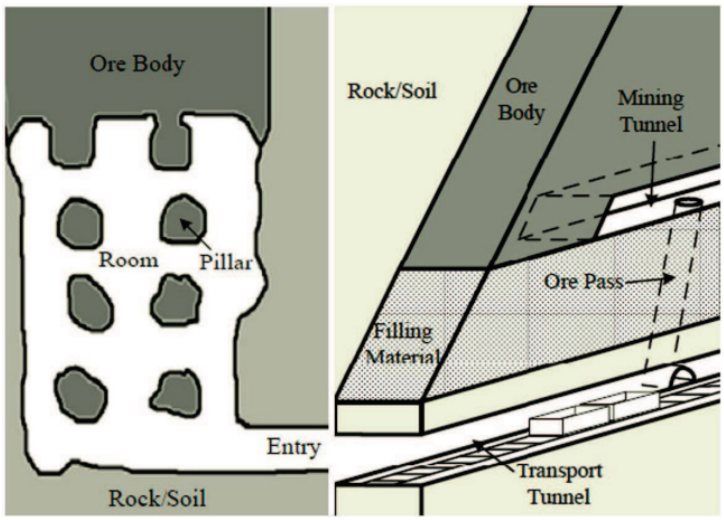
Beyond 2030 wireless applications will demand much higher data rates (up to 1 Tb/s), extremely low end-to-end latency (< 1 ms), extremely high end-to-end reliability (99.99999%). Moreover, 6G networks will comprise a collection of heterogeneous dense networks embedded with connected intelligence and utilize hyper-connected cloudification. Service provision for extreme requirements with complex 6G networks requires sophisticated security mechanisms. The security systems designed for 5G using the concepts of SDN and NFV should be further improved to cater to the security demands in 6G. The end-to-end automation of future networks demands proactive threats discovery, intelligent mitigation techniques, and self-sustaining networks in 6G. Hence,
the end-to-end security design leveraging AI techniques is essential to autonomously identify and respond to potential threats based on network anomalies rather than cryptographic methods.

--H VENKATA SAI KRISHNA (21F11A0428)

Modeling the Leaky Feeder as a Multi Antenna Array

Reliable communication is essential for underground mines and tunnels for multiple reasons including safety and productivity. This communication system is needed to distribute video information, radio telephony and digital control information within the network of tunnels. Video signals originating from the cameras mounted on the moving mining machinery or at fixed locations are transmitted to a remote control room allowing operators to monitor and exert control via a return radio data link. Moveable radio telephony is frequently employed by miners for real-time communication. However, there is no easy way to achieve this. Mines can be tens of hundreds of meters deep and terrestrial radio signals don't propagate to deep underneath. Mine topographies keep changing rapidly; a mine can grow up to 50 m in one day.

Often unused areas are closed down. Typically mines have open areas interconnected with tunnels; pillars and obstructions are very common and the wall will be rough absorbing RF signal. Installing large number of antennas to maintain a well covered wireless network is not practical.

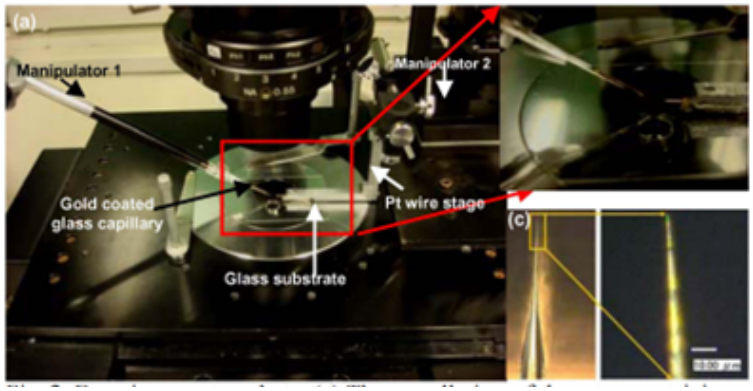


The leaky feeder (LF) is the most widely used transmission medium in underground mines and tunnels. The LF has dual functionality; it not only transmits RF signal as a cable but also radiates the RF signal along its length via carefully designed slots. The leaky feeder radio system is almost noise free and has enough bandwidth to support multiple RF signals carrying voice and data simultaneously. The LF system is also able to transfer the DC power which is required to power up amplifiers and active nodes. Many types of leaky feeder cables with low loss desired radiation and coupling properties have been introduced in the mining industry. Although most studies consider the LF as a single radiating element, it is an interesting task to consider the LF as a multiple antenna array. This will pave way to model the entire system as a multiple input-single-output (MISO) wireless communication system.

--P YASWANTH (21F11A0458)

Catalytic Nano-mobile Robot with Finely Designed Geometry

To compete with the biological nanomotor, researchers have done marvelous works on its counterpart-artificial nanomotor, which can be used to delivery cargo to the destination or actuate micro-nano mechanical system. Among all of the candidates for promising man made nanomotor, the spotlight is always focused on fuel driven nanomotor.



