BOUDDHIK AAGMAN

An Induction Journey at IP Office

INTELLECTUAL PROPERTY INDIA

PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

Cutting Edge Technology

Gaurav Kumar Tomar
Assistant Controller

Electronics and Communication

– Rapidly evolving, Impacting industries

– Innovations in chips and sensors drive IoT

– Telecommunication technologies- 5G,6G
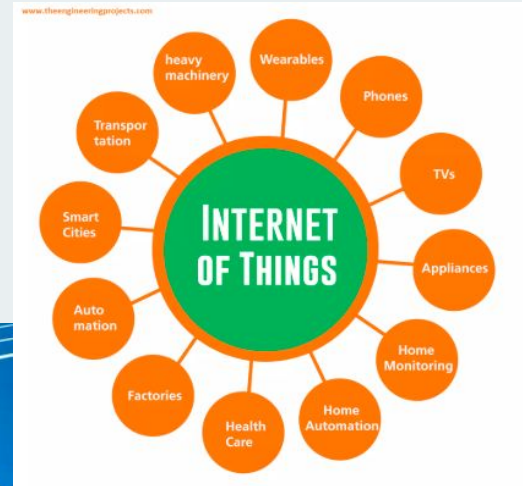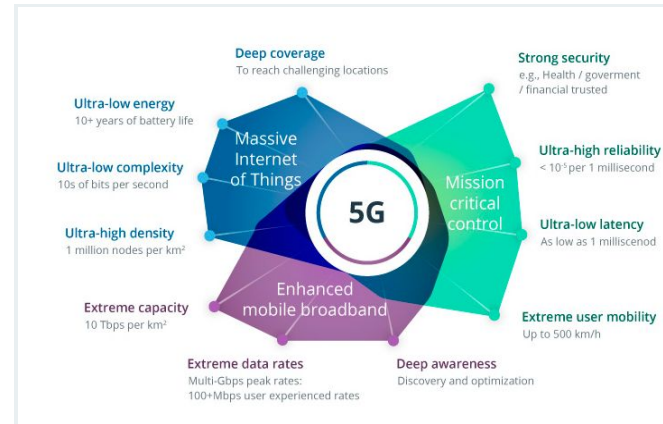
– Satellite-based Communication

Some Examples -

– Artificial Intelligence (AI) Integration

– Internet of Things (IoT) Innovations

– Advanced Display Technologies

– 5G

– Li-Fi

Network Slicing in Telecommunications

– **Network slicing** is a technology in telecommunications, particularly in **5G networks**, that allows a single physical network to be **divided** into multiple virtual networks, called **"slices".**

– 5G network slicing is the use of network virtualization (NV) to divide single network connections into **multiple distinct virtual connections that provide different amounts of resources to different types of traffic.**
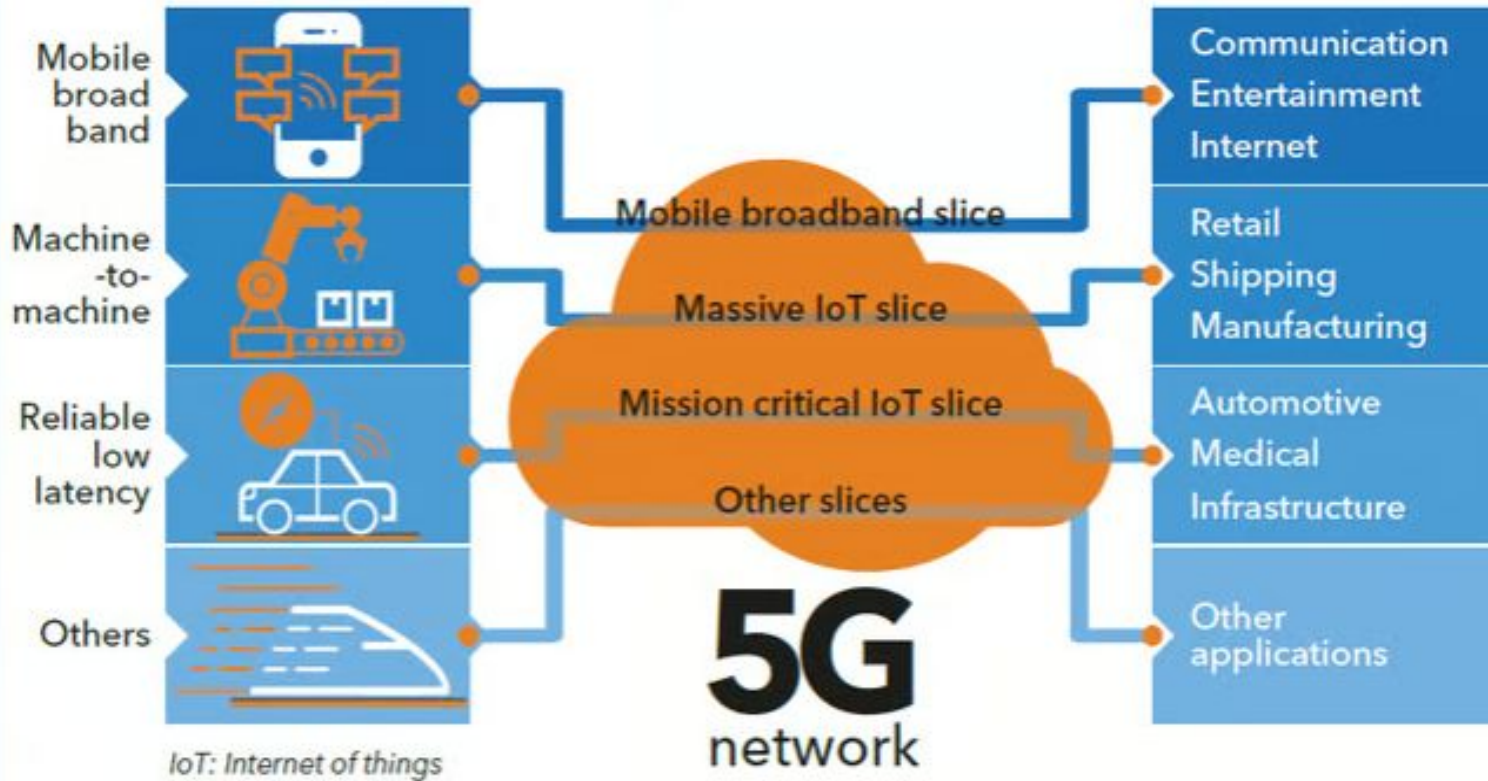
5G network slicing

5G network slicing enables service providers to build virtual end-to-end networks tailored to application requirements.

