Wearable olfactory display

Why “Wearable” Matters

In this research, we designed an olfactory display that attaches directly to VR goggles.

- **Hands-Free:** Unlike desktop, graspable, or arm-mounted devices, users don’t need to hold anything.
- **Immersive:** By mounting it on the headset, users can move freely and enjoy a smell-enhanced environment as simply as using a standard VR system.

In a word, it is intrinsically and extremely suitable for immersive VR experiences.

Fig 1. Multi-channel wearable olfactory display integrated with VR headset.

How It Works (The principle of our multi-channel wearable olfactory display)

Our system generates the target odor by transforming liquid odorants into a fine mist and delivers it to the user:

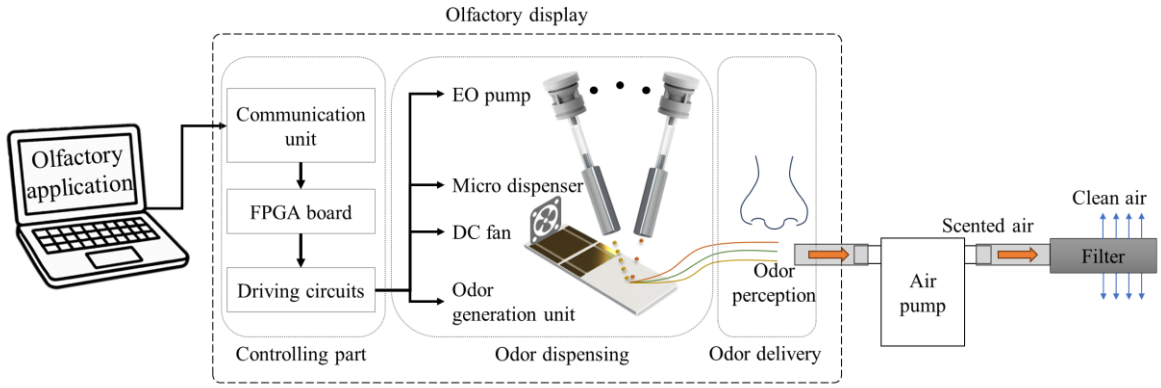

Fig 2. System schematic

1. **Odorant Storage & Supply:** An electroosmotic (EO) pump stores and supplies the liquid odorant with an adjustable flow rate.
2. **Precise Dispensing:** A micro dispenser receives the supplied odorant and ejects it into tiny droplets, but the user cannot directly perceive these droplets.
3. **Atomization:** The droplets hit a surface acoustic wave (SAW) device. This device instantly turns the liquid into a human-perceptible mist.
4. **Delivery:** A small DC fan gently blows the scented mist to the user's nose.
5. **Odor Removal:** An external air pump and deodorant filter continuously remove the residual odor to prevent its lingering.

Key Features

- **Expanded Odor Range:** It integrates multiple independent odor channels, allowing it to mix or switch between different scents instantly.
- **High Precision:** The carefully calibrated EO pump flow rate and micro dispenser ejection frequency enable extreme precision of droplet volume (2~3 nanoliters).
- **Advanced Atomization:** The SAW device effectively atomizes the liquid even for low-volatile liquids.
- **Clean Scent Switching:** The residual odor is removed instantaneously. Otherwise, it may confuse the user. This feature is often overlooked in other research.
- **Long-term Operation Stability:** Optimized structure and signal design enhance the continuous operation ability.

References

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