Dissertation Proposal

By Fionn Lavery

Student number: 09003045

Title:

Creating an interactive installation which causes auditory and visual hallucinations using sensory deprivation and the Multimodal Ganzfeld effect

Introduction:

For my dissertation I intend to make a device which will induce hallucinations in users based on the use of sensory deprivation and Multimodal Ganzfeld effect. The device will be built within a wearable helmet which deprives the user of both visual and auditory stimulation which will cause amplification in neural noise which is then interpreted by the visual cortex in the brain causing the hallucinations. An interactive element of the device will come in the form of EEGs in the helmet which will detect brain wave changes and subtly change the nature of the hallucinations. A possible application of such a device would include meditation or using it to increase creativity but I hope to create it as some form of art installation.

Concept:

To create auditory and visual hallucinations it is quite simple and my device is based on conditions on technology that can be recreated at home with relative ease. To get a real idea of the concept behind this and create your own Multimodal Ganzfeld effect, all you need is a ping pong ball and a small radio.
Cut the ping pong ball in half and tape them over your eyes then turn on your radio and put it on a station with white noise (you might want to turn on the radio first to avoid falling over furniture). Now sit back and relax in a well lit room and soon enough you will

experience the aforementioned auditory and visual hallucinations. This is called the Multimodal Ganzfeld effect.

The Multimodal Ganzfeld Effect:

The Ganzfeld effect is experienced when a person stares at an area of undifferentiated and uniform field of colour. The brain cuts out this unchanging visual signal and amplifies neural noise (random activity of neurons that presumably is not associated with encoding of behaviourally relevant variables) to try and find these missing visual cues. This neural noise is then interpreted by the higher visual cortex which gives rise to visual hallucinations such as kaleidoscope effects. This occursed first in Arctic explorers where snow storms present them with a uniform field of colour. As for the auditory hallucinations the same thing is occurring, lack of viable auditory stimulation causes the brain to create its own, this being used along with the visual deprivation is called the multimodal Ganzfeld effect. The Multimodal Ganzfeld effect has also been heavily studied in parapsychology as it is believed that it is possible to send messages mentally by using the ping pong ball trick but I'm afraid we won't be delving into that area.
Whilst under the Multimodal Ganzfeld effect people have described their hallucinations as follows:

"I can see his face; still, it's very expressive… [I could see] only the horse that comes as if out of clouds. A white horse that jumped over me."

"It was like running a bob sleigh on an uneven runway right down… [There] was snow or maybe water running down… I could hear music, there was music coming from the left side below."

Backround:

Kurt Hentschlager

I got the idea for my proposal when I read about an art installation called ZEE created by Kurt Hentschlager. The piece has been described as

"The mind-melting piece consists of an empty room where rapidly flashing stroboscopic lights and droning music play against a thick fog, immersing the viewer in an overwhelming, three-dimensional vortex that blurs the distinction between the mind and the external stimuli"

This installation has causes hallucinations and seizures in people who enter the room, the seizures are a very rare occurrence but minor hallucinations occur in everyone but vivid hallucinations also occur in some people. I would hope to recreate this to some degree while creating amplifying the original functionality as well as adding new functionality in the form of interactive elements which I will explain in later on in the proposal.

Sensory deprivation

Sensory deprivation shares many traits of the Multimodal Ganzfeld effect and looking at the effects of Sensory deprivation we can also gain incite into the Ganzfeld process. One of the most prolific devices used for home and commercial sensory deprivation is the isolation tank An isolation tank is a lightless, soundproof tank in which subjects float in salinated water at skin temperature. They were first used by John C. Lilly in 1954 in order to test the effects of sensory deprivation. There are four different categories of brainwaves which brain waves are know to fall into. These are Alpha waves, Beta waves, Theta waves and Delta waves. People experience the different brain wave types when they are at different stages of consciousness. Alpha waves are generated when a persons brain is alert but unfocused and have a frequency of 8 - 12 Hz, they are associated with feelings of calm and relaxation. Beta waves occur when a person is awake and focused on tasks and goals, they have a frequency of 13-30 Hz. Theta waves (4 -7 Hz) occur when a person is in a hypnogogic state, that is the state you are in when you are about to fall asleep or are just waking up The theta state is accompanied by unexpected, unpredictable, dreamlike but very vivid mental images. Micheal Hutchinson author of *The Book of* Floating states
"Theta offers access to unconscious material, reverie, free association, sudden insight, creative inspiration. It is a mysterious, elusive state, potentially highly productive and enlightening, but experimenters have had a difficult time studying it, and it is hard to maintain, since people tend to fall asleep as soon as soon as they begin generating large amounts of theta."
Theta brainwaves are also generated when a person uses an isolation tank
The effects of isolation tanks on users brainwaves have been documented and the results show that an increase of theta brainwaves occurs in isolation. It is thought that there is an increase of theta waves when under the Ganzfeld effect but as of yet it is unconfirmed and perhaps it may not represent a true hypnogogic state. Finally Delta brainwaves occur when we are in deep sleep or otherwise unconscious they occur at a frequency of .5-4 Hz. Theta waves.