4G networks do not enable the range of services that the future requires. 5G will be faster and more flexible.

4G network

Mobile broad band
Machine-to-machine
Reliable low latency
Others

Mobile broadband slice
Massive IoT slice
Mission critical IoT slice
Other slices

5G network

Communication Entertainment Internet
Retail Shipping Manufacturing
Automotive Medical Infrastructure
Other applications

IoT: Internet of things

Source: ITUNews

**Patent Example-
Patent Number - IN553722**
(Application number –202121031448), Applicant
– TCS.

–The patent describes a **processor-implemented method** for dynamic network slicing in **5G environments**, focusing on the management and allocation of **radio access network** (RAN) resources to **optimize user equipment** (UE) connections for different application types. The system, **Network Slicing Control and Management System (NSCMS**), periodically retrieves uplink data requests from user equipment and a list of available RAN resources.

Patent classifies requests into **predictive demand** (based on forecasted user needs) and **real-time demand** (driven by immediate traffic patterns), ensuring that each request is efficiently managed.

The system dynamically **slices available RAN resources** into smaller, application-specific slices (such as **eMBB**, **URLLC**, and **mMTC**) based on demand. The **NSCMS** allocates these slices to corresponding UEs using **inter-slice** and **intra-slice allocation** strategies, and monitors the performance of these slices to identify degradation caused by factors like **traffic changes** or **wireless characteristics**.

Once the **performance** reaches a predefined threshold, the system can adapt the resource allocation to ensure consistent service quality. This approach allows for **efficient resource management** while meeting the diverse and dynamic needs of 5G applications.
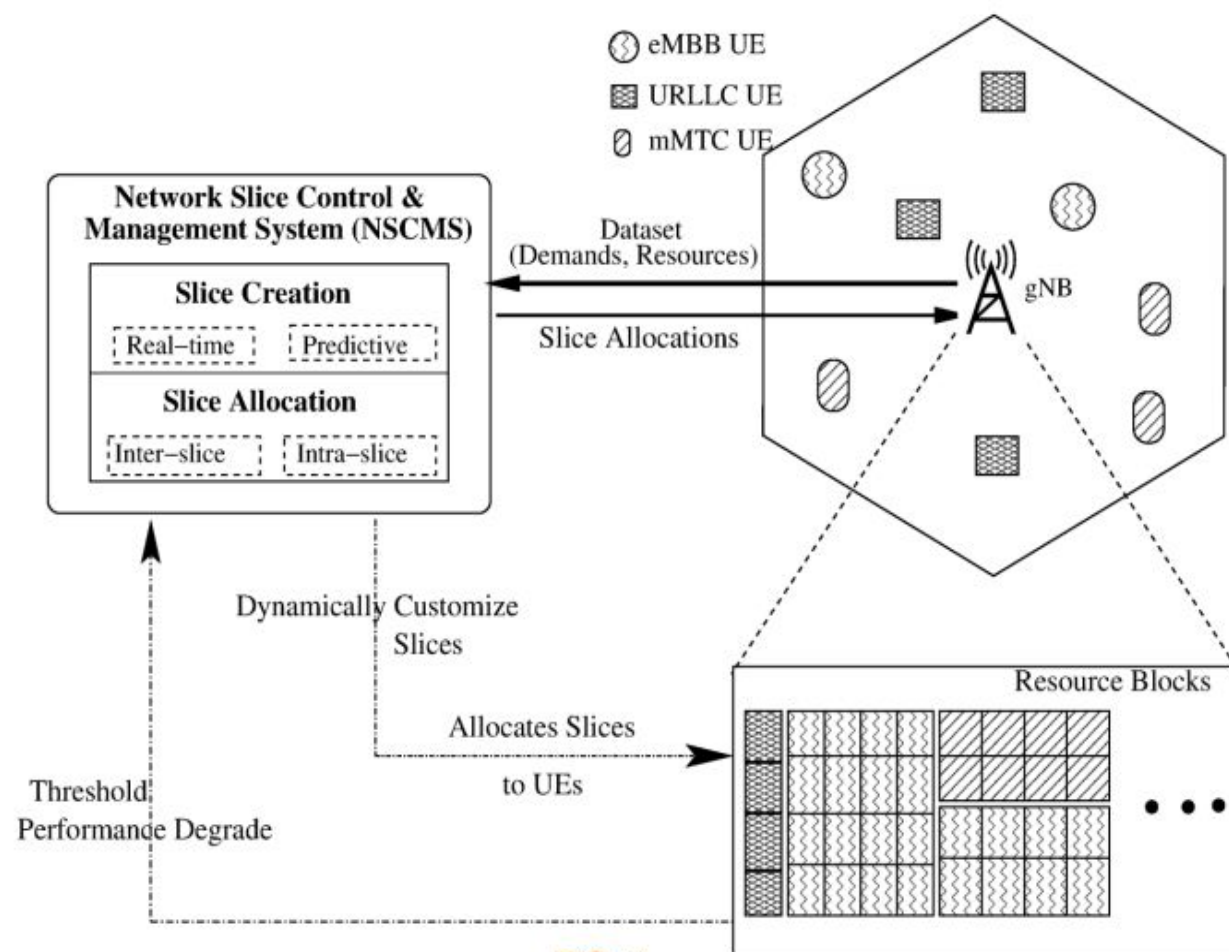

FIG. 2

Patent Example-
Patent Number – IN552433
(Application number –202221031237),
Applicant – JIO PLATFORMS LTD.

