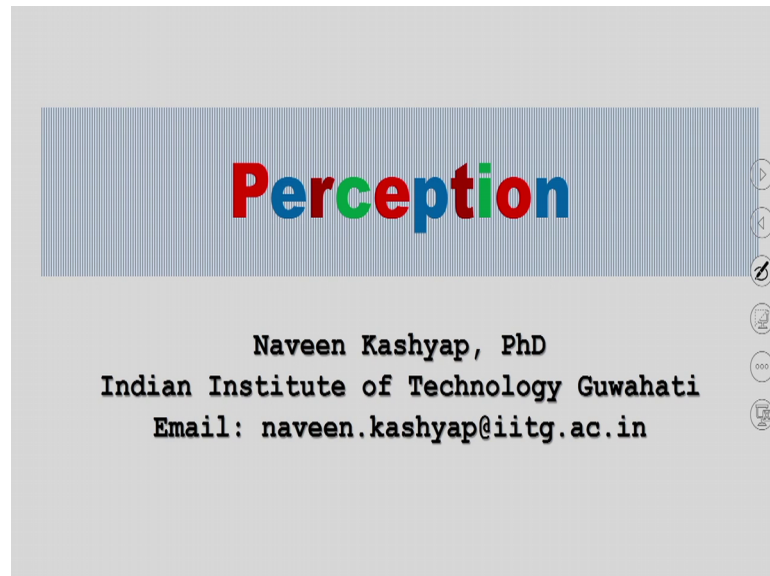**Human Behaviour**
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Lecture - 05
Perception – 1

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Hello friends. Welcome back to this lecture number 5 of the course on Human Behavior. So, this lecture, we will be focus on something called Perception And so, what I will do is as I have been following in the last 4 lectures; I will start with a little recap of what we did in the earlier classes and then, we will get on with the business of making you understand what Perception is. First start is let me start by a definition of what Perception is. So, Perception is making meaning of the external stimuli which the sensory organs are grabbing and sending to the brain that is what perception is.

So, what the sense organs actually see are colors or light which is reflected from some object. So, at the best the sense organs can detect this and tell the brain that they can see colors, they can see form and they can see objects foreground and background. It is the job of the brain to collect these informations about angles, about lines, about foreground and background, about colors, about brightness and darkness and based on that comprising these informations and making the meaning that is a tree something is a tree and something is a person. So, perception is that function of the brain which integrates

information from sensation to make a meaning, but before we jump into what perception is let us go back a little and see what we did in the last 4 lectures.

We started off by telling why do we need this course; how do we study human behavior and explaining what is human behavior; what is the need of study of human behavior. So, we started off by telling that human behavior is necessary because in all situations, we are humans and we want to study humans. So, the only science or the science which actually helps us understand human behavior is Psychology. So, this course is more about psychology. Why do we need to study human behavior? Well, the answer is because everybody wants to study what other people would react to; how other people react to; what they do; why they do; when they do and things like that.

And the core of all this function is the idea that people want to control and that is the one power the people want. If you can control other people it will be in nice world. So, you can control inanimate objects, but you cannot control human beings. And so that is the idea why should we study human behavior and the other important thing being that humans are unpredictable. And so using a science of psychology, we can study what people do and how they do and when we can predict what they do and how to do, we can have a better grip of the situation and can have much meaningful interactions with them.

So, we started out there by starting up and giving up definitions of what psychologies and what does it do and how he does it. Then we went on to look at a little bit of history of how psychology started and then, we pointed out that psychology started from two branches; one with the philosophy and the other is physiology. And how these two branches combined together to actually form the science of psychology. Then we moved on to explaining some basic questions in psychology which is the nature-nurture debate and some other basic debates that we did there further to that we explain some schools of psychology.

So, we started off by looking at the schools of Structuralism, Functionalism, Gestaltism, Psychoanalysis and Behaviorism. So, what are these schools actually? So, when we when we talk about Structuralism, it talks about human behavior in terms of basic structures. So, even behaviors can be broken down into basic structures. The reason why the school was proposed was people who proposed this school they came from basic sciences of physics and physiology and they wanted to study human behavior as they

would study atoms and molecules. As the human behavior, they believed can be broken down into it is parts and can be started.

Contrary to this view was the view of Functionalism where human behavior was explained in terms of adaptiveness of a behavior. So, at you how do you study human behavior? You can only see a human behavior or a study human behavior when it is actually going on and so you cannot be broken breaking them into parts.

Then came the idea of behaviorism which says that if you want to study human behavior, you have to see how many times a particular stimulus gives a particular response; how human beings respond to certain situations and if you can do that for n number of time, you will come up with an optimal response and thus make an prediction that for particular stimulus appears, human beings will do a particular kind of response.

For example, if somebody kicks you, you will become angry is a relational thing. It has nothing to do with mind, brain, soul in those kind of things. So, it is a simple stimulus response function. Then came the idea of Gestalt school which actually talked about that human behavior is not about looking at behavior as part and whole. So, if you want to study human behavior, you have to study human behavior as wholes and parts which basically means that a single behavior and parts of the behavior cannot be combined into one. Also human behaviors could be studied in terms of organization principles that they proposed.

And lastly, we had the Psychoanalysis school which says that most behavior comes from unconscious urges that people have. Further to that we looked at some newer schools of psychology or newer met approaches to psychology and these were the psycholinguistics, the neuro psychology, the idea about cognitive neuroscience and so on and so forth. And that was the end of the first lecture.

And so in continuation to that we had the second lecture, where we actually looked at some viewpoints from which a human behavior could be studied. So, a particular human behavior can be studied from a number of viewpoints starting from the behavioral viewpoint, to the cognitive viewpoint, to the subjective viewpoint, to the psychoanalytical viewpoint and so on and so forth and that is what we did in that lecture.

Further to that we expanded our study there or we expanded our lecture there and I explained to you how do we do research in human behavior in human psychology and that I explained in terms of something called Experimentation, something called Correlational research, Literature reviews, in terms of Observations and in terms of Modeling and n number of other ways of doing research in human or research on humans.

The last 2 lectures, we focused on sensation where we looked at how the physical world and the psychological world interact with each other. In the physical world we have things which are physical in nature. For example, we have temperature, we have pressure, we have light photons; we have air pressure which are which is creating the audition and so on and so forth.

So, how these objects or how these elements actually get converted into something which humans can read and that was the topic of the last the third lecture. So, the third lecture, we looked at how the sensory organs take these physical information and convert it into something which the brain can study and make meaning out of it. We started off by looking at what are the problems which any sensory organs would face and then, we looked at the characteristics of any sense organs and there we defied two factors; one is called Sensitivity and the other is called Sensory Coding.

Sensitivity is how accurate your sensory system is or any detection system is and we looked at 2 basic parameters of any sensitivity of a system which is the absolute threshold and the differential threshold. Further to that we looked at how errors are marked in these sensory systems using a theory of signal detection. Then we focused on to something called sensory coding which is how the biological functions or how the biological system encodes the sensory information which is passed on from the sensory systems.

We also looked at how complexity means intensity of a physical stimulus is encoded by the sensory system. Further to that we took a model sensory organ which is the eye and then, dissected it to look at how does the eye create vision? How does the eye encode information from the external environment and created to vision? So, that is what we did up till now in the past 4 lectures. Once the information is passed on from the sensory

organ is coded through the biological mechanisms, a meaning has to be generated out of it and that is where the idea of perception comes in.

Perception is making meaning out of sensory or sensory stimulus or making meaning out of information which is passed on for the sensory stimulus. So, organization of those sensory stimulus into meaningful bits is what is perception. Before we start perception, let me tell you a little story for why do we need to study perception first of all.

So, there is this famous case where these two hunters were actually venturing into wild life and they were spending the night there. So, it was night and they had the camp made out and they were enjoying the night and they were looking for bears which they can shoot and so it was it was nearly dusk, not actually night nearly dusk and so in that point of time, they were talking to each other; they were partially intoxicated and they heard a shrill noise when they heard a shrill noise and at this point of time, they were very far away from their camp.

So, when they heard the shrill noise, one of the hunters actually both of the hunters picked up their gun and they shot in the direction of the shrill noise. They thought it was a bear which was actually morning and the idea was to shoot this bear. As soon as they shot from the gun, a bullet they heard a shrill human noise; a shrill human cry for help. They rush to that direction from where that the tent was and where they actually shot in the direction in which they shot and when they actually went near the tent, they saw that another hunter which was in the nearby neighborhood was actually shot by the bullet.

How can that be possible? They did see a bear in the low light of the dusk; what they saw was a bear which was approaching and grilling and making terrible sounds. So, they shot. So, the question was both of these people were then tried for murder and when the case went into the court, what happened is that all evidences were collected. Now as an evidence, it was found out that the both the shots actually pass the tent, but one of the shots hit the person and the other short cleanly passed through the tent.
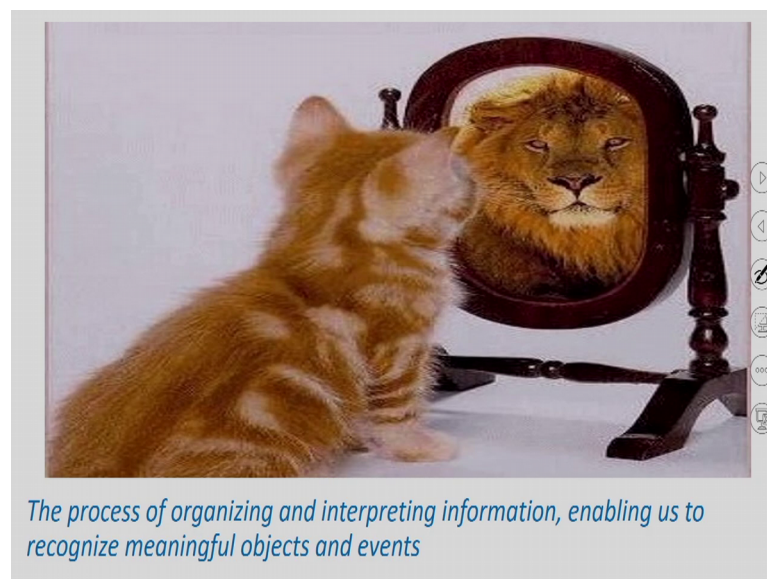
The question was how can these people imagine a yellow tent to be a bear. It was very difficult to explain this that how can it be possible that this people who know their tent very well, they were away from the tent, but in the light of the dusk how can they imagine the tent to be a bear? Did you in believe it? And one of the person was convicted. Years later it was explained how the perceptual system can actually fool us.