Health and safety

Health and safety is also a great concern so I will need to do more research to ensure that my proposed device would not have negative effects on users such as those who may suffer from photosensitive epilepsy.

The Device:

The device itself would be unlike Hentschlagers installation, in that it would be encapsulated within a helmet which covers the eyes and ears and contains electrodes which are used to

record the wearers EEGs (Electroencephalography) which is electrical activity along the scalp produced by the firing of neurons within the brain. Recording of EEG is used in medicine for a variety of circumstances such as testing brain death and distinguishing epileptic seizures from other types of spells. Commercial EEGs are expensive and difficult to come by but it is possible to make your own at home using the instructions from the openEEG project, which also avoids using expensive and messy and instead opts to use saline solution. It uses pretty inexpensive materials and basic electronic assembly skills are required, it also uses open source software to interpret the data from the EEG.

The helmet also contains two pocket sized projectors which are projected onto the semi-opaque eye covers (ping-pong balls) also it contains a pair of headphones that will produce the white noise required for auditory hallucinations. The pocket projectors maybe a bit unwieldy if located in front of the eyes so a support stand maybe required so that the user isn't overly conscious of the weight on the users head. Alternatively the projectors could be place on top of the head and mirrors could be used to create a periscope effect is another possible solution.
As the Multimodal Ganzfeld effect produces changes in the EEG I hope to have the electrodes detect changes in brainwaves specifically an increase of Theta waves (assuming they do occur, an increase in Alpha brain waves would be the alternative) which would then be used to cause subtle changes in the movement and colours being projected onto the eye covers and the white noise being produced in the head phones. I would hope to achieve this using MaxMSP and perhaps embed it into the helmet itself using Arduino technology. This would avoid having the helmet attached to an external computer and would render it more portable. Because measuring brain waves might involve equipment that I would probably not be able to aquire, alternatives to using electrodes to measure EEG would be to record an electrodermal response in the user. One of the most widely used psycho-pysiological measures used in psychology is that of skin conductance or skin resistance where a device is used to measures electrodermal activity. A device not unlike the "E-meter" used by scientologists to measure "thethan" levels (although not quite as ridiculous), by creating a simples circuit by passing a small current across two electrodes, through the body of a person you can measure fluctuations in skin resistance in response to a variety or internal and external stimuli, The magnitude of the electrical resistance is effected by immediate emotional reactions. This makes the measuring electrical resistance highly suitable for use in my proposed idea. Using an ohm meter to measure the resistance of the person's skin within the circuit, the changes could be put into MaxMSP and change things such as intensity of light being projected and white noise being played. While it probably isn't possible for electrodermal measurements to predict or signify an increase in Theta brainwaves emotional reactions to wearing the helmet should be dicernable using this method.

Bibliography:

Ustinova, Yulia.*Caves and the Ancient Greek Mind: Descending Underground in the Search for Ultimate Truth*, Oxford University Press US, 2009. ISBN 0199548560

Kurt Hentschlager's Hallucinatory, Freakout-Inducing, Torture-Curious ZEE: A Q&A
http://www.motherboard.tv/2009/11/24/kurt-hentschlager-s-hallucinatory-freakout-inducing-torture-curious-zee-a-q-a

http://www.shvoong.com/exact-sciences/biology/1671321-ganzfeld-effect/

Dean I. Radin (1997). *The Conscious Universe: The Scientific Truth of Psychic Phenomena*. HarperOne. ISBN 0-06-251502-0.

http://www.boston.com/bostonglobe/ideas/graphics/011109_hacking_your_brain/

EEG correlates of multimodal ganzfeld induced hallucinatory imagery
Peter Putz, Matthias Braeunig, Jiri Wackermann
http://openeeg.sourceforge.net/buildeeg/electrodes.php

Michael Hutchison "The Book of Floating"