As related previous work, Pt and Au bimetallic nanowire motor was synthesized by Aluminum membrane template (TDEP), where hydrogen peroxide is used as fuel. And the Pt and Au hybrid nanorod or nanorotor demonstrated translation or rotation in nanometer scale.

Recently, they introduced a new type of nanomotor based on Cu and Pt segmented nanobattery in dilute aqueous Br2 or b solutions. The motion of the two types of nanomotor mentioned above are both powered by self-electrophoresis caused by redox reactions occurring on the two different metal segments. Beside this, Pt (or Ag) and Si nanomotor grown by dynamic shadow growth (DSG) method is also introduced, which even can grow nanospring structure. In this case, the nanomotor is actuated by the bubble generated from hydrogen peroxide decomposition into water and oxygen. And Pt or Ag works as an engine because it is strong catalyst of this chemical reaction; while Si serves as the body of the nanomotor without reaction with the solution. Moreover, not only metal material can be used for development of nanomotor, even polymer can realize the actuation in micro and nanometer scale. Researchers devise the motor powered by a polymerization reaction outside biological systems. The motor is powered by ring-opening metathesis polymerization (ROMP) of norbornene in solutions of the monomer. In fact, any design of nano scale object, which can create the gradient of concentration, has promise to generate the desired phenomenon of actuation. But there are some drawbacks in the previous works: the fabrication method is complex and time-consuming, and the shape or geometry is hard to control, which is critical for mobile nano machine.

As the catalyst of hydrogen peroxide's decomposition into water and oxygen, Platinum can increase the reaction rate and make the activity more intensive. As the result, there will be plenty of oxygen bubbles generated at the interface between Pt nano-mobile robot and solutions. Then the bubbles keep growing in size until big enough to detach from the it.

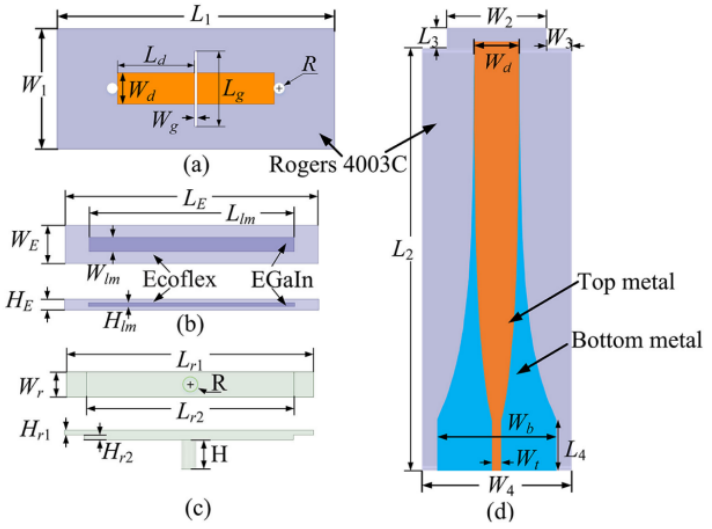
The momentum change of bubbles and nano-mobile robot's system leads to Platinum nano-mobile robot's movement in the opposite direction by recoiling.

But if the structure of nano-mobile robot is symmetric, for example like a cantilever beam, the movement will be hard to control and is kind of random movement. Because the oxygen bubble's propulsion take place on the whole symmetric surface, the propulsion is offset with each other.