- The invention provides a system and method for ensuring **network slicing continuity** across multiple network operators.
- It receives **roaming requests** based on Quality of Service (QoS) requirements specified by users in their Home Public Land Mobile Network (HPLMN).
- The system provisions an appropriate **network slice** in the Visitor Public Land Mobile Network (VPLMN) to accommodate the users' roaming requests.
- It enables seamless **user access to the VPLMN** while maintaining the desired QoS, ensuring uninterrupted service during roaming.
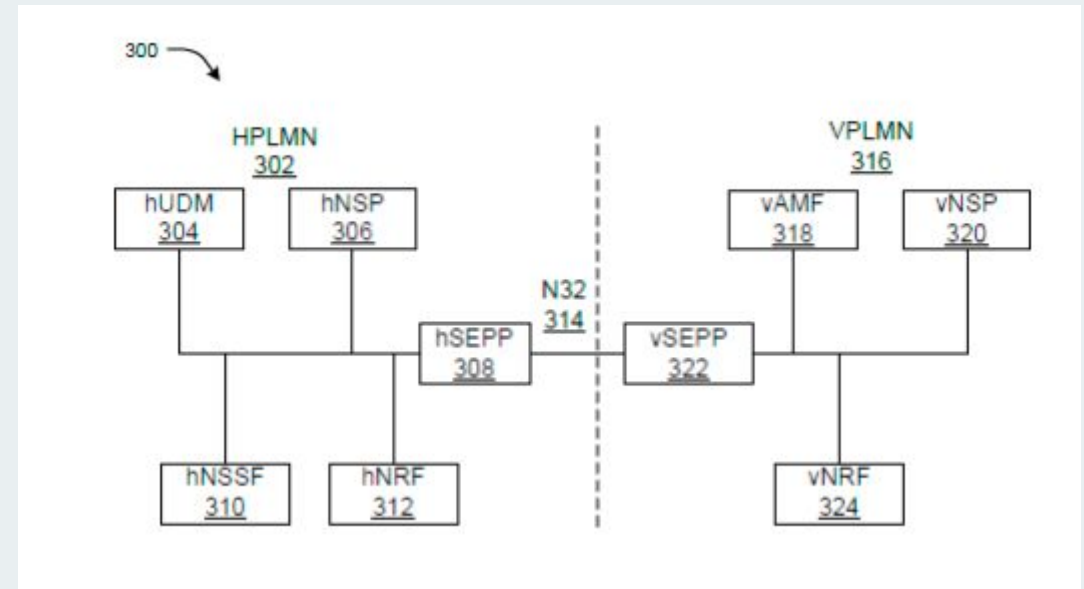
IOT- Internet of Things

– IoT integrates devices with sensors and processing abilities for real-time data exchange.

– **Goal of IoT** - Work together, Share information, and Make Autonomous Decisions.

– **5G, AI, ML** - Enhance IoT systems

Patent Example -
IOT in the Smart meter
Patent Number - IN551892
(Application number -202111037712)
Applicant - IIT DELHI

– Managing energy usage through the **integration of a retrofitted smart energy** metering device into an existing electrical system.

– Once installed, the device receives a variety of inputs related to electrical parameters through a graphical user interface (GUI) platform on a user terminal. These parameters, such as voltage, current, and **energy consumption**, are then communicated to a cloud database server unit, where the data is securely stored and accessible to authorized users via the same GUI platform.

– Empowers users with precise control over energy consumption, promoting efficiency and reducing waste through proactive management of electrical systems.

Patent Example

IOT in the Agriculture
Patent Number - IN549310 (Application number -202341026449)
Applicant - P.S.R. ENGINEERING COLLEGE

