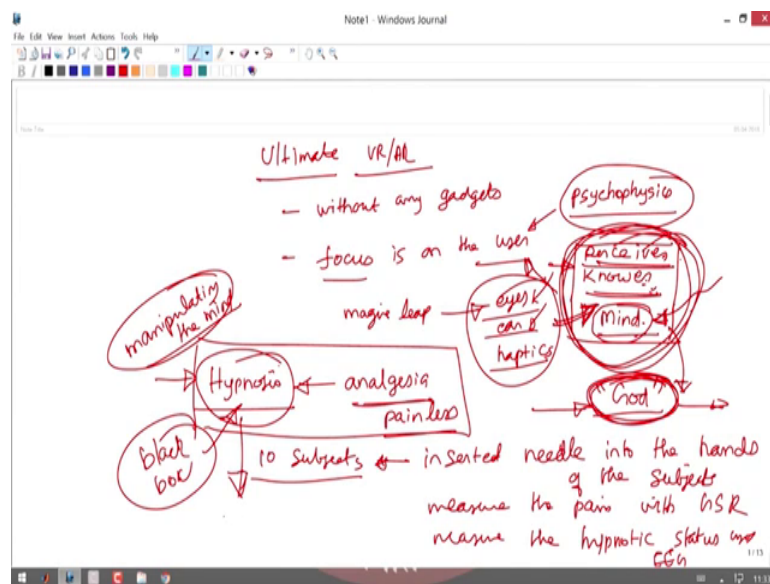


**Virtual Reality Engineering**  
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**Lecture - 90**  
**Ultimate VR/AR System**

Welcome to this last topic of our course. In this topic, I am going to talk about ultimate VR AR system.

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So, what could be Ultimate VR, AR. Ultimate in the sense, there are no better than a particular this particular AR, VR systems. It is like a you know it is just you know futuristic system; it does not exist, but you know we want to think about it right. What is required? In a ultimate virtual reality systems or augmented reality systems, in my definition that is going to be you know without any gadgets.

So, in the futuristic ultimate VR, AR it does not need a hmd, it does not need the gloves, it does not need the surround systems, but still we feel the fully immersive of environments, we are able to interact with all the objects in the system that is what you know would be the ultimate virtual reality systems. Again the cost also can be you know without anything means, the cost can be you know minimal right. Is it first of all possible is a question we wanted to answer.

So, I am trying to you know end this is a course with a question in your mind, I want to instill this question in your mind, and then I would like you to think about this futuristic system which may not be possible at all or it or you can come up with you know some solutions to make it possible, ok.

In this ultimate system without any gadgets that may be possible if you look at the virtual reality from this way. In the whole course, we have focused on the user focus is on the user. So, we have designed the hmd for the user, we have designed the interaction techniques for the user, because the user is the center, the user has to you know feel the fully immersive environments, the fully interactive environments ok. So, the user to be more specific so, without the psychophysics we would not come up with a numbers what is just enough for the user right.

So, to be even more precise, I am going to you know even more further down refine the requirements or refine the focus is going to be something like the knower. Who is the perceiver? The whole gadgets or the whole techniques what we have learned in this course is for the perceiver. There is a perceiver in you; there is a knower in you. And we have designed the entire gadgets for this knower, for this perceiver. And this perceiver or the knower is also called the minder ok.

So, do we know the properties of this perceiver or the knower or the mind? We know the properties of the eyes, physiological properties of the eyes. We know the properties of the ears, physiological property, psychophysics of the eyes we saw, psychophysics of the ears we saw, psychophysics of the haptics we saw right. But, do we know the properties of the mind; do we know the properties of the perceiver or a knower? Do we have a system specification for the mind?

Once we have a complete understanding then and we can build a better virtual reality system or haptic Systems. So, we need to move from periphery to the interior ok. So, as of now the state of the art research in virtual reality and AR is in this stage the periphery, eyes, ears and haptics. But the future technologies can you know move into knowing the mind directly ok. So, in one of the technologies for example, magic leap magic leap is directly rendering the visual scene onto the eyes without the display.

So, we are going one step into the eyes the retina rendering right. So, one more step would be you know directly going to stimulate the visual cortex right. But, the ultimate

one would be you know going inside at the mind and then making the perceiver believe that that a particular virtual environment is existing that is possible only when and we understand the mind much better ok. Do we have an understanding of a mind? The answer is big no. In the western system of a sciences mind that does not exist at all ok.

Whereas, in India we call this mind, this knower or the perceiver as somebody called the God. We are marketing the knower, the mind or the perceiver as somebody is called God. We have a, you know religionist this concept of the mind as God. We built temples in India so many temples in India specifically to tell that the mind or the perceiver is nothing but the God. The God is within each one of us, because the perceiver is the God. The perceiver the there are many properties of the Gods which is told us you know in many of the literatures, many of the customs, so each God their each property is you know portrayed in a different, different God, but essentially the same, the essentially the same knower, the same perceiver, the same mind ok.