So, with the light intensity decreasing and with a level of intoxication that they have, it was fairly possible to see the tent as a bear and they hitting the tent or they trying to save their life with the gun.

And so years later these kind of explanations are provided and the person who actually had spent some years in jail, he was given some relief or he was like he was let go on the jail. This is what perception is all about. At times you actually see things that do not exist; you make meaning of things that do not exist. But why are all these errors and how these all errors actually begin. So, before we begin with this perception a chapter, I will show you some illusions. I will show you some slides here and I will maybe give you some time to see what you see.

And I will show to you that what you see with your eyes is not what is presented to you and that is what perception is all about and then, I will explain how does the perception process work. So, ready for it, let us go it.

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The process of organizing and interpreting information, enabling us to recognize meaningful objects and events

So, as you can see this is a funny picture here is a cat and here is a mirror and when the cat sees the mirror, sees a tiger. This is what perception is all about. As you can see the headline what it says is the process of organizing and interpreting information, which enables us to recognize meaning full objects is what the event is.

So, although the cat actually in the mirror is the cat, but what the cat is perceiving is that it is a tiger and this is what perception is all about. So, powerful is the idea of perception.

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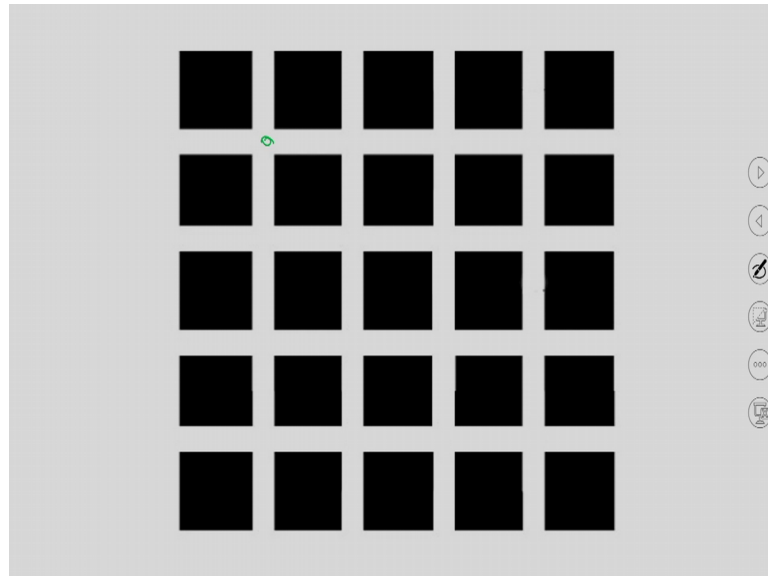
Let us see something else this is called the Hermann grid. Now we have seen this grid in the last lecture on Sensation. So, what I ask you to do is to move from this direction and this direction onwards your eyes. As you do that you will see that in between this area, at this area you will see graying out; which means that you no more see a white color, but you see smudges of gray color.

Why is this happening? Remember the explanation that I gave you in the chapter on Sensation and then, I said why this happens is because how the cones and rods are actually located on your retina and that is one reason why when you quickly move from this area to this area, you see the smudges.

Let us go to a third figure.
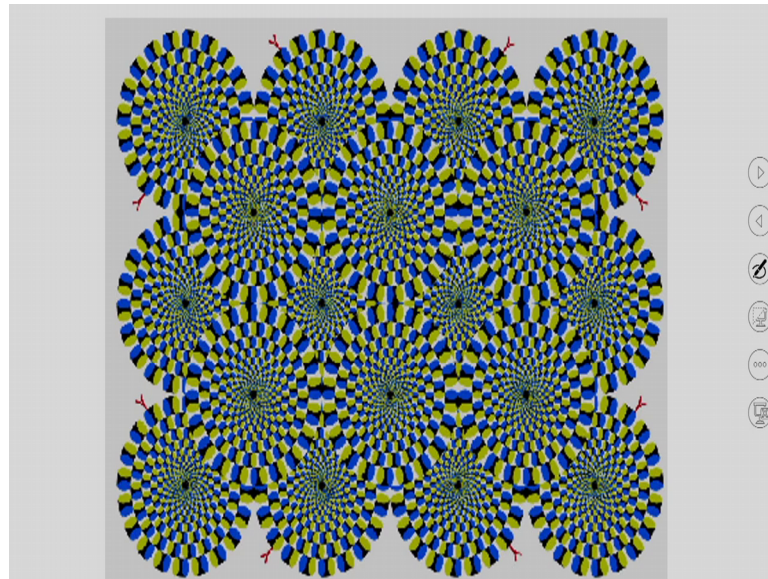
Now obviously, this is the best figure to look at and once you do that once you focus on this figure, you see that things are moving and believe me they are not.

So, the idea of motion that happens here is because it is an illusion and if you try focusing yourself at the center of these. So, these are the center where you try focusing yourself for a longer periods of time what will happen is the motion disappears. So, the motion happens because there is a stimulus is presented in such a way that, it creates virtual motion on you and see that is the power of perception, the things that do not exist actually start existing.
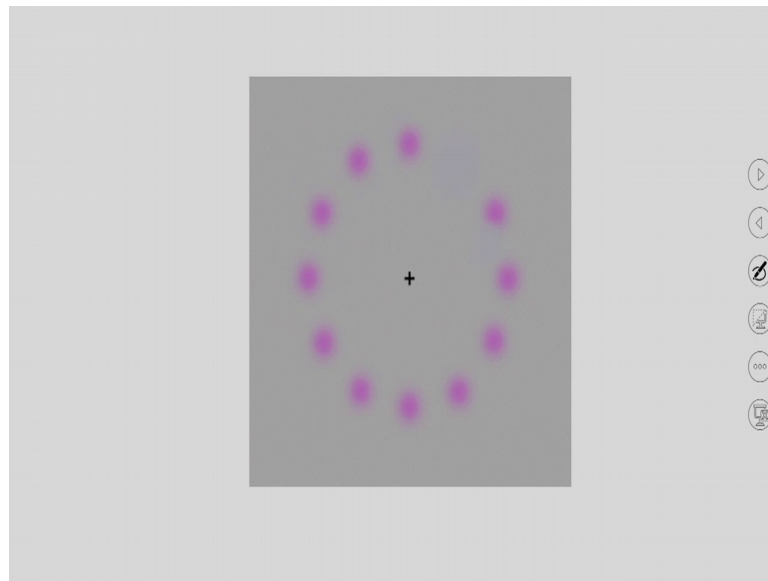
It is not only with figures that perception can happen, it can happen with a lot of things. Now this is an interesting thing to look at. Focus your eyes in the middle plus.

If you do that, after a period of time what you will see is you will not see these moving violet figures, but you see a single green figure which is moving. Can you do that? I am pretty sure, most of you would be seeing that and then this is alternating. So, sometimes you see the green figure, a single green ball which is moving and then at other times you see the violet wall which is moving. That is the power of what perception can do.
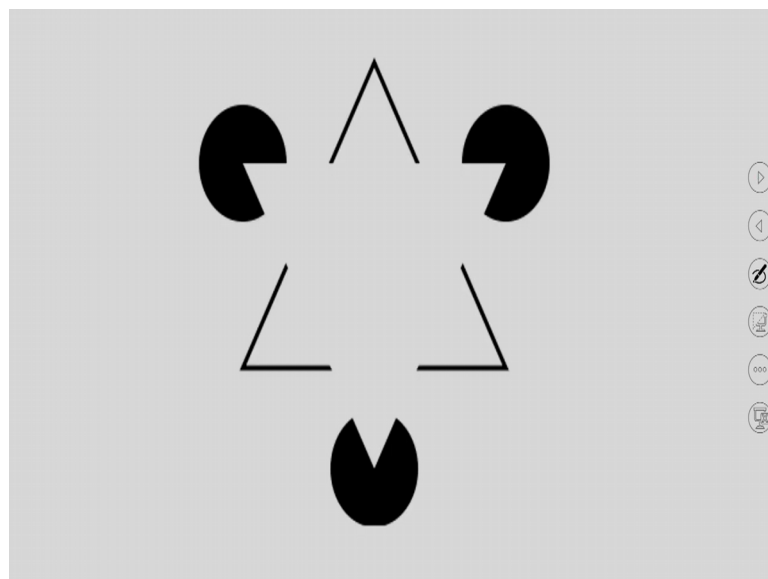
Let us look at this. What do you see and most people are going to tell me that what they see are 2 triangles one over the other. There is a black triangle and on top of the black triangle is a white triangle, correct? Wrong, these are not 2 triangles. What I see is 3 angles in black and 3 balls which have a section cut off cut off of it and placed in the right direction and that is why there is this imaginary triangle in white that you see and then, you believe that this white triangle is actually covering the black triangle. Is not that what is happening?

But then, if you look into it the perceptual system is making meaning of it when there is no meaning to start with. It is not only with figures that you actually see these illusions or perceptual illusions happen or perceptual inconformity happens.

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There are other written things or written documents where you see perception. Let us look at this and try to read it. Simple, A Bird In The Hand. Now, what most people miss is there are two THE. If you look into it there is one here and there is other here and it is very conveniently that people miss one THE and the organization or the reading is so the ability of reading is so developed in humans that you do not see one of these until unless I point it out to you.