– The system employs advanced **IoT-enabled components**, including a **microcontroller** comprising an Arduino board and Node MCU, which work in tandem with a DHT11 sensor to **measure temperature and humidity**, as well as a water **vapor sensor** that uses electrical conductivity to detect soil moisture levels. This seamless integration of IoT technology ensures accurate and **timely irrigation** schedules, with the microcontroller adjusting watering times and durations automatically based on sensor data. By leveraging IoT for automated monitoring and irrigation, farmers can significantly reduce manual intervention, conserve water resources, and enhance crop yields, making agriculture more sustainable and efficient. This system is a prime example of how **IoT is transforming traditional farming practices into smart, data-driven operations.**
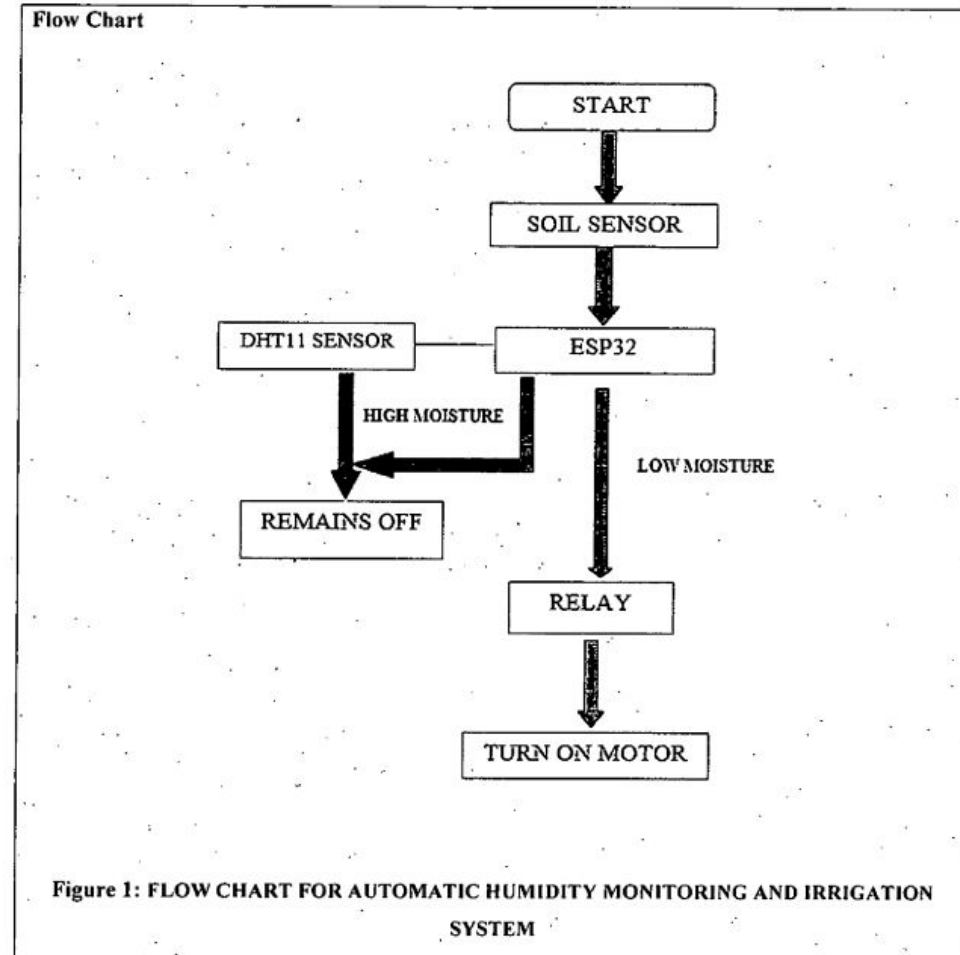
Flow Chart

Figure 1: FLOW CHART FOR AUTOMATIC HUMIDITY MONITORING AND IRRIGATION SYSTEM

Which of the following is the primary characteristic of IoT devices?

– A) They operate without the need for internet connectivity.

– B) They are able to collect and exchange data over the internet.

– C) They do not require sensors to function.

– D) They can only be used in industrial applications.

Which of the following is the primary characteristic of IoT devices?

– A) They operate without the need for internet connectivity.

– B) **They are able to collect and exchange data over the internet.**

– C) They do not require sensors to function.

– D) They can only be used in industrial applications.

How does IoT contribute to energy management in smart buildings?

– A) By reducing the need for sensors in the system
– B) By enabling remote monitoring and control of lighting, heating, and cooling systems
– C) By making manual control of energy systems more efficient
– D) By eliminating the need for electricity in buildings

How does IoT contribute to energy management in smart buildings?

– A) By reducing the need for sensors in the system
– B) By enabling remote monitoring and control of lighting, heating, and cooling systems
– C) By making manual control of energy systems more efficient
– D) By eliminating the need for electricity in buildings

Patent Number – IN462406
(Application number -201927047913).
# Applicant - BEIJING XIAOMI MOBILE SOFTWARE CO LTD.

– The Invention discloses a method which enables the **reception of control signaling** from a 5G base station by a target terminal that manages and controls a specific NB-IoT device.

– The NB-IoT base station forwards the **control signaling** received from the 5G base station to the corresponding NB-IoT device.

– The NB-IoT device executes the required operations based on the forwarded control signaling, enabling efficient remote control.

– This approach allows seamless **integration of 5G networks** with NB-IoT devices, ensuring improved management and control capabilities.

– The disclosed method enhances the **performance and flexibility** of 5G systems by enabling effective remote management of NB-IoT devices.

LIDAR

- An acronym of "light detection and ranging" or "laser imaging, detection, and ranging"

- Measuring the time for the reflected light to return to the receiver.

