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ZENAB – AI Tree That Connects with Smartwatch to Detect Human Presence and Activate Smart Functions

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Abstract

Urban environments are increasingly adopting smart technologies to promote sustainability and enhance public spaces. This paper introduces ZENAB – an AI-powered artificial tree system designed to detect human presence through smartwatch integration and activate its smart features within a 200-metre range. ZENAB combines AI, IoT, and eco-design to provide functions such as air purification, environmental monitoring, and interactive lighting. Built as a visionary model of future smart green infrastructure, ZENAB demonstrates how wearable devices can be harmonized with intelligent installations in public areas. This innovation aims to contribute to cleaner air, safer urban zones, and enhanced quality of life. The system represents a step forward in merging nature-inspired designs with real-time human detection and smart responsiveness.

1. Introduction

With rising concerns over urban pollution and climate change, smart environmental solutions have gained importance in urban planning. ZENAB (Zero-Emission Nature-Aided Botany) is envisioned as a next-generation AI tree that responds to human presence via wearable devices. It merges artificial intelligence, the Internet of Things (IoT), and sustainable design to create an interactive and responsive smart ecosystem.

2. Methodology

The development of ZENAB follows a modular approach combining hardware and software components:

- Smartwatch integration to detect user presence via Bluetooth/GPS.

- Microcontroller-based activation system within the tree.

- AI algorithms trained to detect human approach patterns.

- Environmental sensors to monitor air quality, temperature, and humidity.

- Solar-powered energy system to maintain eco-friendliness.

Data is processed in real-time to trigger appropriate actions such as lighting, air filtration, and alerts.

3. Key Features of ZENAB

- Smartwatch-based human detection within a 200-metre radius.
- Air purification using HEPA and activated carbon filters.
- LED lighting that adjusts based on ambient conditions and user proximity.
- Data logging and cloud reporting via IoT modules.
- Touchscreen interface for local interaction and environmental stats display.

4. System Workflow

1. The user with a paired smartwatch enters ZENAB's detection zone.
2. The smartwatch transmits identification or proximity data.
3. ZENAB’s controller unit verifies and activates subsystems.
4. Air filters turn on, lights activate, and environmental data is collected.
5. User feedback and environmental updates are displayed on the interface.
6. System returns to standby mode when no presence is detected.

5. Future Scope

Future iterations of ZENAB can include:

- Integration with health apps to detect stress or fatigue.
- Expanded network of AI trees for large-scale urban coverage.
- Emergency alert system in case of poor air quality or extreme weather.
- Integration with public transportation systems for energy optimization.

6. Conclusion

ZENAB offers a glimpse into the future of sustainable, responsive urban infrastructure. By linking wearable tech with AI-driven smart trees, it creates a symbiotic relationship between humans and their environment. This innovation has the potential to transform public spaces into safer, greener, and more intelligent zones.

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