Interesting one and the best one.
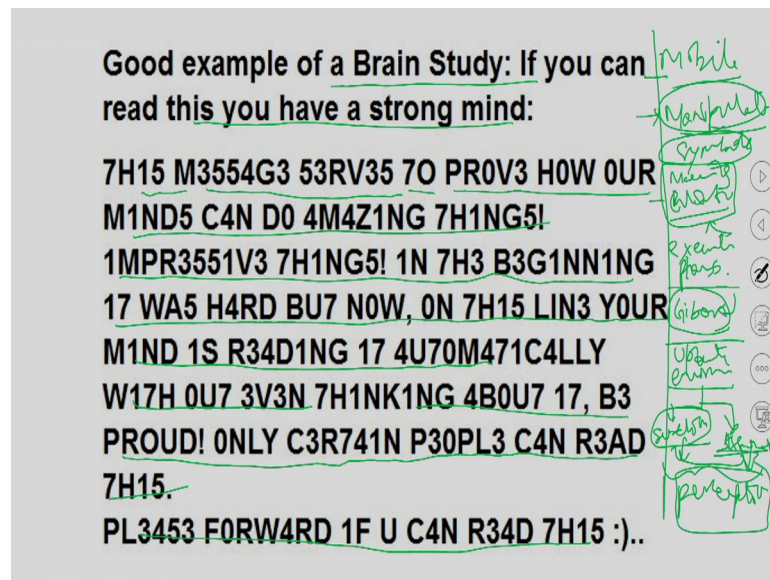
Look at this; it is a good example of a Brain Study. Now if you can read, this you have a strong mind. And most of us can. Here you cannot read, here you cannot read, here you cannot read, until you come to this thing. Now it is proof, how your mind can do amazing things, impressive things. In the beginning it was hard, but now on this line your mind is reading it automatically with our even thinking about without thinking about. So, without thinking about it because be proud only because certain people can only read this. Please forward if you can read this. Amazing right?

Now, if you look into it there is nothing and there is nowhere where you can find sentences, but you can read it. Amazing is not it? And that is what perception can do. So, let us start our idea of what perception is and how does it really function; what is the way in which perception functions?

So, before we go into the idea of Perception or the 5 functions of Perception, let me tell you what is the need of Perception at all; what is the need of making meaning of stimuluses which actually come to us?

Now, if I was a small flower, if I was a daffodil; the only thing that I wanted from life was to know where my roots are going, where my leaves are going; how big it is, where are the new trends in, where is the water and those kind of questions which are there and so these are pretty simple questions. So, if I was a flower or if I the bird these are the questions that I actually need. But most human beings are not birds and they are complex in nature and that most of us will agree. And so for that matter human beings since they are complex in nature they have 4 or 5 functions or at least 4 functions that I can think of which is different from most simple organisms.

And. So, what are these 4 functions? One of these functions is that human beings are mobile. They move the human beings can loco mote right, but flowers cannot and since they can loco mote, they have to navigate through places and directions and cities and all kind of things environments. Once they are required to that do that, perceptual systems are required because this perceptual system will tell them where to go and where not to go. If these systems are not present, then human beings will keep on falling down, keep on going into ops running into obstacles and will never be able to pass on or never be able to navigate directions.

So, one of the primary functions of human beings which is different from bird birds or animals or plants or flowers is that they can move. The second function is that human beings manipulate. Now, human beings manipulate symbols to make meaning. For example, when you are at any point of time when you are reading something, you are doing something; there are lots of symbols around us. There are symbols of currency, there are symbols of our attention which are the symbols of direction, there are symbols of things like several things if you look around the world, there lots of symbols.

And at any point of time, we look at these symbols and they make meaning to us. So, human beings they make meaning of symbols and interpret these and then they go around their everyday work. Now in terms of manipulation human beings also manipulate objects around them. For example, if you are sitting in a car, you manipulate the wheel. If you are walking, you manipulate your leg. If you are riding a bicycle, you manipulate something else and so human beings do a lot of manipulations.

So, not only human beings are mobile, they are also they also manipulate it at different functions and they know human beings also use symbols and make decisions based on the symbols. For example, if there is a red light, it is a symbol that do not cross. If it is a green light, there is a symbol that you cross. If it is a orange light, it gives you invitation to pass till the point of time that it turns into or pass slowly. There are symbols in driving, there are symbols everywhere and so the third function that human beings are prone to is understanding symbols and make meaning out of it.

And the fourth thing is that human beings execute plans. Human beings based on their capacities, they execute a number of plants; they make complex plans and not only they make complex planes, they execute it. So, example cooking dinner together tonight now for that I have to make a plan now getting something from the market; then how do we make it? What temperature should the oven be; where I should be putting it; where should be hot should be told; how many people to call; not to call that kind of a thing.

And so, human beings actually make plan and so that is one of the 4 functions that human beings do and because of that, they are different from smaller organisms. And for all these functions to actually go through, for all these function is to take place, it is belief there are 2 group of scientists which believe that the information from sensation is more than enough. Now, on one level we have someone called J J Gibson. So, before we

come to the 5 functions, there is the need to explain why these 5 function how these 5 functions come about?

So, we have 2 classes of theories which believe why perception is necessary or how perception really functions; what is necessary. So, one the one theory is called the Gibsonia theory and what Gibsonia theory actually tells is that the light which is following on to the retina has enough information and this 2D structure, this 2D information on the retina is more than enough for human beings to do whatever they want to do; to achieve whatever they want to achieve.

Now, this theory is called the theory of Ecological optics and the theory of ecological optics says that the retina and light falling on the retina has enough information and that is how they believe that pilots actually make decisions of landing, turning around and things like that. So, you do not need to use your brain, the information which is coming onto the retina from the sensory organs that is enough for making all kind of manipulations, making plans, doing decisions and so on and so forth.

Opposition to that a group of psychologists who says that no it is more than enough; it is not more than enough. Human beings at all point of time need an updated image of the world around them or a model of the environment, an updated model of the environment. So, human beings are not only dependent on static information which is falling on their eye, they need an updated information of the environment around us or for them to create a model of the environment and based on this model they do what they do.

They make meaning of the world around us and that makes them do primary functions. So, what does this theory actually say? This theory says that. So, it is called the updated, it is not actually called the updated information, but I will state is as the update environment theory and so what this theory says is that human beings need two information for an updated view of the environment around us. First is information from sensory organs.

So, human beings for creating a model of the environment around us, a model which is being updated at all points of time need 2 bits of information. The first information is information which is coming from the Sensation. So, Gibsonian view or the Gibsonian idea; so, all information which is coming from the physical environment falling onto the sensory organs is what human beings need, other than that they also need certain

assumptions. So, for perception to a function, human beings not only need information from sensations; they also need certain assumptions.

Assumptions like birds fly assumptions; like lizards are mostly on the roof; assumptions like the roof is always on the top; assumptions like a door will mostly open on the outside, these kind of assumptions. So, certain assumptions that fishes will always live in water and these kind of assumptions are necessary for human beings to make perceptions. Because if fishes can fly, then the whole world around us will be haywire and so based on these assumptions and based on certain informations which is coming from sensations, human beings integrate these two things and create predictions and these predictions actually are what are called perceptions.

So, how do human beings perceive? Human beings mostly perceive not from just sensations, but certain assumptions about the world and integrate these them together to form perception. So, what is perception then? Perception is integrating sensory information from the world with certain assumptions or believes that or certain pre encoded beliefs that human beings have combined them together to make meaning of the incoming stimulus in relation to the world around you that is what perception is all about.

Now, most perception generally fall into 5 categories and what we are going to do in this lecture in the upcoming lecture is we are going to focus ourselves on to these 5 categories or on to these 5 functions of perception. So, let us start looking at it. So, they are 5 functions of perception; for any perception to go through we have 5 things right. So, perception require 5 steps or it is a 5 step model. First the first step in perception or the first thing that should happen, first event in a perceptual event is called Attention.

So, attention is used to make decisions about which incoming information is to be further processed and which is not. At any point of time your eye is receiving a lot of information from the world dependent on your attention or attention span, we decide what information to look at and what information not to look at. If we try taking in all the information inside us or if you tried encoding all the information inside us from the sensory system; then it will not make meaning.

For example, if I am driving a car, the information that I want is only looking is only at looking at the road. I do not want the information from the car radio which is coming up

or from the friend who is talking next to you or the person next to you in another car who is honking or any other or how the wind is blowing those kind of information is not immediate. But when the car is moving smoothly, then I can perhaps take some of this information.

So, there are certain information that I do not want and certain information that I want and perception is basically deciding which information to process. So, making decisions about which incoming information is important to us. The second step in perception is the system must be able to determine where the objects are located in the external environment. The second step in perception is finding out what objects you are looking at and where these objects in the environment.

Once you can find out where these objects in the environment, when you are able to locate these objects in the environment, you can perhaps separate the background from the foreground and then you can do a perceptual process or you can do perception or make meaning out of it. If you are not able to separate the background from the foreground or the figure from the ground, you would not be able to make meaning of what you are seeing and what you are not saying; what you have to see it what you do not have to see.

The third system of perception is the personal system may be able to determine which objects are out there in the environment; not only we should be able to and this is called Recognition. This is called Recognition. So, I should be able to recognize what I am seeing; I should be able to localize or locally locate what objects are there and I should be able to attend. So, the perception starts with Attention, then Localization and then Recognition. Recognition is the process through which we are able to distinguish objects in the environment.

So, what is a tree; what is a cow; what is a person and so on and so forth? If you cannot do that, what will happen is everything seems to be the same. So, that is the third step in perception.