- Accurate, Fast, Weather Proof.
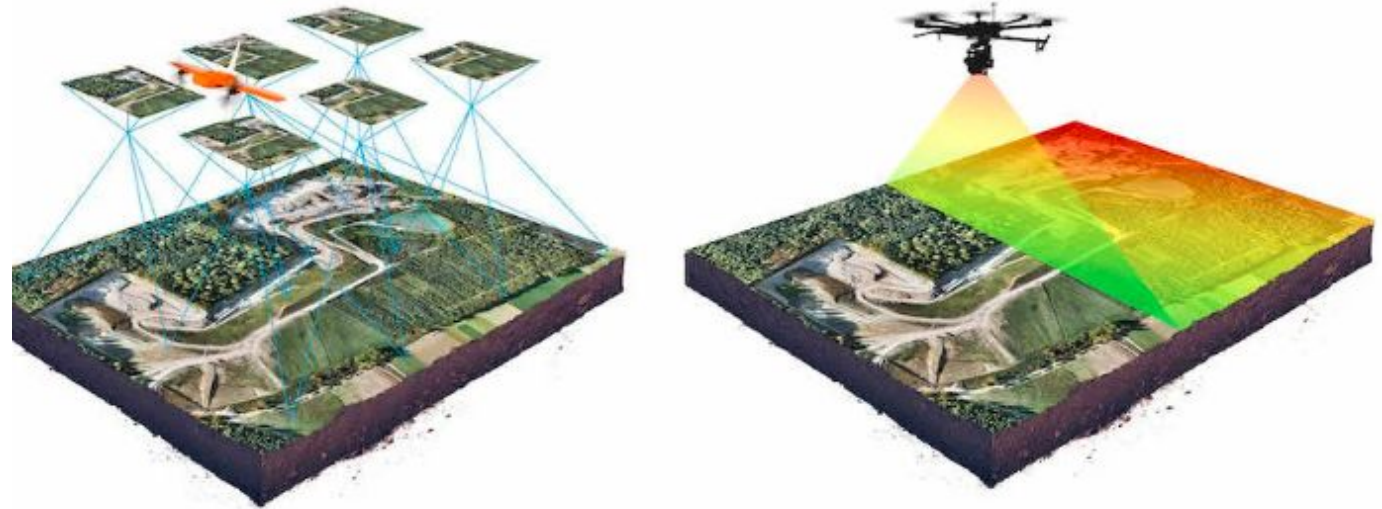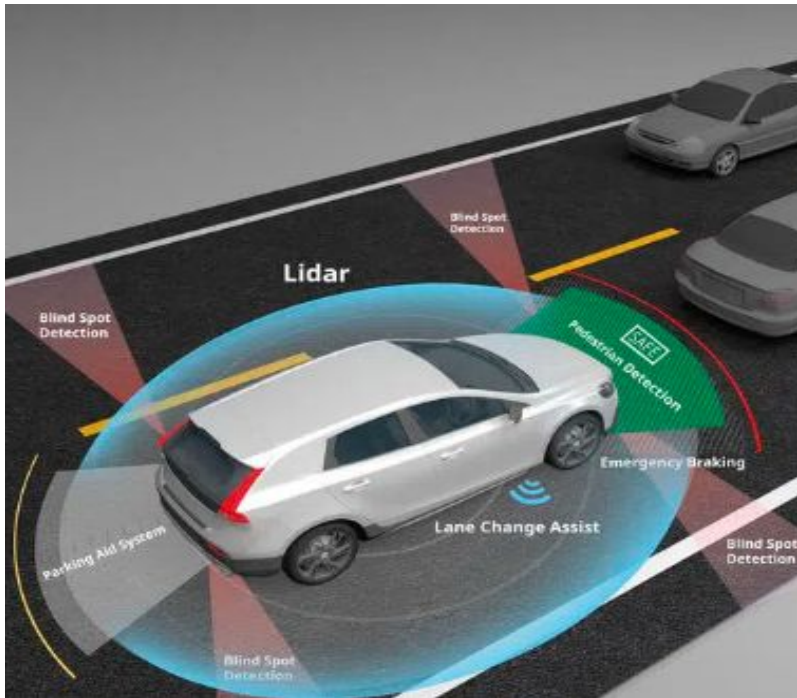
In autonomous vehicles, **LiDAR enables real-time object detection, navigation, and obstacle avoidance** by generating accurate 3D maps of the surrounding environment.

In geospatial mapping, **LiDAR supports topographic surveys, urban planning, and disaster management** by providing detailed elevation data.

In agriculture, **LiDAR facilitates precision farming** by monitoring crop health, soil properties, and terrain analysis for efficient resource management.

- In forestry, **LiDAR helps measure tree canopy heights, biomass, and forest structures**, aiding in ecological and environmental studies.

- In construction and architecture, **LiDAR creates accurate 3D models of buildings and infrastructure**, enhancing design, monitoring, and planning processes.

- In archaeology and environmental monitoring, **LiDAR uncovers hidden structures and tracks natural changes**, such as coastal erosion, glacial shifts, and vegetation analysis.

Patent Example

LIDAR in vehicle

Patent Number - IN544554 (Application number -202311004343)
**Applicant - Indira Gandhi Delhi Technical University for Women**

– **LiDAR-based system**: The system uses a LiDAR sensor to detect obstacles and potholes on the road, providing distance measurements to help enhance road safety.

– **Visibility detection**: A visibility sensor located at the vehicle's front detects impaired visibility by analyzing the scattering pattern of emitted light.

– **Speed monitoring**: A Hall effect sensor, activated by a microcontroller, tracks the vehicle's speed when visibility is compromised, ensuring safety precautions are triggered accordingly.

Obstacle alerts: If the vehicle's speed exceeds a preset threshold and an obstacle or pothole is detected within a critical range, the system activates a buzzer to alert the driver.

Rain and water detection: The system includes rain and ultrasonic sensors that detect rain and measure waterlogged areas, alerting the driver if water levels exceed safe thresholds.

Integrated safety features: By combining LiDAR with advanced sensors like rain and ultrasonic sensors, the system provides timely alerts for better driver decision-making and accident avoidance.

