What if we truly connected with nature?

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UNCERTAINTIES

Nature, Technology

MEGATREND (Most significant)

Boundless Multidimensional Data

TRENDS

Community-Based Solutions Human–Machine New Materials Air Pollution

TECHNOLOGIES

Edge Computing Immersive Technologies & Wearables Internet of Things (IoT)

SECTORS IMPACTED

Art, Media, Sports & Entertainment Communication Technologies & Systems Consumer Goods, Services & Retail Data Science, AI & Machine Learning Education Health & Healthcare Immersive Technologies Insurance & Reinsurance Materials & Biotechnology

KEYWORDS

Behavioural Change Environmental Sensing Sensory Experience Touchless Haptics Ultrasonic Technology

The Feel of Nature

Within Reach

Transitional

Visionary

Touchless haptic technology uses ultrasonic waves and smart sensors to convert environmental data into mid-air sensations, creating immersive, real-time and tangible connections that enhance awareness of nature.





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90% of their time indoors in artificial, temperaturecontrolled environments

WHY IT MATTERS TODAY

Tactile feedback expands the boundaries of sensory experience. The potential of haptic technology extends far beyond assistive applications, offering immersive experiences that were previously unimaginable. By converting sensory information into tactile feedback, this technology allows individuals to experience music, virtual environments, and complex interactions in entirely new ways.

Climate change and environmental degradation are urgent global issues but often feel far from individuals. The expanding urban population, in particular, often lose touch with nature and the health of their surroundings.⁶⁴² People in modern industrial societies spend 90% of their time indoors⁶⁴³ in artificial, temperature-controlled environments. Their lives are often cut off from natural cycles and devoid of birdsong, rivers and streams, and fresh air. Even people living in rural areas are not immune to the disconnecting effects of increasingly technology-mediated, busy modern life.⁶⁴⁴

There is a growing emphasis on experiential learning and sensory engagement, which can be key contributors to behavioural change. King's College London used a device developed by Dyson as part of the Breathe London initiative. The aim of this study, which involved 250 children, was to understand the effects of daily exposure to pollutants, including $PM_{2.5}$ and nitrogen dioxide, on the school run.⁶⁴⁵ As a result of the study, 31% of children changed the way they travelled to and from school to reduce their exposure to air pollution.⁶⁴⁶

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THE OPPORTUNITY

Using ultrasonic waves,⁶⁴⁷ mid-air sensations allow people to experience – and feel – nature. By adjusting airborne ultrasonic waves and using acoustic levitation (the use of sound waves to hold particles in the air),⁶⁴⁸ data and sounds are converted into haptic sensations. Users can experience virtual textures and forces with unprecedented spatial precision and responsiveness.⁶⁴⁹

Ultrasonic transducers⁶⁵⁰ and the Internet of Things (IoT)⁶⁵¹ enable touchless interactions and a wide range of sensations, from light pressure to more complex tactile experiences,⁶⁵² enabling more natural and immersive experiences across environments.⁶⁵³ A distributed nanoscale sensor network embedded in nature⁶⁵⁴ monitors environmental conditions, such as air quality (PM_{2.5}), soil moisture, temperature and pollutants. Edge computing simultaneously processes these data to deliver real-time physical sensations.

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BENEFITS

Increased awareness of nature; enhanced environmental education; data-driven ecosystem management; accessible experiences for the visually impaired; enhanced immersive experiences.

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RISKS

Increased eco-anxiety; data manipulation; reliance on training to understand how haptics relate to given environmental conditions; less authentic nature experiences; sensory overload; wear and tear of sensors.