The fourth step in perception is that as I said perception starts with not only getting information about the environment and updating them, it also works in terms of certain assumptions. We have to have your certain assumptions and these are the last 2 things last 2 things to do. The system must be able to abstract the criteria features of a recognized object. What is meaning abstraction? So, this is called Abstraction.

So, when I see a particular object in the environment, I should be able to gather only those features of the object in environment which I require. Now what does what is the meaning of this? Anything that you see in the environment; so, you perceive everyday right. So, if you are looking at a chair, now there is a model of the chair in the head that chair should be looking like this and that is called the prototype, we will come to that when we explain the idea of perception.

So, the prototype is an idea of a chair which is in your head or which is stored somewhere as a representation in your brain. Now once you see a chair what features do you want to take from it is just the idea of it is form and the idea of the fact that, it is a chair and when these ideas or these information gets binded up or gets thrown on to the to the brain which does a comparison and based on what you are seeing in terms of angles, lines and things like that it makes an assumptions and also affordances, it makes an assumptions that this is a chair.

So, every time you see a chair, you actually do not perceive the whole chair; you perceive parts of it right. For example, there is a beanbag how do you make an idea that this is a chair. What is the function of a chair? What is the idea of a chair? A chair is something in which you sit. So, it has to have a place where you can sit and if the beanbag has a place where you can sit which is called the Affordance. So, affordance is what does the object afford or what does the object naturally seem to be like. Now in a beanbag there is enough space where a person can sit and that makes you believe that it is a chair or a kind of a chair.

And so, this is called Abstraction. Abstraction is basically looking at the external stimulus and making a very primitive model or making the very minimalistic model of what are the features or what are the primary features; what are the extra features which do not exist in the prototype in your head. And the last is the perceptual system must maintain certain inherent features of the object and this is what these 2 things are what are called assumptions. So, this is called Constancy.

So, what is Constancy? Constancy is maintaining certain features. For example, if there is a door and I move the door out, it still looks like a door. If I move the door in it still looks like a door, but the angle that it is pertaining the angle that is the door is obtaining is different on your retina, but you still see a door. Look at your friend, if it is coming from a distance and if he is standing in front of your distance the image that falls in your retina of the friend are different, but then in your mind you do not see your friend actually growing in size and decreasing in size. This is called Constancy right.

You see the moon, a full moon is bigger than a part moon and when you look at them, you do not see that the moon has changes shape this is called Constancy. So, maintaining that assumption that moons are the top and this kind of idea is what is called constancy.

So, let us go back and start with the first function of perception which is called Attention and let us look at how does an attention really function?

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So, the first step of perception where we start is call Attention. Now what is Attention first of all? Attention is of mental filter, a filter which is in your brain which the brain puts in front of the incoming stimuli. So, that certain stimulus can be selected and certain stimulus should cannot be selected. Now think of it as a sieve. Now what is a sieve? Have you made tea before? Now if you made tea before you use a sieve a filter for separating the tea and the tea leaves; attention think of attention as a thing like that it separates what you want and what you do not want.

So, those stimulus which you want or those information from the external stimulus that you want is separated by the attention filter and those stimuli is you do not want stay on the output or the output side of a filter. So, attention can be thought of as a filter. So, it is a life filter like this and so all incoming information is falling on this attention filter and this attention filter based on certain assumptions or based on certain motivations, we will allow only. So, if we have R 1 R 2 R 3 R 4 these are the 4 input stimulus which are coming in the attention filter based on certain characteristics, certain parameters or certain requirements will only allow R 3.

Because R 3 is the information that you want or R 3 is the only stimulus that you want to see. So, the study of attention concerns primarily with the cognitive resources and the limitations. What is attention? So, basically as I said this is an attention filter and this attention filter depends upon your cognitive resources. How much cognitive resources

are there and limitations? The eye has certain limitations; the nose has certain limitations; the ear has certain limitations; it can take only certain amount of information.

Now, if you remember sensation, I showed you some limitations. So, for example, the opponent process theory says that if you see red color immediately you will see the green color right and so it has the limitation that if I overexcite the red color; then after a point of time it becomes saturated and you start seeing green. So, this is the limitation of the cone for that matter and so there are certain limitations with the ear also, there are certain limitations with all of the sensory organs. And so these sensory organs these limitations and the availability of cognitive resources decide which stimulus goes in and which stimulus does not go in and that is what attention is all about.

Now, at any given period of time, people only have a certain amount of mental energy to be devoted to all possible tasks and all the incoming information confronting them. So, what attention filter is. Attention filter is how much mental resource or how much cognitive resources available with you, the cognitive resources that people have; they get divided or they are used up by the brain for certain functions. Now most of the cognitive resources are used for doing automatic functions.

For example, maintaining heartbeat, maintaining pulse rate; you are not asked the body does it on your own their own. Things like perceiving, things like movement; things like thinking; they require cognitive resources as well. So, mostly 70 to 80 percent cognitive resources dedicated doing normal functions or functions which can keep the body alive; the 30 percent way or 20 percent which is available is what is available to people and that is what they have to tap to.

You have often heard the term saying that we never use 100 percent of the brain we only use 5 percent of the brain. The reason being that or 10 percent of the brain the reason being that the 90 percent that that is there is used for maintaining the bodily functions and so within the 10 percent or 5 percent which is available, there are lot of functions to be done. For example, walking, thinking, talking, eating and so many other things which are there right and so once those are there, only a part of the cognitive resources is left for attention to happen. So, what is happen attention? Attention is sometimes synonymously used with something called mental concentration.

Remember all those days when we were sitting in a class and the teacher used to say pay attention; what does it mean? It means to concentrate to focus on what you are doing and once you focus on what you are doing you put all your mental energy into one work and when you do that all of the stimuli which is in front of you, which is next to you does not get perceived or does not get recorded at all right. So, does not get inputted at all and that is what is mental concentration.

Now, I have a wonderful question here which says does people concentration level changes with practice? And what I will do is at the end of this lecture maybe or this topic, I will tell you whether this happens or not. But let us leave this question with you; what do you think? And so once you are viewing this lecture what I will do is there is a forum which you can go to and maybe you post answer saying that what do you think this happens; whether you can increase your concentration levels with practice. So, let us leave that question open for now.

So, attention itself is of 2 types. You have something called Selective attention and you have something called Sustained Attention. Mostly we deal with something called Selective Attention. What is Selective Attention? Selective Attention is a process in which you focus your attention selectively to certain stimuli and not to other stimuli. Sustained Attention is a process in which you put your attention for longer periods of time on selected stimuli. So, Selective is when selectively you look at certain things and then you keep on moving that way. Sustainable attention is putting yourself onto one piece of information or one piece of incoming information and staying there for longer periods of time.

So, what is Selective attention?
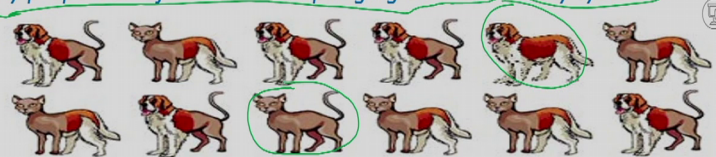
The term selective attention refers to the fact that we usually focus our attention on one or few tasks or events rather than many. So, selective attention is the term which basically tells that what we tend to do is we focus our attention on some task and not on all tasks. We mentally focus our resources implies that we shut out or at least processed less information from other competing tasks as attention researcher Hal Pashle puts it what is attention. He says that at any given moment people's awareness encompasses only a tiny portion of the stimulus impinging on their sensory system. So, what is this? Attention.

So, the first step in perception and attention which means that I have to narrow down on what to look at and what not to look at. So, when I once I want to do perception or once I am doing perception since we are talking about visual perception here, there are other kinds of perception only, but the model that are using here is called. So, this is called visual. This section or lecture is basically on visual perception because the most easiest to explain is visual perception.
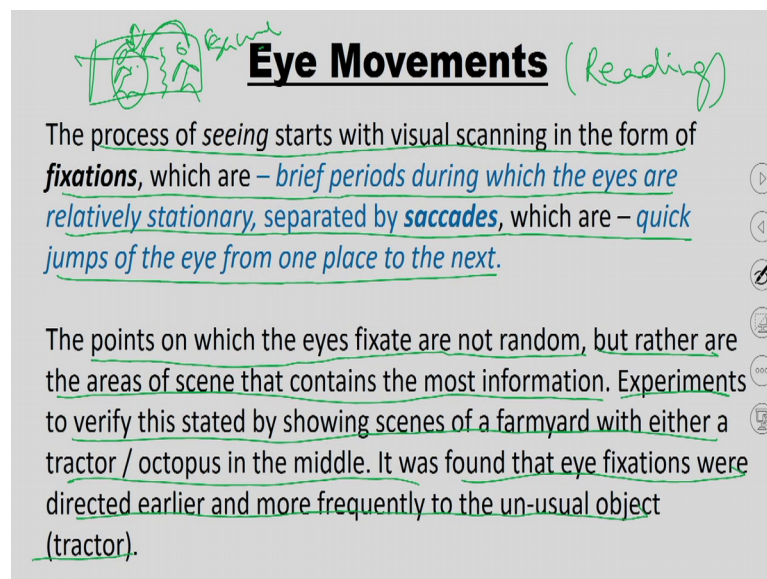
So, in terms of visual perception, the eye focusing itself on certain objects in the external environment and not next there are other objects is what is called perception. Good example. Now look at these dogs and cats and can you tell me which of these dogs is possible and which of these cats is possible? The tasks that you do in searching, it is called selective attention. Selectively you look at this. So, there are a number of dogs and

cats and then what your job is to is tell me which of the dog is possible which of the cat is possible can you do that?

And when you do that, what you are actually using is called selective attention. And if you say that this is the proper dog and this is the proper cat that can exist, you are right. The job that you just did is, what is selective attention. You focus selectively on all these cats and dogs and compared it with mental representations of what a dog could be and what a cat could be.