Figure 2
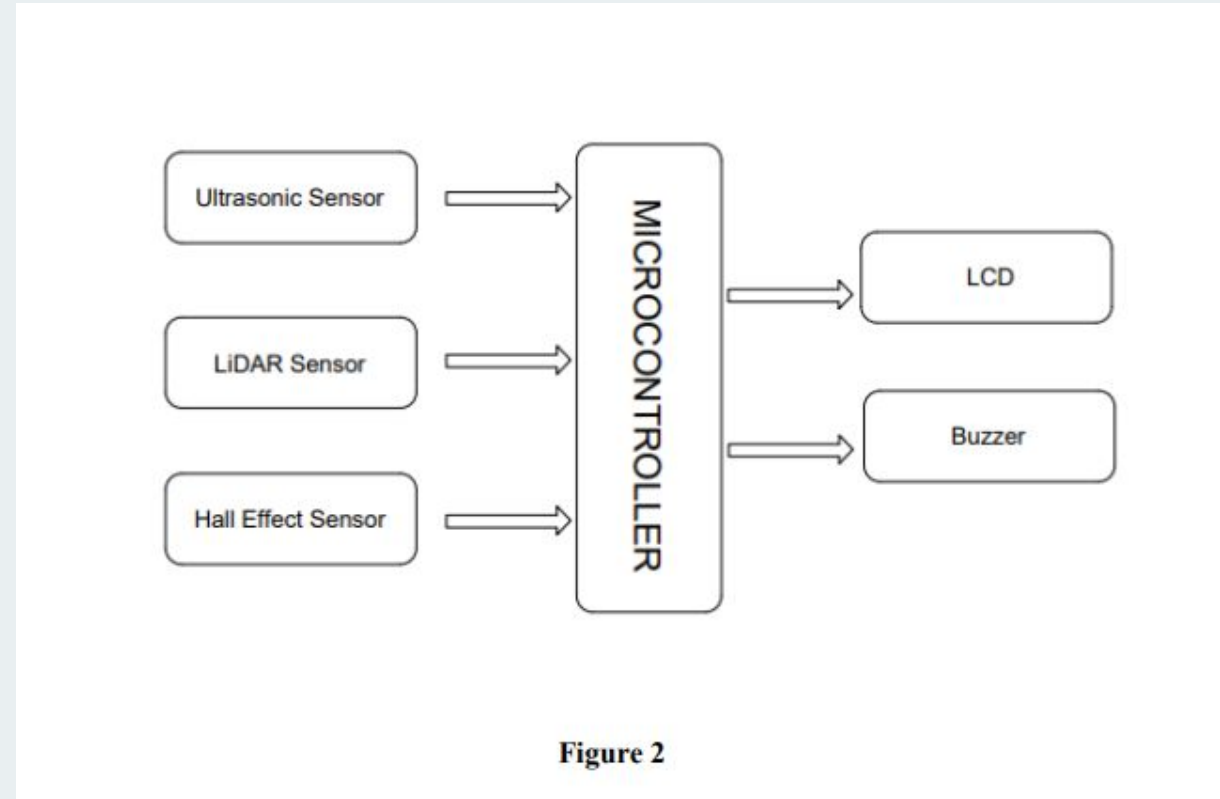
LIDAR for MEASUREMENT OF ATMOSPHERIC WATER VAPOUR
Patent Number -IN333818 (Application number -1972/CHE/2012)
Applicant - INDIAN SPACE RESEARCH ORGANISATION

– The invention describes a **Raman LIDAR system**, designed to enhance atmospheric scanning for detecting water vapor and aerosols. The system consists of three main components:

– **Transmitter Subsystem**: Emits laser pulses used to probe the atmosphere.

– **Receiver Subsystem**: Captures the scattered light signals (Raman signals) from atmospheric particles and processes them for analysis.

– **Optical Separator**: Ensures a **biaxial configuration** by aligning the optical axes of the transmitter and receiver subsystems parallel to each other but on separate paths. This configuration isolates the functions of transmitting and receiving light, improving precision and reducing interference.

– **Titling the mechanical housing** enables the Raman LIDAR system to scan the atmosphere from various angles, thereby increasing an area of scanning the atmosphere for water vapour /aerosol

Li-Fi

– **High-Speed Data Transmission**: Li-Fi (Light Fidelity) uses light waves to transmit data.

– **Enhanced Security**: Li-Fi provides improved security as light cannot penetrate walls, ensuring that the communication remains confined to the physical space of the light beam.

– **Energy Efficiency**: Cost-effective and energy-efficient solution.

– **Versatile Applications**: Li-Fi is ideal for environments like hospitals, airplanes, and underwater communication.

What are challenges in Li-Fi?

– Line-of-Sight Dependency

– Limited Range

– Light Interference

– Infrastructure Costs

Patent Example Interference in Li-Fi

Patent Number - IN414620 (Application number -201941051271)
Applicant -   WIPRO LIMITED

– The patent discloses a method of **managing interference between multiple Li-Fi** access points to ensure optimal data transmission. The process involves an interference management device receiving uplink data frames from a User Equipment (UE).

– Each uplink frame contains a response to a corresponding downlink test frame from a Li-Fi access point, which includes **either an Acknowledgment (ACK) or a Negative Acknowledgment (NACK)**, along with a Channel Quality Indication (CQI) based on the received downlink test frame. If the interference management device detects the presence of the UE in an interference-prone region—indicated by **at least one NACK**—it identifies the Li-Fi access point with the highest CQI (e.g., access point 108) and attaches the UE to it.

– To mitigate interference, the device **schedules** data transmissions in mutually exclusive **time slots**, ensuring that the UE accepts data only from the designated Li-Fi access point while dropping data from others. This method enhances network efficiency by dynamically managing channel quality and minimizing interference in multi-access point Li-Fi environments.
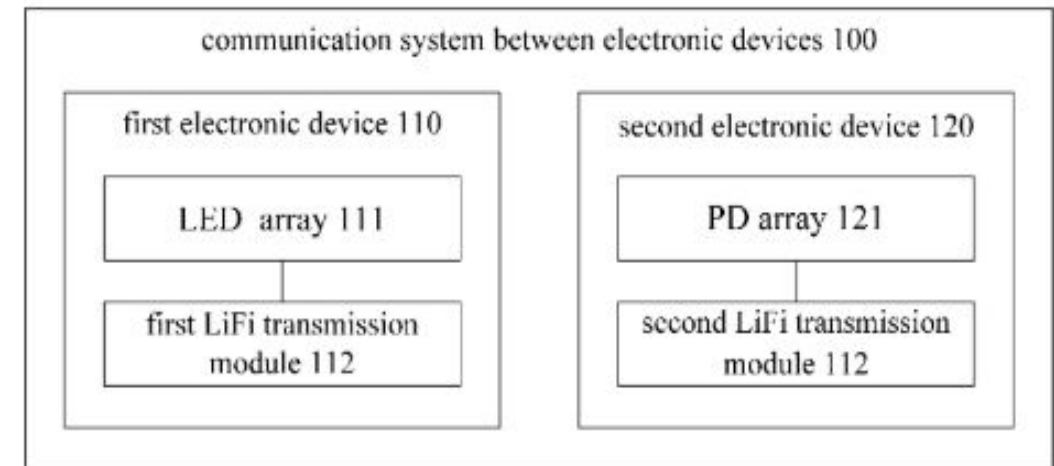
Li-Fi Data Transfer
Patent Number – IN505282
(Application number -202014016129)
Applicant-GUANGDONG OPPO MOBILE TELECOM CORP LTD

– The invention introduces a **communication system leveraging Li-Fi (Light Fidelity)** technology in the infrared frequency band for efficient and dynamic data transmission.

