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Environmental Monitoring System and Wireless Charging Station

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ABSTRACT :

Imagine a machine that exhibits environmental conditions equally to provide a method of wireless charging to the video - and fulfills the same use of natural, inexperienced power. This work affects this task. Using sensors such as DHT11 and MQ135, it measures temperature, humidity, and air quality, and sends this information through Wi-Fi (ESP8266 module). Meanwhile, an RFID device controls which can use the Wi-Fi charging station, which itself is powered by the Sun Electricity.

This assignment feature, stability and mix of smart era, aims to expand cities of our cities and is a generation maturity, we want smart and greenery solutions. Smart cities commendablely rely on the Internet of Things (IOT) for the use of more green environmental facts and more green. Parallel, wireless charging and renewable power assets are becoming important to continuously supply our electricity needs.

Our function, "environmental monitoring system and wireless charging station," adds those requirements to an unmarried device. It monitors the environment, presents Wi-Fi charging with RFID-Items-based entry rights, and operates on solar energy.

Objective

To give an environmentally pleasant, green answer that basically integrates in the future of the city. ,

Literature review

Research indicates that IOT-operated environmental tracking may offer real-time comments on wind and climatic conditions (Jain et al., 2019; Yadav et al., 2020). Wireless charging, especially through.

Objectives

- Use solar energy to encourage renewable power use.
- Monitor key environmental factors like air quality and temperature.
- Manage energy smartly using IoT.
- Strengthen smart city infrastructure with modern technologies.
- Improve the reliability of wireless charging and secure RFID-based access.

Methodology

System Design

The system consists of two main parts:

1. Environmental Monitoring
2. Wireless Charging Station

Both are connected through IoT for seamless data flow.

Hardware Used

- Sensors: DHT11 (temperature, humidity), MQ135 (air quality)
- Controllers: Arduino, ESP32
- Modules: Wireless Charging Unit, RFID Reader
- Power: Solar Panels

Data Transmission

Data is sent wirelessly via Wi-Fi or Zigbee and visualized through a mobile or web dashboard.

Software Development

- C/C++ programming for managing sensor data and RFID authentication.
- Cloud storage and display for real-time environmental monitoring.

Testing

- Calibrated the sensors for accuracy.
- Measured wireless charging efficiency.
- Checked the security and speed of the RFID system.

Results

- Environmental Monitoring: Data was transmitted in under 2 seconds with ±5% sensor accuracy.
- Wireless Charging: Achieved around 85% efficiency at a distance of 3–5 cm.
- RFID Authentication: Verified access within 1 second.
- Energy Management: Solar panels met 70–75% of the system's energy needs; batteries kicked in when sunlight was low.

Discussion

The system successfully tracked environmental data and provided reliable wireless charging, all while maintaining a sustainable energy source. RFID ensured secure, contactless access. However, slight misalignments in the charging coils reduced efficiency — an area that could use improvement. Additionally, since the system relies heavily on solar power, better battery backup would be helpful in areas with less sunshine. Future upgrades could add noise, radiation, or soil moisture monitoring to expand the system's uses, especially in agriculture.

Conclusion

This project shows that it's possible to create an integrated, solar-powered platform for environmental monitoring and wireless device charging. It's a scalable, eco-friendly solution ideal for modern smart cities. Still, improving the charging range and enhancing battery systems would make it even more robust and widely applicable.