And so this is not possible; this is not possible; this is not possible; this is not possible, but this is possible and so how did you do that. Well, took these objects or you took these forms and compared it to some mental representations which is already there in your head and that says that this is the only dog and cat possible or forms or dogs and cats which are possible.

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So, how do we actually read visual perception in terms of reading that is for object perception? So, in terms of cats and dogs what we did was, this is object perception. But when we are reading how does attention process really work or how does the I work for that matter? Now the process of seeing starts with visual scanning in the form of fixations which are brief periods during which the eyes are relatively stationary separated by circuits which are quick jumps of the eye from one place to another.

So, how do we see? The way in which we see is that the eye focuses a certain subjects certain objects stays there for a period of time and then jumps to the second object. Now the staying period is very brief and it is called fixation and the jumping period is also very brief which is called the saccade.

So, if I have if I want to focus on this object and this object has or this scene has 2 objects maybe; what the eye does is first focuses itself on this. So, your eye will first focus on this is called a fixation and then quickly move from here to here because in between I have nothing no information is there and so when once it does this jump from here to here, this is called a saccade or saccade and this thing at these 2 objects is what is called fixations.

Now, the points on which the eye fixates are not random. The eye just does not fixate on anything or any information which is out there in the environment randomly. It is a calculative process; but rather are the areas of scene that contains the most information. So, if I use an eye tracker and if I give you an object or if I show you a picture and monitor your eye throne eye tactor, I will see that the eye keeps on moving from one point to another point in a particular fashion in a particular pre calculated fashion.

And how does it do that? It does that in a manner that it focuses itself on objects of maximum information and not focus on areas where there is no information. Now experiments to verify this started by showing scenes of a farmyard with either a tractor an octopus in the middle. It was found out that the eye fixations were directed earlier and more frequently to the unusual object tractor right. So, a experiment was done in which a scene was created; a farm yard scene was created in this farm yard you had a tractor an octopus.

And so, what happens is when I looked at eye fixations in terms of how the eye is moving, we saw that un visual objects required lesser attention than visual objects right. Visual objects got little attention. Now this is a good demonstration of how the eye actually looks at if you look at.

4. Aus: A. L. Yarbus: *Eye Movements and Vision*, New York 1967 S. 174 (Fig. 109)
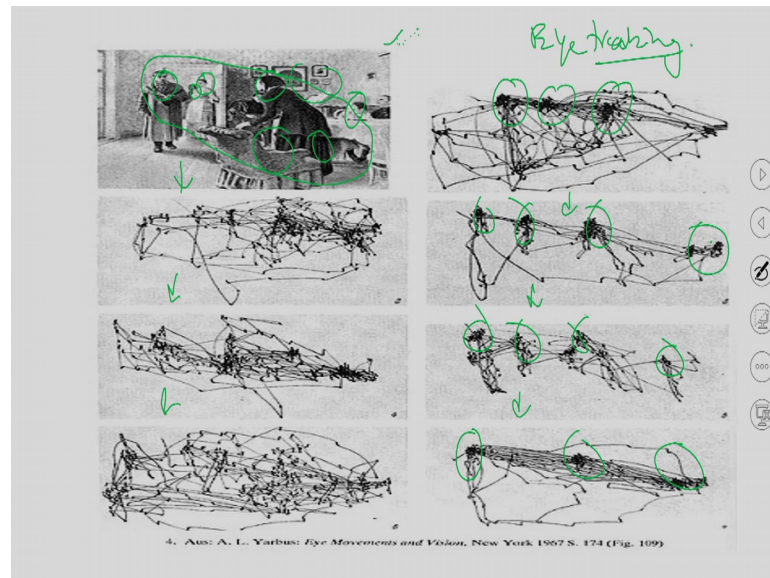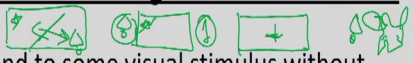
This figure, now if this figure has certain points which has to be followed. For example, this is the one face an object and person, a person, a person and object here and something here and that is what it is and all these are blanks. Now what does the eye do? This is an eye tracker. This is the demonstration or the data from an eye tracker.

If you look into it the fixations are at the point of most region which I have circled out. If you look here still it is the same way. Now these regions which have no data at all you see that no fixations are here. For most of it the maximum fixations are here. If you look into it and in this case also the maximum fixations are here and this is where my faces are or if you look into it this is where my most this is the region which has the most number of fixations which means that our theory is correct in terms of the fact that the eye fixates itself on 2 areas of maximum information. And then it moves on and this is the kind of movement or this is an eye tracking data.

So, this is an eye tracking data. Now one of these data is from my own lab, but other data is from some other lab and so they show how the eye actually moves or make information.

There is another kind of attention which is called divided attention without eye movements. Now humans can also selectively attend to some visual stimulus without moving their eye. In experiments that demonstrate this observers had to detect when an object occurs. On each trial the person stares at a bank blank field and then sees a brief cue. A cue is basically plus sign appearing or some kind of a stimulus appearing or some kind of information appearing which is directing stimulus such a small arrow that directs the subjects attention whether to the left or to the right.

An object is then presented either in their location indicated by the cue or the opposite location. The interval between the cue and the object is too brief for observers to move their eyes. Yet they can detect the object faster in the cue location than when in the occurs in elsewhere which basically means that if I create an if I create a stream stimulus like this or if I create an experiment like this, in this what happens is the subjects are asked to first look at the center of the screen which has a plus sign. Later on what will happen is certain objects will appear right.

So, maybe the object is a bell or an object is a dog or so on and so forth; maybe this is a dog and so it has a tail this is the mouth and so on and so forth. So, these objects will appear. Now what will happen is there are 2 conditions; in one condition what will happen is after seeing the plus you may see a star here and as soon as you see the star

here, the object in this case the bell appears here. This is case number 1. In case number 2, what will happen is you see a star here, but the bell appears somewhere here.

Now, if an experiment like this is done. So, you start with a plus sign, then a cue appears and in terms of the cue in one case the cue where the cue appears or where this signal appears, you see the object there or sometimes you see it opposite. Now experiments reveal that when the cue was presented, the object that you want to see or you see is presented in terms of where the cue is appearing people responded it faster and then, when it was in opposite direction which basically means that they did have divided attention. So, they did see this object on the opposite direction. But the response time was slower which means that people can see multiple objects or they have something called divided attention.

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So, this was about the first step that is called attention in which we focus ourselves onto certain objects and how do we read certain objects. The second step as we saw is which object where in the where in the external environment is the object and this term is called Localization. So, what is Localization? Localization of information in the external environment is essential for solving the following problems.

Why do we need localization? As I said the second step in perception is localization which means how do we know what objects are there and not what objects are there rather that is the third step the second step is where are the objects in the external

environment. First step is recognizing that there is that or basically filtering what you want to see and the second step is locating where in the external environment is are these objects. So, why do we need localization? The answer is navigating our view through the even cluttered environment.

We need this localization because human beings navigate through cluttered environments and if they can locate objects in the external environment, they can pass through complex environments or they can navigate through complex environments and do their day to day work. So, localization is an important part because localization helps human beings move in complex environments, do complex things in environments by the information which is provided a sense organs and using this information in certain assumptions to find out what is there in the external element and where they are in related to where this person is.

Think of it in terms of the map. When you see a map, you can see things around you and once you do that you are able to navigate it. So, localization is important because it helps in navigating people. Also grasping objects; navigation is important or localization is important because it helps you in grasping objects or touching objects. If there is an object in front of you and if you cannot see where it is you will be fumbling around. So, when you want to grass certain objects or when you want to reach certain objects, hold them in hand reach them reach to them or in any interaction with an external object, the other thing that you require is called localization.

So, what is localization? It is achieved by first separating the objects from one another and then, separating each from the background. So, there are 2 steps in localization. First separate objects among themselves. So, if there are 2 objects if I have a scene like this and in this I have a person and a dog. The first step this is my dog, it is not very good drawing, but then you have to bear with me. So, if I have a person and dog in an external environment, the first step in localization is separating the person from the environment.

So, the first step is I have a man and a dog and the next step is looking at these forms and separating it from the environment which is or the background which is this frame. So, this first step is recognizing that there are 2 objects. The third the second step is recognizing the 2 objects is on a white frame or is in a white object that is the 2 steps which are there.

So, how does the separation of objects happen? It happens in terms of figure and background. So, what is this figure and background separation?

Now, the most elementary form of perceptual organization is that in a stimulus with 2 or more distinct regions. We usually see part of it as figure and part of it as background. Now if I have an object like this right and so again if I have this dog right. So, these are the legs of the dog and this is the tail, this is the mouth and eye. So, if I have a dog like this the idea of what is a dog and what is not is that anything inside this, the colored area is what is the dog and whatever is white is not a dog and this separation is important.

Because the outline which is filled in green is what the dog is and whatever is in white is not the dog. So, this separation is important and this is called separating the figure from the background. So, once we do that anything which is green filled in it is called the dog. So, this line this dark line that I have drawn green color is what is the dog and anything outside of it is called a background. So, this is my figure and this is what is called the background; this is how separation of objects are done.