– The first electronic device features an **LED array and a Li-Fi transmission module** that codes and transmits data in the infrared spectrum.

– The second electronic device, equipped with a **PD (photodiode) array and a Li-Fi transmission module**, receives and decodes the transmitted data.

– This system enables high-speed, **infrared-based communication** between devices, ensuring reliable and secure data transfer.

communication system between electronic devices 100

first electronic device 110	second electronic device 120
LED array 111	PD array 121
first LiFi transmission module 112	second LiFi transmission module 112

Satellite Communication

– A communications satellite is an **artificial satellite** that relays and amplifies radio telecommunication signals via a transponder; it creates a communication channel between a source transmitter and a receiver at different locations on Earth.

– Satellite communication for phones enables wireless connectivity over vast distances by transmitting signals between ground-based devices and orbiting satellites. This technology is crucial in providing voice, text, and data services to areas where traditional cellular networks are unavailable, such as remote regions, oceans, and disaster-stricken zones.

– Satellite communication relies on specialized **protocols** to manage data transmission, ensure signal integrity, and correct errors over long distances as ever-changing phone standards.

Patent Example

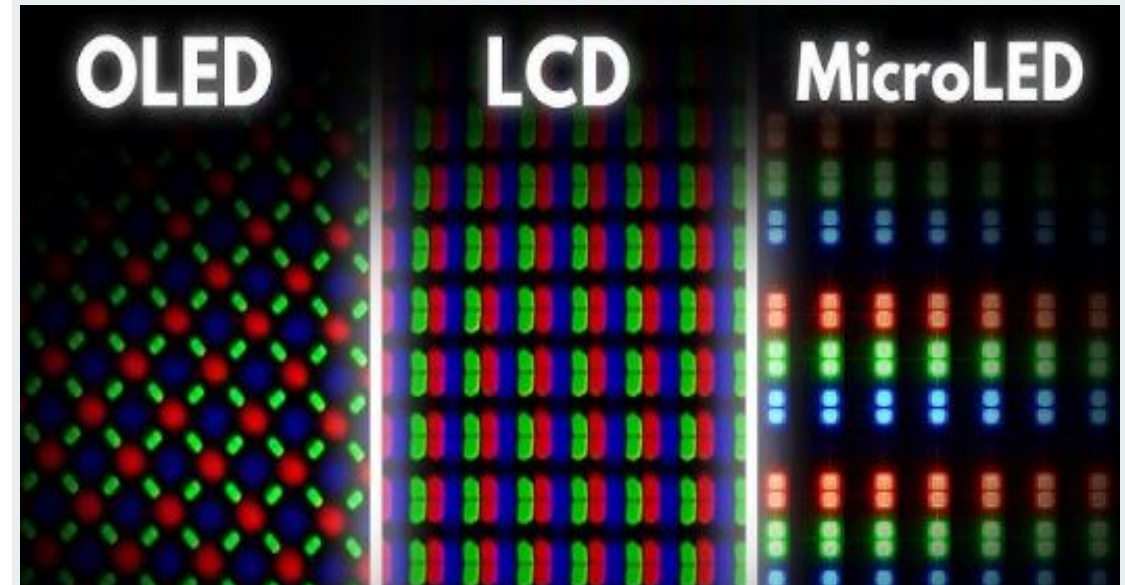**Patent Number - IN436460 (Application number -202017035850)**
Applicant - IPCOM GMBH & CO KG

– The invention involves a method for **operating a user equipment (UE)** device in communication with a non-terrestrial communication system, consisting of multiple transmission points.

– The UE triggers a transmission of a **measurement report based** on the received signal parameter measured from a transmission point and a comparison with a threshold.

– The threshold is dynamic, varying according to a predetermined function based on the expected position of the UE relative to the transmission point.

– This **dynamic threshold strategy** enhances the accuracy and relevance of measurement reporting, improving the efficient use of network resources.

– The method ensures strong connectivity, smooth **handovers**, and improves communication reliability, particularly in rapidly changing environments like satellite systems.

Micro Led

- **Self-Emitting Pixels**: MicroLED technology uses microscopic, self-emitting LEDs as individual pixel elements, eliminating the need for liquid crystals or backlighting used in traditional LCDs and OLEDs.

- **Energy Efficiency and Performance**: MicroLED displays consume significantly less energy while offering pixel-level light control, high contrast ratios, and superior brightness.

- **Versatility in Applications**: MicroLEDs can be scaled for various display sizes, enabling applications ranging from small wearable screens to large, modular displays for home entertainment, digital signage, and augmented reality.

- **Future Advancements**: The integration of MicroLED technology with flexible displays could revolutionize display design, offering unprecedented adaptability and innovation.

