Introduction to Cognitive Psychology
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Lecture – 05
Models of Perception-01

Hello, in the last lecture, we looked at what is perception, and we also looked at the classical approach to perception. In addition we went ahead and saw the gestalt approach to perception the organization principle of the gestalt and the law of pranks, and the limitations of the gestalt approach.

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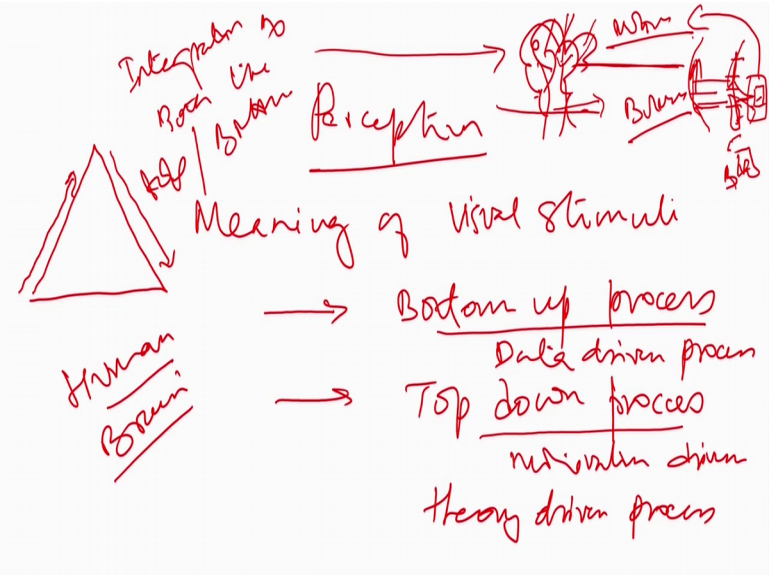

Now perception which is making meaning of visual stimuli is believed to be a two part process.

In terms of the human brain perception happens through something called a bottom up process and something called a top down process. The bottom up process is a data driven process and it moves from top to bottom. So, if I consider a triangle representing how the process of perception really work, moving from general to specific is basically what top down processes are. Most top down processes bank upon basic stimulus properties, add up these stimulus properties and come up with a meaningful percept a meaningful interpretation.

In contrast the top down processes are generally motivation driven processes or theory driven processes. What it means is coming from specific to general. Most perception require the top down process and the bottom up process and so, the next particular thing that we are going to under in this lecture is the bottom up process and the top down process.

Think what really happens when you see a tree like this. The process of perception of visualizing this tree of making meaning of this tree starts by the creation of a proximal stimulus from the distal stimulus by the eye. The lens of the eye projects this proximal stimulus which is the inverted image of the tree the inverted image of the lights falling from the tree on to the retina which then depending on the intensity and the type of illumination, the type of electrical current that is generated by the pers the proximal stimulus sends this information on to the occipital lobe. The occipital lobe then integrates various kinds of information which is sent on by the retina, it is probably right time to introduce that the retina does not only passively transmits the intensity of light waves which are falling onto it, transmits several other information about the distal stimulus onto the occipital lobe.

For example some information regarding the motion of objects; information regarding the contours which divide the background and the foreground and several other basic information in terms of the color, in terms of the texture are transmitted by the retina itself. These informations are then taken up by the occipital areas or the visual processing areas. Now this process which starts with light falling off the tree being reflected on to the lens and the retina and then there is not passing up specific bits of information onto the occipital lobe or the occipital visual processing areas is called the bottom up process.

This percept which is formed, this interpretation which is formed from the primary inputs from the retina is then compared with pre stored notions or pre stored representations into the brain, and then a meaningful interpretation, a meaningful idea is made about the particular object in the environment. In this case the idea that this is the tree composed of two parts, the bottom up process will include those processes or those events in through which the greens color, the brown color of the trunk, the green color the leaf, the shape, size of the tree the texture of where the tree is standing how far it is from some other object in the visual field these kind of informations which la leaders are the kind of structure of the leave, the idea that it has a leaf, and the idea that it is it has a

certain length and it is green in color, the bark is brown in color it has roots, it has fruits these kind of information which leads us to identify a particular visual stimulus as a tree is the bottom up process.

Whereas taking all these information to get this percept together, and comprising them to approach the type of a tree to the idea of a tree which is stored into the long term memory is the top down process. Basically most perceptual processes or most perceptual events require the integration of both the top down and the bottom up process. So, let us start with understanding what are the bottom up processes in perception, and looking at some of the bottom up processes in perception which are used for understanding the perceptual process.