Now, the region seen as figure contains the object of interest. This is the figure contains the object of interest which appears more solid than the ground and appears in front of it. So, this dog appears in front of the white surface and that is why it is called a figure and the white surface is called the background.
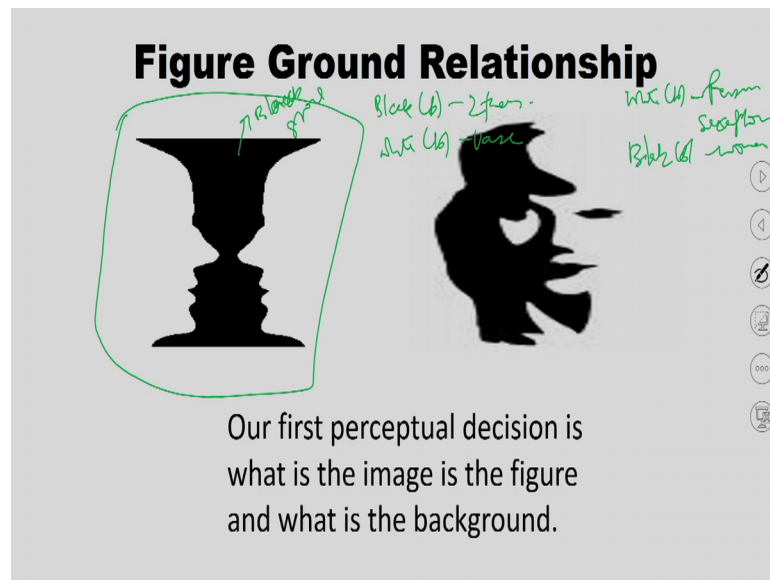
The ground is the region that appears to be behind the figure. So, this is the ground it is behind this dog and that is why it is called the background; figure background relationships, look at this. What do you see? Now it is called a reversible image and it is very easy to see.

Now, if you consider the black as the background, the movement you think the black is the background which means that this figure if I draw like this is a cutout and once that is there this figure is a cutout you see 2 people staring at each other. Can you see the 2 people staring at each other? These are the nose. This is the mouth and this is what is all about.
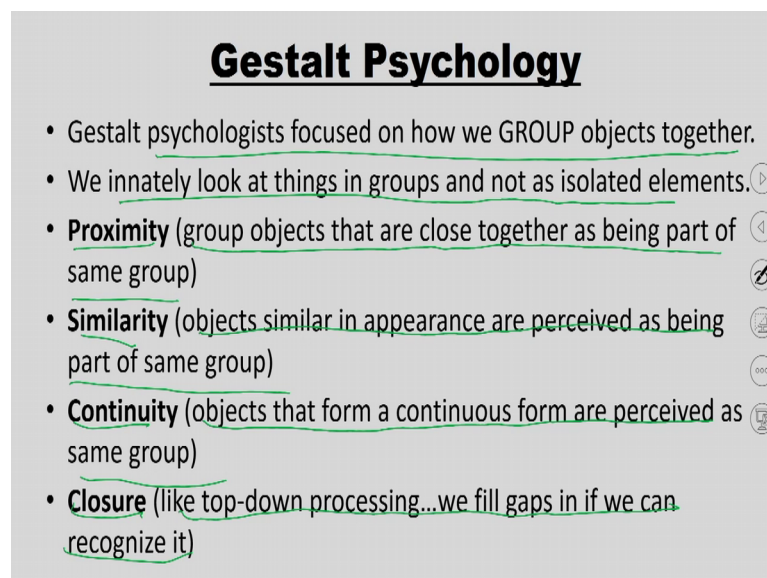
But the moment we see the white as the background and black as the figure, you see a vas. So, this is basically if black is the background, you see 2 faces and if white is the background, you see a vas; this is called a reversible image. Can you see the in the 2 faces which are seeing each other? Yes that is what is perception all about and that is called localization or separating the figure from the background.

Let us look a second one. Look at this, what do you see? Again keeping the black as the background or white as a background there are 2 figures. If we black as the background foreground sorry and white as the background, you see a person who is actually playing a saxophone. Can you see the person? This is the nose, this is the form of the body and this is my saxophone which is there. But if I change; so, if I make white as the

background, I see a person playing a saxophone correct; but if the moment I say black is the background, I see a woman a face of a woman can you see the face of a woman. These are the 2 eyes, this is the nose, this is the mouth, this is the part of her hair and so on and so forth.

Amazing right? Reversible figures, so this is important the first step in localization or maybe the second step in localization is distinguishing what is the figure in the background and that tells you a lot about how to do perception or localizations and this is important for perception.

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Now, there are certain rules which are followed in this perception or there are certain perceptual organisations which are proposed by Gaston organize a Gestalt rule which is used for perception or which is used for localization of object in the background.

Now, Gestalt psychologists focused on how we group objects together because perception or this localization requires not only separating objects from one another, but also organizing objects together so that we can view them. So, we innately look at things in groups and not as isolated elements. There are certain rules with the gestalt have and these rules are used for perception. Now one of the rule is called Proximity. These groups objects that are closer together as being part of the same group.

The second rule is called Similarity which says that objects which are similar in appearance are perceived as being part of the same group. Similarly we have the third rule which says that objects that form a continuous form are perceived as the same group and we also have a fourth one which is called closure like top down processing we fill gaps in it and can recognize it. Now immediately it will come to your mind that one of the figures that has showed to you the 2 triangles actually follow the rule of closure and that is why you the to triangle.

Let us look at what does it really mean.

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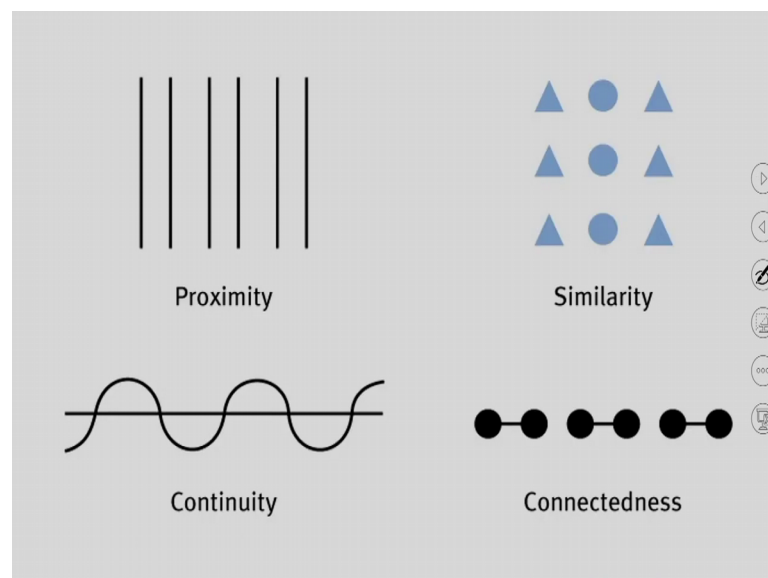
This is proximity.
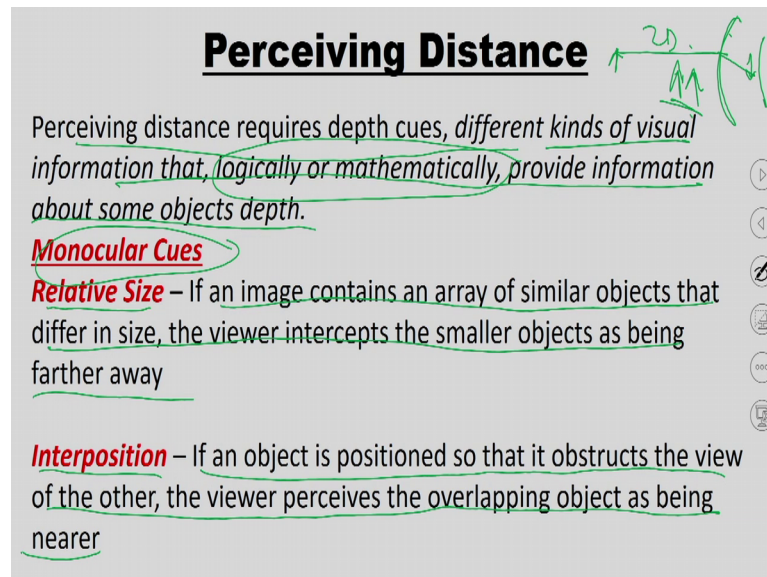
So, when I show you this, what do you say? I see bunch of lines parallel lines, all of these lines are independent of each other; but you group them together and this is called simple Proximity rule. When I ask you what is this you see there? You say that I have 2 group of triangles and 1 group of circle and this is called the idea of Similarity.

Similarly, when I show you this most people will say that it is a curve complex function curve this is not a sine curve, but it is a cosine curve and when you say that it is wrong because what will happen is this part is different from this part. But since they are aligned in a certain manner or it looks at continuity or it appears to be continuous.

Similarly when I show you this what do you see? You see 3 balls or 3 dumbbells; but they are not 3 dumbbells, these are 6 different balls which are connected by sticks. So, the idea of grouping them together is what is Gestalt. What gestalt is say is how we make perception or how do we do localization.

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That was of how perceiving objects or grouping objects was, but then an amazing thing with eye is that the eye can not only see 2 dimensional it can 3 dimensional. So, how does the I see the third dimension; how does the I perceive the third dimension or the 3D pictures?

So, perceiving distance required depth cues different kind of visual information that logically or mathematically provide information about some objects on depth. When you when you have seen the structure of the eye, I said that an object which is in the field will actually be projected onto the retina in a reverse manner, but the object will be in 2D format right because the retina has only 2 dimensions; a length and a breadth. Retina has a length and a breadth; how does it create 3D? It creates 3D by doing some mathematical and logical calculations.