Patent Example
MICRO LED GARMENT

Patent Number - IN414620 (Application number -202147036628)

Applicant - LIM, Seong Kyu, KIM, Myeong Hee, LIM, Jong Ho, LIM, Jong Yoon

The patent describes a self-customizable **micro LED garment** capable of changing colors and patterns like a TV screen and, more particularly, to a useful invention comprising: a garment composed of upper and lower garments worn on a wearer's body;

a transparent micro **LED display skin coated on the surface of the garment;** a master unit and a remote slave inside the upper and lower garments of the garment;

a smartphone, wherein the transparent micro LED display skin is selectively **controlled by means of an application** installed on the smartphone by the wearer to express a variety of colors according to the current situation of the wearer.
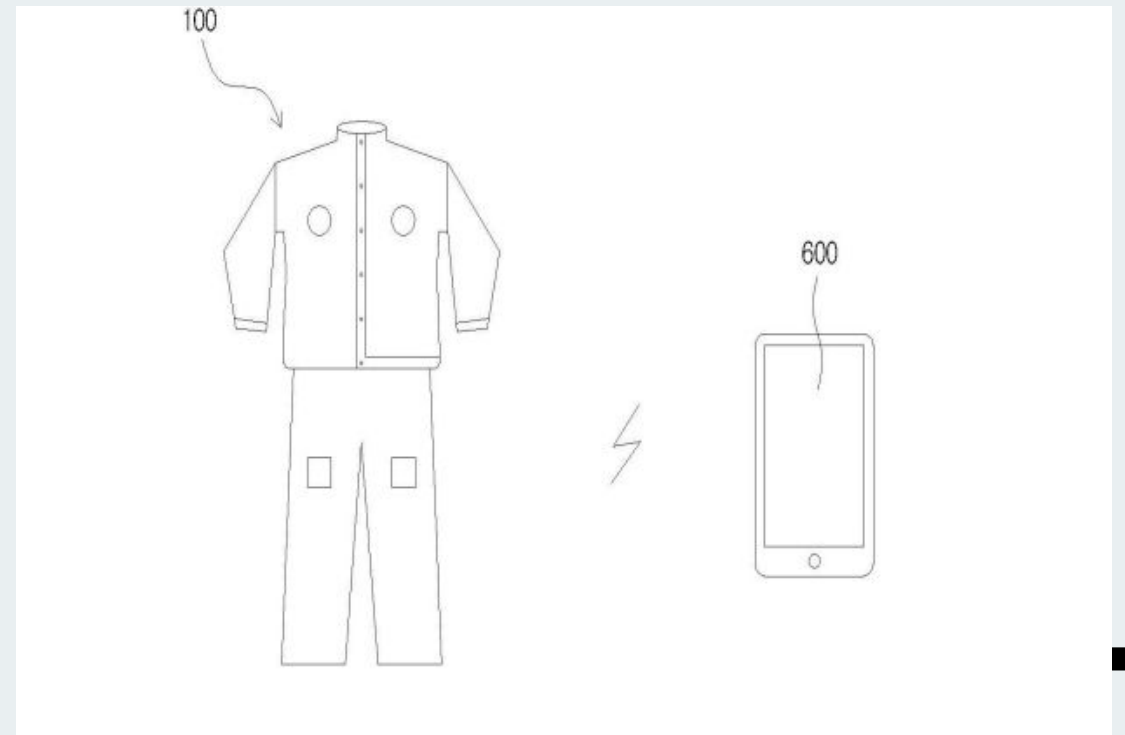
MICROLED DISPLAY PANEL
**Patent Number –
(Application number -201811001663)
Applicant - PRILIT OPTRONICS INC.**
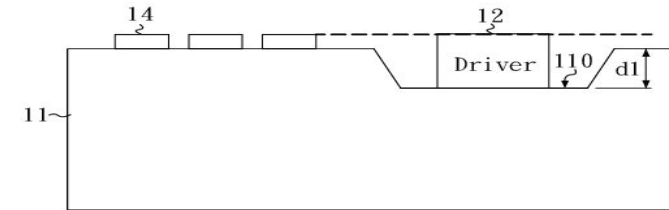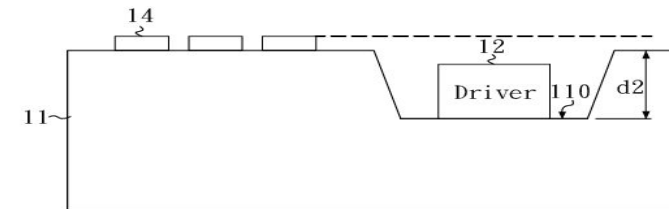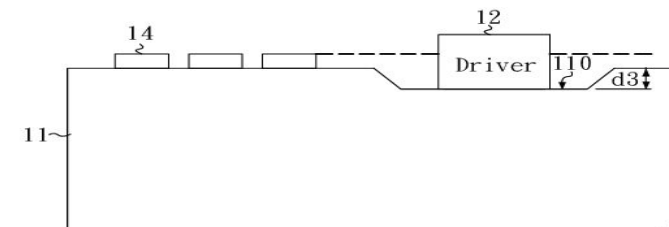
- The invention describes a **microLED display panel** with an innovative design for enhanced integration and performance.

- The panel's substrate is divided into **multiple sub-regions**, each housing a driver within specifically designed recesses.

- The combined depth of the recess and the microLED's height matches the driver's height, ensuring a **uniform surface profile** across the panel.

- This configuration optimizes the **assembly process**, improves **display uniformity**, and reduces the risk of **component interference**.

FIG. 6A

FIG. 6B

FIG. 6C

Recap -

– **Advancements in Electronics and Communication**: Innovations are driving profound impacts across industries, improving efficiency and sustainability.

– **Network Slicing in Telecommunications**: Enables dynamic and efficient 5G connectivity, enhancing network performance and user experience.

– **Internet of Things (IoT)**: Revolutionizing sectors like energy management and agriculture through smart technologies such as automated irrigation and smart metering.

– **LiDAR Technology**: Transforming fields such as autonomous vehicles, geospatial mapping, and environmental monitoring by offering precise data for better decision-making.

– **Li-Fi**: To fast data transfer between devices and transforming data transfer

– **Satellite Communication:** Providing global coverage.

– **Micro Led**: Microscopic LEDs forming the individual pixel elements, transforming display.

Thank You