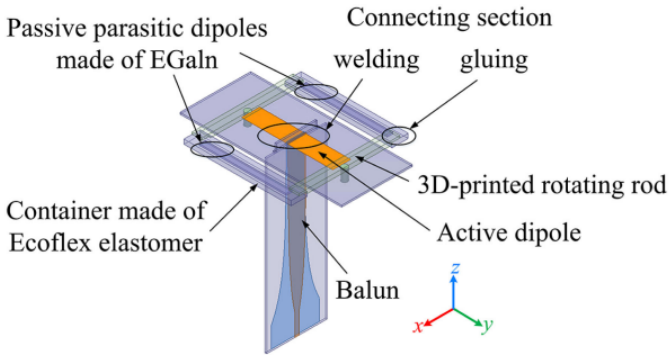
--CH. UMA PRASANTHI

Pattern-Reconfigurable Yagi–Uda Antenna Based on Liquid Metal

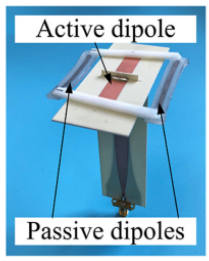
The antenna consists of a balun-fed active dipole and a pair of stretchable passive parasitic dipoles, which are implemented by eutectic gallium-indium (EGaIn) alloy embedded in microfluidic channels. The parasitic dipoles are driven at each end by two low-cost, three-dimensional printed media rods. Afterward, spinning the rods at different angles leads to varying degrees of stretching upon the stretchable dipoles. Note the length of passive parasitic dipoles is a vital factor for antenna radiation reconfiguration. The antenna exhibits bidirectional radiation if the parasitic dipoles are equal in length. Otherwise, directional radiation toward the shorter parasitic dipole direction can be obtained. Based on the above-mentioned working principle, a pattern-reconfigurable antenna working in wireless local area network (WLAN) band is fabricated and measured. Apart from the reconfigurable capability, the proposed antenna keeps operating in the WLAN band of 2.4–2.48 GHz during the whole shape deformation.

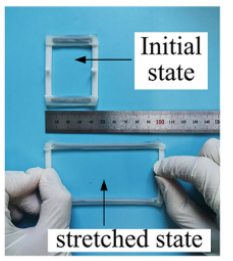


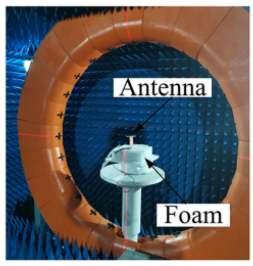
Depicted in the figure, the antenna realized a −10 dB bandwidth over the WLAN band of 2.4–2.48 GHz. Moreover, the comparison of the results indicates an excellent agreement between the experiment and simulation results with a deviation of merely 0.8% (20 MHz). Furthermore, the measured and simulated gain (dBi) and efficiency (%) versus frequency in each state Antenna efficiency measured in WLAN band is no less than 60% at each state. By rotating the angle of the dielectric rods on both sides from 5° to 0° and 0° to −5°, the antenna radiation pattern switches from directional radiation toward one dipole's direction to bidirectional radiation and from bidirectional radiation to directional radiation, respectively, exhibiting reasonable radiation reconfiguration ability.



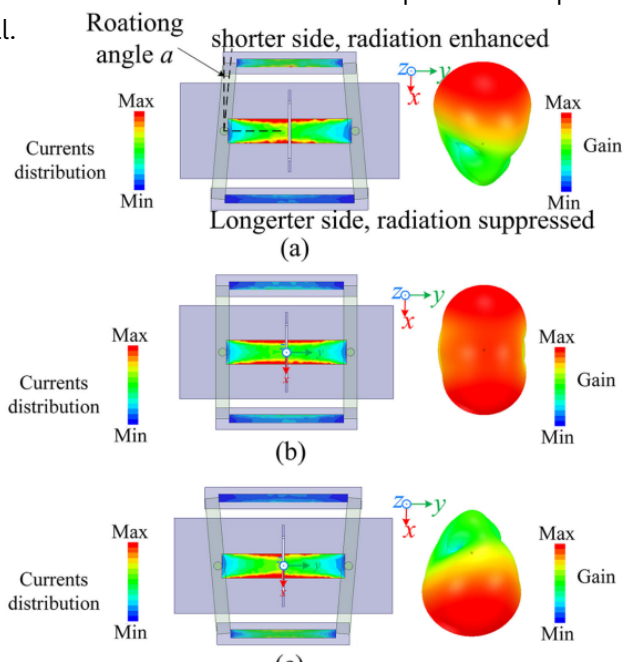
The pattern radiation reconfigurable function is realized under the working principle of the Yagi–Uda antenna. As depicted in, the antenna is composed of a fed dipole, a reflector lightly longer than the fed dipole, and several directors slightly shorter than the fed dipole. The length of the passive elements and their position relative to that fed dipole are vital to the antenna radiation pattern. On the one hand, the passive element with marginally longer length can act as a reflector and hence suppress the radiation of the dipole in its direction. On the other hand, the radiation of the dipole can be enhanced toward a slightly shorter element post in the opposite direction. Thus, by changing the length of those parasitic dipoles, the pattern radiation pattern of the antenna can be changed.







To specifically explain above radiation characteristic, an antenna designed to work at 2.45 GHz has been simulated in professional full-wave simulation software ANSYS HFSS. Spinning the two rotating rods at opposite angles reduces the length of the flexible parasitic dipole on one side but increases the other one on the opposite. Accordingly, the microfluidic channel and the liquid metal strip of each side follow the identical changing trend as the corresponding parasitic dipoles. Obviously, the currents on the shorter side are stronger than that on the longer side. Therefore, directional radiation can be observed when the parasitic dipoles are different in length. In contrast, the pattern would switch to bidirectional radiation when the parasitic dipoles are equal.



-- M JASWANTH CHOWDARY

NARAYANA ENGINEERING COLLEGE, GUDUR
Dhurjati Nagar, Gudur – 524 101,
Tirupathi (Dist.), Andhra Pradesh.
Email: hodece@necg.ac.in