So, how does the 3D actually come about? There are 2 different kind of cues. Have you ever wondered why do we have only 2 eyes or why do we have 2 eyes? The reason that we have 2 eyes is that the 2 eyes are helpful in making distance right. So, once you want to see distance, once you want to calculate distance one of the cues or one of the things is
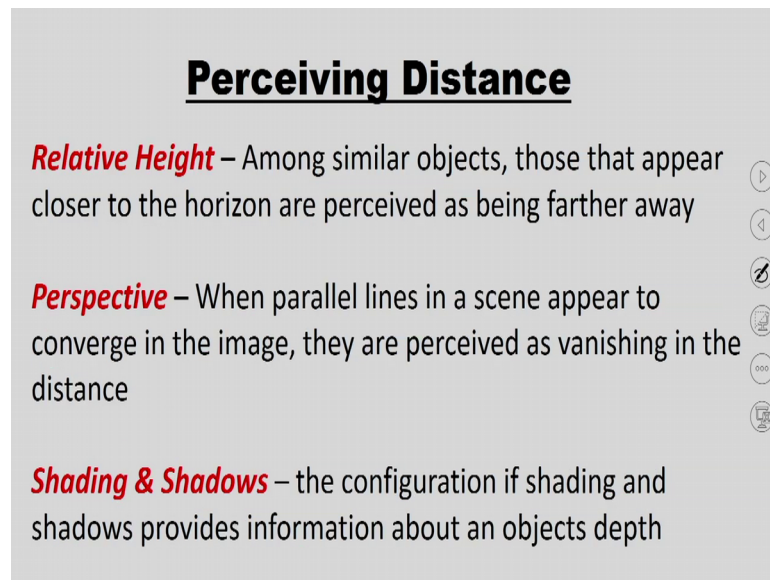
that a single eye can see distance which is far away. So, there are certain monocular cues which means that these cues are independent and then, any of the eye can actually see it right.

And so, how do you see distance? You see distance by certain cues or certain information which each eye can actually process or which and these keys are cues are actually assumptions. So, eyes have the certain eyes or independent both the eyes have independent assumptions. Based on these certain assumptions and fitting these assumptions onto an object which is falling or the information from an object which is falling onto your eye, the brain calculates distance. How does it do that? One of the cues or one of the assumptions is relative size.

What does it mean? If an image contains an array of stimuli objects that differ in size, the viewer interprets the smaller object as being further away right. So, if there are 2 objects there and so 2 lamppost and if these lampposts are in this way that one lamppost looks smaller than the other lamppost, people believe or assume that lamppost are of the same size and that is why they say that the lamppost behind the smaller lamppost is further away than the lamppost which is in front of you. Similarly something called interposition is another assumption.

If an object is position so that it obstructs the view of other object, the viewer perceives the overlapping object as being nearer to you. So, if there are 2 objects which are in front of each other and 1 blocks the view of the other, the one that blocks the view is perceived to be nearer to you than the one object of the view of which is being blocked.

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Perceiving Distance

Relative Height – Among similar objects, those that appear closer to the horizon are perceived as being farther away

Perspective – When parallel lines in a scene appear to converge in the image, they are perceived as vanishing in the distance

**Shading & Shadows** – the configuration if shading and shadows provides information about an objects depth

Similarly, you have something called Relative Height. Now among similar objects those that appear closer to the horizon are perceived to be further away.

So, there are diagonal lines inside of an object and these diagonals when it goes inside an object that creates a motion of depth, that creates some motion of that depth and within that you have if you have 2 objects and one object appear to be going inside and the other object come is appears to be coming out of the frame; then the relative height tells you that there is depth or there is some kind of 3D in the object or depth in the object.

There is something called perspective. What is perspective? When a parallel lines in a scene appear to be converging in the image, these are position as vanishing or these are positioned as vanish vanishing. They appear to be perceive as vanishing in the distance and that creates some kind of an image. And lastly we are saw something called Shadowing and Shading. Now the configuration the configuration is shading and shadows provide information about an object and it is depth.

So, let us look at those things that we saw right now.
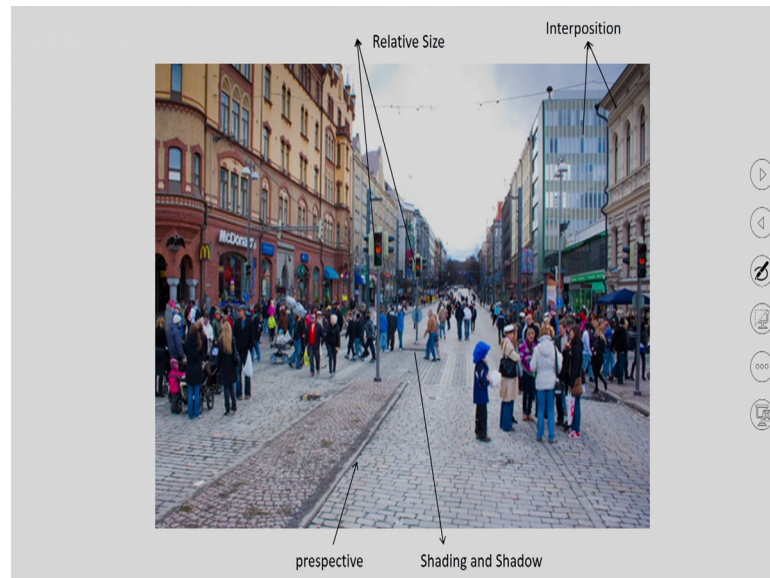
So, if this is an object, this is a visual image that we have and you can see the 4 cues or 5 cues that we have defined. If relative size is 2 lamppost 1 here and 1 here, now they are the same size. This appears to be going inside and this is called relative size that tells you depth. This image actually tells your depth right it look like a market and so if the within the market place, there are people this is called interposition. There are 2 objects and so this line here drawn in front of this says that this object is in front of it.

Similarly, you have perspective. Now these lines parallel lines are appear to go inside right and converge at some point of time and that tells you depth and similarly, shading and shadow if you look into it. The shadows falling in a certain manner and those shadows actually tell you that there is depth in there and that this object is a 3D object.

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So, perceiving distance requires depth cues different kind of visual information that logically or mathematically provide information about some object depths.

Now, how does the depth cue really work? An experiment was done by someone called Eleanor Gibson and what her idea was that depth perception or perception of depth actually is embedded in humans to start with and she created something called a Visual Cliff Experiment. What was it? If you are old enough to crawl, you are old enough to see in depth that is the outline of this experiment. Now we see depth by using 2 cues that researchers have put into categories; one is called the Monocular cue and the other is called a Binocular cue.
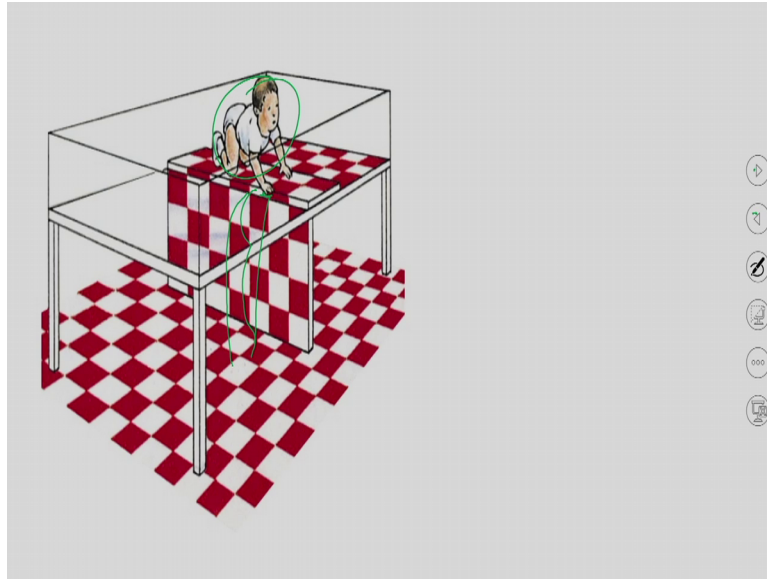
So, we will discuss the Binocular movement. So, what Eleanor Gibson's idea was or she designed an experiment which is called the visual cliff experiment. What was the experiment? A small baby like this was put on a visual clip. Now this is the hypothetical visual cliff, it is an illusion and there is no depth. You can see, this is a depth, but this is not a depth and so the child was put on as area like that and the child was crawling.

Now, it was seen that when the child came near the edge and this edge seems like it is going to fall the child stopped moving which basically means that the child did not call out of here because he can perceive depth; he can see that I will fall and that is called a Visual Cliff Experiment.
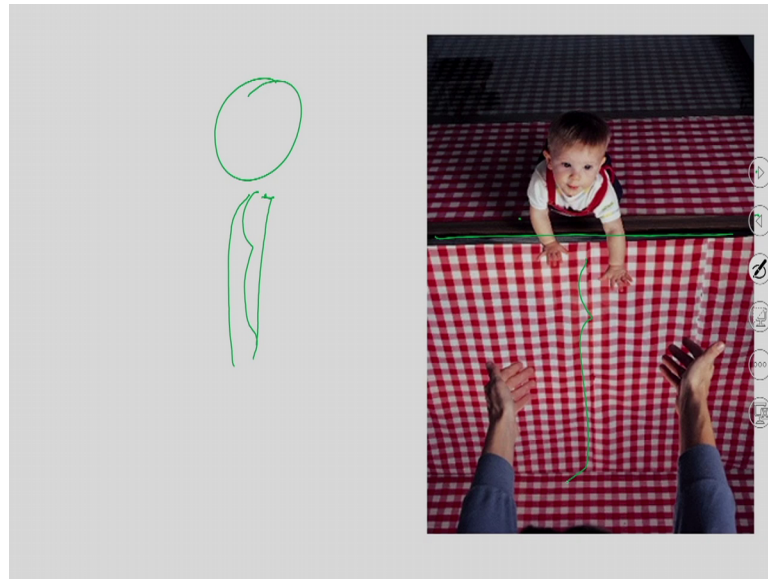
So, you see that this is where the cliff is and this is the edge of the cliff. The child is not moving further. Now this is an illusion that has been done. This part is a illusion which seems like a depth, but it is not and so the child exactly does not move out or does not come back or does not fall.

Now, with the mono Monocular ok. So, when you are seeing distance one eye is enough, but when you are seeing nearby objects; objects which are coming right at you, you need

something called by binocular cues. A very good experiment to understand my Binocular cues is hold your hand in front of your eyes and then close 1 eye.

If you close the left eye first and then afterwards close the right eye, the hand keeps on moving the finger keeps on moving. So, if I creep my hand like this cliff the then move the right eye the position is this, but then I move the left eye, it goes somewhere here and so keeps on moving this is basically because the 2 eyes are there and these eyes create motion or create depth, depth effect for objects which is nearby to you and that is called the binocular cue.