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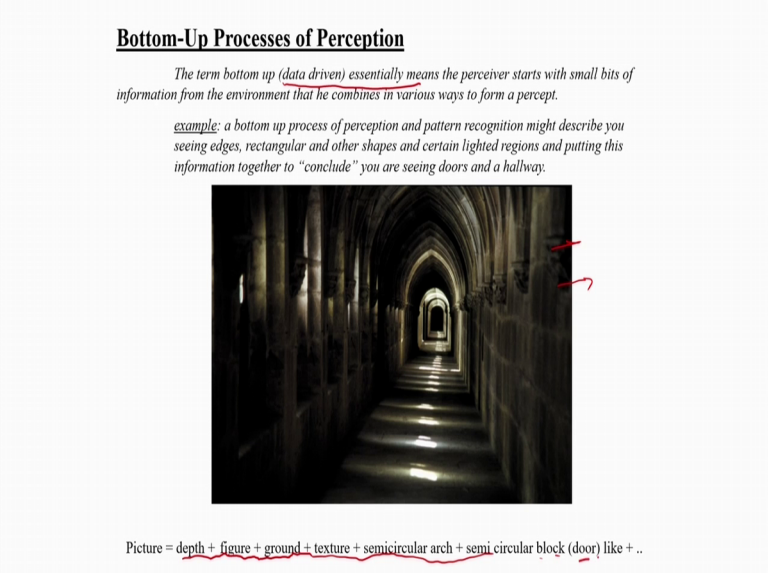

The bot the term bottom up process or data driven process essentially means perceiver starts the punt first person who is perceiving the brain which is perceiving the image starts with bits and pieces of information of the object in the environment, integrating them together to form in a percept. As I was explaining if you are looking at a tree the idea that green leaves are there brown, trunk is there fruits are there, flowers are there, it is of certain height it is of certain texture all this information which is passed on from the retina onto the occipital visual processing area is what is the bottom up process.

So, basically in this case in this particular image I have brought an image, I have got an image which will explain to you or which will try and explain to you what is the how do

we interpret the meaning of this particular image through a bottom up and top down process. So, looking at this particular thing this particular image what do you see? Most people think of this as a corridor of a cathedral of old building or of a European building or some kind of a corridor out there.

The idea that this is a corridor can be generated by both the top down and the bottom up process. From for the bottom up process what would happen is you would see into this picture and based on the kind of shading, based on the kind of light that is have that it is having based on the kind of architecture that it has, the kind of curves that it has the kind of architecture, the kind of bricks that are making this the diverging lines inside this image the diverging lines which is inside the all these information basic information the kind of steps that you see, the kind of arches that you see, these and the lightings the pattern the shading the color all these integrate together to give you the idea that this is an hall. And this process of using these information from the visual field to tell you that this is in hall is what is the bottom up process.

In contrast it the top down process we will look at this particular picture and compare it with something that you have seen before and we will try to match up. So, if you have ever been into a hall like this before or if you have been to a cathedral before which has similar interpretations or which were similarly interpreted or which was seen, similar to it or how close that image which is in your mind that representation of a hall is in your mind, how close that fits to this that gives rise to or that if you are using that to interpret that this is a corridor of a cathedral, if you are using that particular image or if you are using that approach to make giving meaning to this image that is called the top down process.

So, this picture through a bottom up process is basically coming up from facts like the depth, the figure the ground in texture semicircular, arch a semicircular blocks doors and so on and so forth.

Now, how do we understand the bottom up process? An easier way to understand the bottom up process is that bottom up processes for most bottom up processes as you move along the chain as processes move along from lower dimension to the higher dimension there is no possibility of correction. So, in most bottom up processes as you move higher

along the dimension as you move up higher along the processes, there is chances of corrections are very low. Now how do we visualize a bottom up process?

Think of a class in which the person who is sitting on the last bench is given the task of writing a word anybody wishes, and then the next person to him writes adds up another word our job here is to interpret or basically make a story of what students write onto it and. So, the person next to the person who wrote the word first writes another word and this way this keep on going.

You will soon see that the person at the front of the class has not much option, what he has to do is he has to look at whatever has been written before and based on that make an interpretation. Bottom up processes are like that basic stimuli or first processes in or the first inputs are taken in and from there higher inputs are made or higher configurations are made, but it is not possible to go back to the basic inputs from which higher inputs are made though that is how we visualize the bottom up process.

Also most bottom up process are automatic in nature as they do not require some kind of control by the mind, they do not require some kind of cognitive control. So, they are very automatic process as you see something, the brain interprets the eye retina of the eye basically breaks the information which is coming into its similar path in terms shading color and so on and so forth interprets this takes in this and sends it to the occipital visual area for processing, also these are very reflexive processes bottom up processors are generally a reflexive processes.

Now, there are three or four bottom up processes, that we will discuss in this particular lecture the first is called the template matching process.

