Advanced Research in Olfaction for Multi-modal Applications (AROMA) Laboratory

Overview:

Current virtual environments have advanced visual and audio outputs, but the use of smell is either very limited or completely absent. Adding olfactory stimulation to current virtual environments will greatly enhance the sense or presence, or 'realness' of the environment. Though many attempts have been made to include olfactory displays in virtual environments, most of them were unsuccessful. There is still no standard by which to represent and playback smells. Olfactory effects could play a crucial role in certain training environments, such as fire fighter and medical training.

Accomplishments:

The Institute for Simulation & Training (IST) at the University of Central Florida (UCF) has been researching whether the addition of an olfactory component to a Virtual Environment (VE) would improve the user's sense of presence. We have researched olfactory devices for VE and selected the ScentKiosk system from ScentAir. It has worked very well for all our current applications. Therefore, we are developing scientific studies to determine if olfaction augments the cognitive processes of human operators experiencing the least optimal stress levels (low or high) for optimal performance without additional cognitive overload. There is conflicting literature as to whether olfaction acts on a separate sensory modality from the visual/spatial or verbal/auditory modalities. Therefore, we plan to determine if the addition of an olfactory component would increase transfer effectiveness (i.e., more efficient training/less time) without compromising cognitive overload or increasing cost. Olfactory, cognitive, and training literature was examined and the results suggest that an olfactory component may augment human information processing without additional cognitive overload.

In simulated and training applications, spatially placing a smell to be originating from a particular location might be necessary. A personalized olfactory display can achieve this task more efficiently, as it may have two individual displays for the two nostrils. The concentration and phase gradient between the two displays can make the odor appear to be originating from a particular location. Therefore, personalized olfactory displays may be more suited for simulation and training applications. Since the devices are small in size, they can easily be head-mounted or worn by the trainee.

Chemistry composition of the odorant (the particular chemical that causes the odor) is used to create the olfactory effects. It is not yet known if any smell can be generated from a combination of some basic smells. Initial research indicates the contrary.

We selected ScentAir Technologies, Inc. ScentKiosk Scent Dispenser, which dispenses precise fragrance volumes directly to the guest user via a tube. It uses single scent cartridges. Since the cartridges are sealed when not in use, the system does not leak any scents, a problem for many olfactory systems. The current system contains three of these cartridges for three different scents. There are three small air pumps that push a small amount of air through these cartridges and out the hose. The end of hose needs to be within 18 inches of the user's nose. Therefore, we connected it to a headphone and microphone set in order to minimize encumbrance to the user and for ease of setup. Since the ScentKiosk system uses a separate hose for each scent, the different scents are not mixed.

Conclusion:

In conclusion, an ideal training program is designed to reduce interference and cognitive overload, resulting in less time, less cost, and longer retention. It appears that if olfaction works on a separate modality than the addition of an olfactory component may augment the cognitive processes of human operators experiencing the least optimal stress levels (low or high) for optimal performance without additional cognitive overload

We are conducting research and experiments to confirm whether olfaction acts on a separate sensory modality from the visual/spatial or verbal/auditory modalities and therefore if the addition of an olfactory component would increase transfer effectiveness without compromising cognitive overload. It is suggested that research to test the impact of an olfactory component on human information processing be conducted on tasks that already involve dual-modalities.

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