So, we need both eyes both of our eyes to see these binocular cues or motions of objects or actually objects in front of you. Retinal disparity, the experiment that I showed you is called retinal disparity if I close 1 eye and see an object which is near to you. If the object is far away, then it will appear similar whether you close the left eye or the right eye, but if an object is right in front of you and if you close one of the eyes, the object keeps on moving and that is called Retinal Disparity.

As an object comes from closer to us, the differences in image between our eyes becomes greater. Convergence as an object comes closer to eyes, our eyes have to come together to keep focus on the object. So, objects which are 2 eyes are there because if objects are there in front of you, we need both the eyes. We need images from both the eyes.

Also seeing movies, how do we see movies? We need both the eyes because both the eyes. Create different perspectives and these different perspectives are added together to create the 3D movies that you actually see there are 3 dimensions or there are multiple cameras which are taking it and because you have these 2 eyes and the binocular cues you get the 3D vision and a conversion is one of the things which are there.
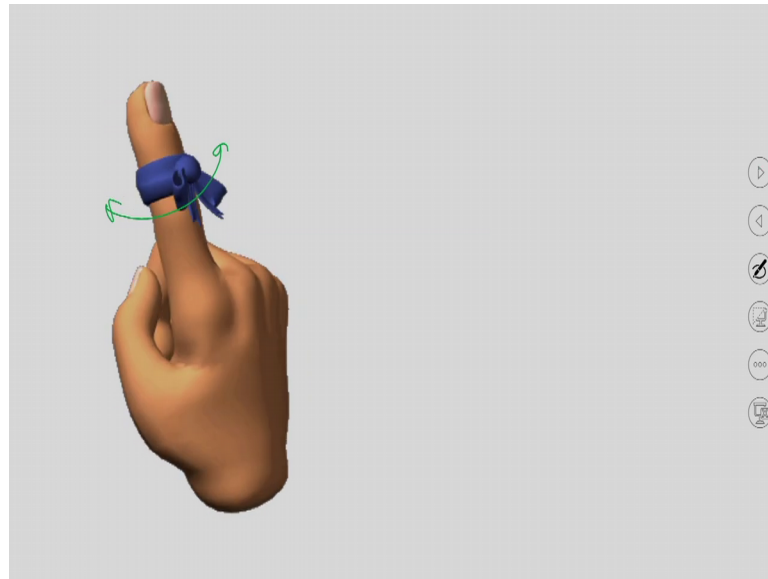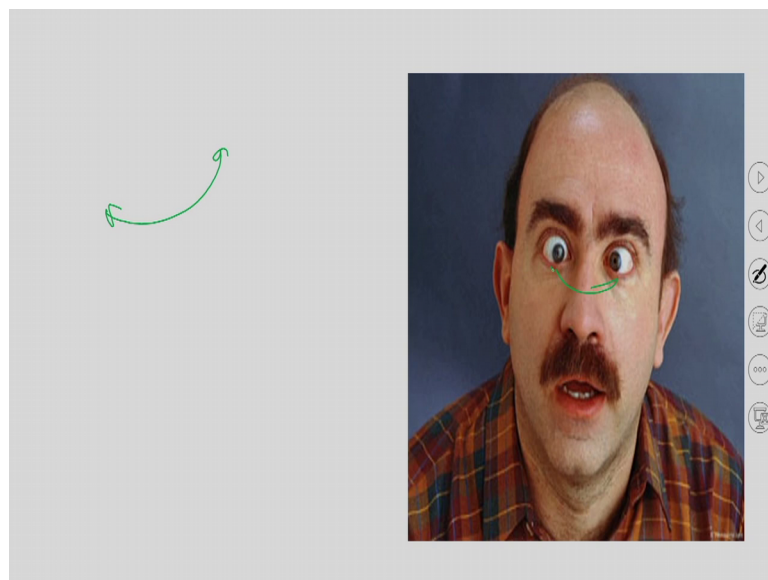
So, if you can see this figure which is in front of you and it is moving you know when you look at it, the image of this moving in this direction is because of the 2 eyes. If you had just 1 eye, we will not be able to see this motion from nearby.
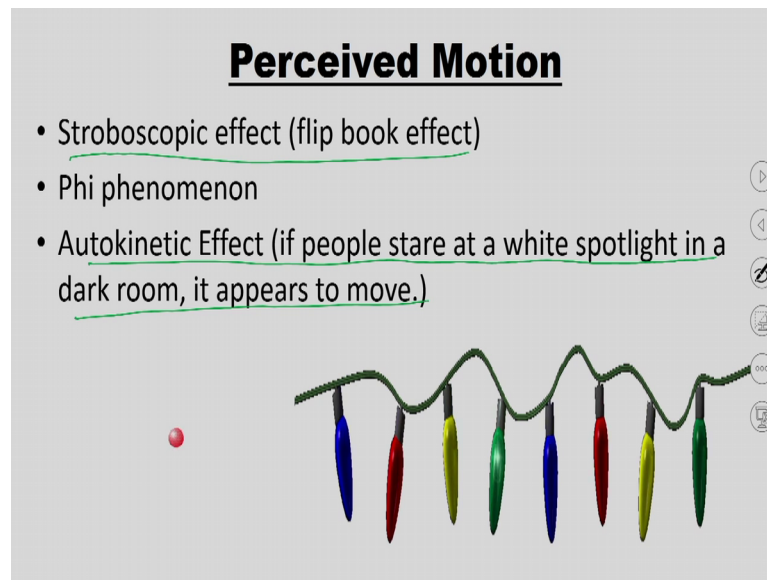
As you can see this person as this is this person is seeing that figure and because of these 2 eyes which are there and they are converging to each other you can see this motion which is out there.
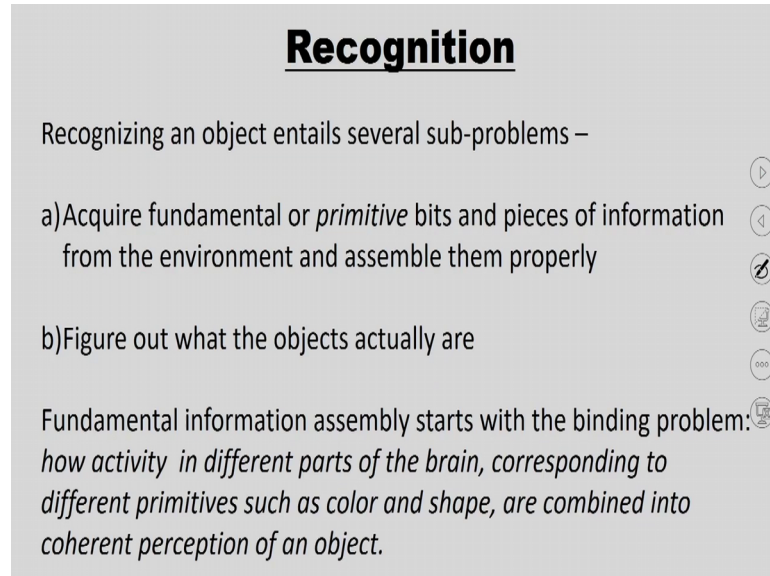
Now, how do we Perceived motion? There are several the 2 eyes are responsible for perceiving motion. So, Stroboscopic effect or a flip book effect. If you take a book and there are several cartoons in which we take a book and then we move the book in a certain way or we just move the pages of the book. When we do that what happens is we create something called artificial motion and that happens because we have binocular cues or 2 eyes. The 5 phenomena; what is the 5 phenomena? You see this object moving in a white space this red object moving is because of the 2 eyes or the binocular cues from the 2 eyes.

Do you see the motion here? Now this motion, artificial motion is being done because the 2 2 eyes is creating this artificial motion or because of the 2 eyes that is there. Now there is quite an explanation to why this happens? But since this is an introductory course, I am not going into the basics of how this motion is created. This is called artificial motion. You would have seen villages or you would have seen certain diagrams or certain lights which actually move in a certain way and creates motion; not only create motion, it creates letters and all kinds of things.

So, this motion that you are seeing is because these lights are actually timed in such a way that it creates motion. Auto kinetic effect, if people stare at a white spots light, in a dark room it appears to move right. So, if this is object, the movement you are actually seeing and this is I mean in this experiment it is not possible, but if assume that it is a

dark room and this object is static, it will start moving on itself and that is because of the two eyes that that is there.

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Recognition

Recognizing an object entails several sub-problems –

a) Acquire fundamental or *primitive* bits and pieces of information from the environment and assemble them properly

b) Figure out what the objects actually are

Fundamental information assembly starts with the binding problem: *how activity in different parts of the brain, corresponding to different primitives such as color and shape, are combined into coherent perception of an object.*

So, what I will do is I will stop my lecture here and start with the third process of Recognition in the upcoming lecture.

So, very quickly I will try and review what we did in this lecture. In this lecture, we try to look at how what is perception and how does perception really progress and then we looked at what is the need of perception. For that matter and we gave up enough information or we gave up enough evidences of why perception is needed for at all. From there on we looked at the 5 step process that perception starts with and we covered the idea of what is attention and what attention comprises off and what kind of attentions are there and what is the process of attention.

Then, we looked at the process of localization which is locating an object in the external environment in terms of not only grouping objects together, but in terms of also figure ground effect. In relation to that or in addition to that we actually looked at also how does the eye perceive distance and not only distance how does the eye manage 3D images when objects are very closer to you. So, we used something called the idea of binocular cues and monocular cues and how this minor color cues and monocular cues not only perceives distances and also objects near to you, it also perceives motion; how does motion is perceived.

We will stop our lecture here and then, continue on this in the next lecture where we will take up what is recognition; what is constancy and what is abstraction and how they all combine together to form perception.

So, from here now it is goodbye.