So, even the churches are built to know inform you that the God is nothing but you know the yourself, the knower, the perceiver ok. The in fact you know as many of you know India is the spiritual capital of the whole world. Most of the religions have you know origins over here in India ok. So, essentially because hence we have a good understanding of a, what a mind is, what a knower is, what the perceiver is, what the God is, but unfortunately a in the name of the religion, we do not question and the concept of the God. We need to come over the concept of the God and then look into the concept of the mind, the perceiver or the knower ok.

Once the understanding of the mind is already there in India, but only thing is we need to come over the concept of the religion or the concept of the God. Once we have this is once we understand the full properties of the mind then and we can exploit or we can develop technologies to render virtual reality and augmented reality directly into the mind.

Let me give you an example of a one of the experiments we have done and sometime back. So, in this experiment, we have we have used we have used a hypnosis. We wanted to see whether hypnosis is can lead to you know analgesia effect, analgesia effect. Analgesia is a, you know painless effect. So, how do we avoid pain using hypnosis? Is that first of all true? There are some clients we wanted to see whether that is true. So, we

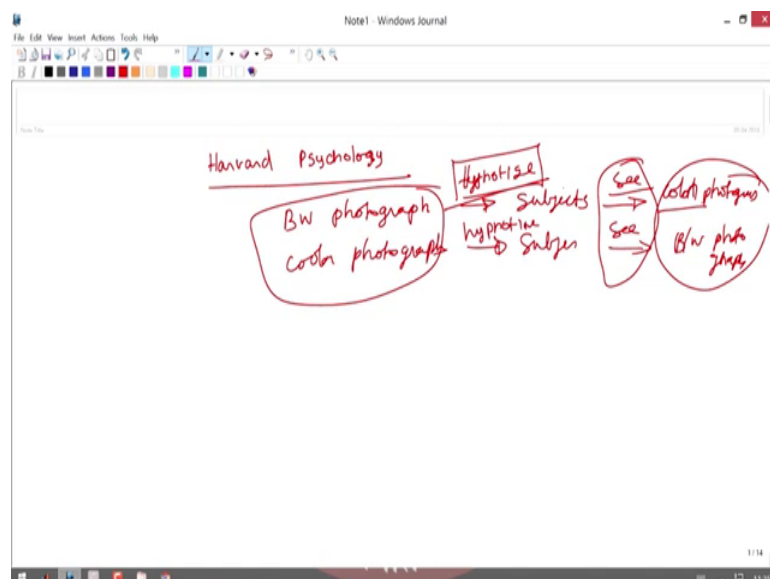
have taken some 10 subjects and then inserted needle inserted needle into the hands of the subjects the subjects.

Obviously, when the needle is inserted, the subjects will feel the pain. But when the subjects are hypnotized, do they feel the pain is a question ok. So, we have measured the measured the pain with a GSR - Galvanic Skin Response. We have measured the hypnotic status hypnotic status using EEG, a particular you know frequency band which will ensure that the subject is in the hypnosis. What we found is that when the subject is in the hypnotic state, they do not feel the pain. So, hypnotic, hypnosis is true, and it leads to analgesia effect as was the experiment the conclusion and we derive some 10 years ago ok.

So, how does this hypnosis is working? Hypnosis is true is what the conclusion of may be true is the conclusion of our experiment 10 years ago. But, now how does this hypnosis work, essentially it is manipulating the mind. So, as far as this how the mind is working is a black box for hypnosis.

We do not know how the mind is working, but still the effect is known in the hypnosis. So, we have extended this analgesia effect of the hypnosis even to render the forces. So, if I hypnotize a subject and then tell them that you know there is a particular virtual object then they could feel the real forces in their hands ok. So, similar experiment is done in our, you know collaborators experiment also.

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There is a collaborator in a Harvard, in psychology department. He has done a very interesting experiment in which he has shown black and white photographs to subjects. When they are hypnotized, the subjects see color photograph. He could hypnotize these subjects in order to make them see the color photographs. Similarly, he could show the real color photographs to the subjects hypnotize them, and then make them see black and white photographs.

So, they see a color photo or the black and white photo which is not real the physical stimulus may not be the one what we are actually seeing it right. So, without even any of these things, without this you know input stimulus we can make them which is possible to make the subject see they the photographs color photographs or the black and white photographs.

How does this mind work is still a, you know mystery as far as the hypnosis is concerned; whereas, in India the mind is understood very well. Only thing is it is packaged as a you know religion or a God, we need to come out of that at packaging and then get into the you need to look at the this concept from the scientific point of view then use, develop technologies as far as the virtual reality is concerned ok.

So, the ultimate virtual reality or AR systems as, India is the only place where the mind is understood very well ok. So, you could be though you know whoever is watching this ultimate to virtual reality or a augmented reality systems. I will stop here with you know best wishes for you to have a you know great career in Virtual Reality and Augmented Reality.

Thank you, bye.