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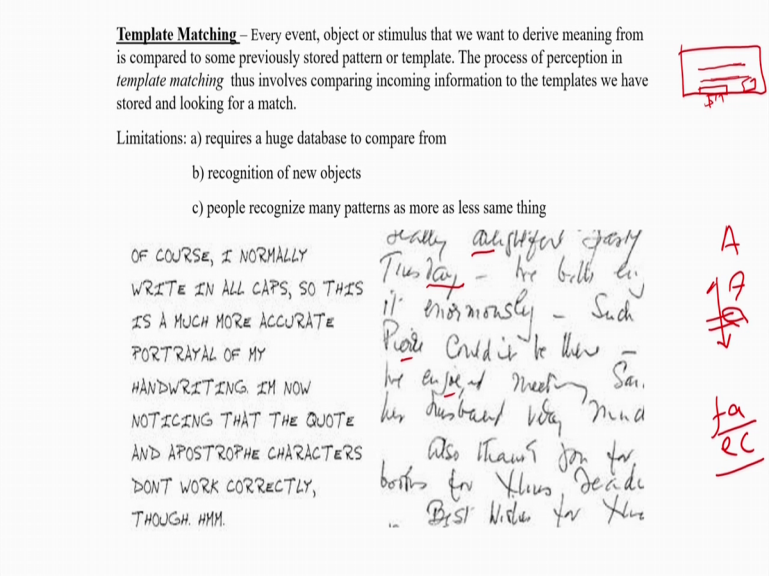

It is a very simple process and what it says there are pre configured template into the brain; and what really the bottom up process really does is it takes in information from the visual world integrates them together and compares them across this template with this template and when a match is recognized, an interpretation a correct interpretation is done when a match is not there, another template is looked to a match is made and so on and so forth.

Now, think of templates stencils. These stencils in general use most stencils are used to make figures or to make words or to make events which are re equivalent to the stencils in template matching model or according to a template mogic matching model a reverse of what the stencil does happen. So, we have a fixed stencils into the brain, a fixed idea into the brain and whatever the eye or whatever the visual system in is sending whatever information it is sending into the brain, it is taken in and compared to preconceived stencils out there.

As the information matches a stencil, it is recognized a percept test formed and it is recognized as it is and this is called pattern recognition, but if a match is not found a next stencil looked into and so, a large number of comparison has to be done. Also think of template matching or understanding template matching in terms of cheques. Now all of you would have seen what a cheque looks like. So, most cheques have a certain area where person can write his name and amounts, and then he has a signature area and then

below you see certain numbers, what is the use of these numbers. These numbers are generally used by cheque sorting machines, these cheque slotting machines which are installed in different banks and what these banks actually do is that, based on various numbers and letters it then forwards a cheque to a particular branch.

It is a very simple interpretation of what the template matching model does. So, banks sotters or bank cheques sotters are equivalent to a template matching scheme, in which several templates are there with the blank sorting machine and what this machine does based on which numbers and letters you have on the cheque, it will pass your cheque along to a particular bank. It is a very comprehensive model and the main proposal of this model there are prefix templates into the brain and incoming information from the eye is made into a percept and a template it is matched to preconceived templates into the brain, and if there is a match and interpret is eminent, if it is not a second template is looked about and so on and so forth.

Now, there are several obvious limitations of the template matching model. One of the first template matching model limitation is the requirement of a huge number of templates. Now by its the design itself the template matching model requires that we have to have a huge number of templates into the brain. Now since the brain capacity the idea that the brain has a fixed capacity and it cannot have a large number of templates. So, this model lacks a particular feature lacks a particular gain over other models also when a new template or when a new image or new object comes into perception in the perceptual field, how does the template mat matching model account for that?

Think of this in this way. The phone industry started with button phones and then came in the first resistive touch screens and the capacity touch screens. No matter we move from the button phones to the resistive touch screen or the capacitive touch screen phones people did not have any difficulty, at all the bar candy phone with the buttons had a particular mental template, this is what is supposed to do.

But then when people migrated to capacitive touch screen or touch screen phones they did not have too much difficulty into identifying touch screen phones or the functions of the touch screens phone, which means that the template of the button phone got transferred or somehow accommodated the new template of the capacitive phone or it extended itself to the capacity phone. Now how does that happen that is not explained by

the template matching model. So, it does not say that if a new model comes in or if a new form of object comes in, which is will be different from the template how do you account for that also another interesting thing or limitation of the template matching modulus handwritings.

Now a lot of people recognize a lot of symbols as meaning the same thing. So, how does the template mapping model actually account for that? On your left on the slide you see a text written and. So, this text has been very nicely written in all capitals and it is very easy to read, and most people are able to read it.

On the left you see a very bad handwriting tell me this, is it difficult to read the text on your right it is not. Most images or most letters are preferably out there and it makes meaning to you, but template matching model says that fixed templates are available to the brain. So, if A is written in this way any deviation of A into like this will not be matched and will be an outlier or will be not perceived by the brain. As we can see handwritings whereas, as you see here this day and this a here, this a here and this o here and this f here they do not match to the general way of how f a e and c should be written, but still we are able to read this.

Which basically means that the existence of fixed templates is something which is a far off cry which is not true and. So, to basically fill in the gap which was made by the template matching model to counter the limitations of the template matching model as we saw, in the study of cognition that several methods are used for studying cognition because one method we have if one method has the limitation a second method goes ahead and plugs this limitation, or basically proposes something which accounts for this limitation and so, a better idea of how cognitive process really works or how mentally means are process that gives us a great idea.

And so, to plug in through this limitations to account for these limitations or the template matching model, a new ma model which was called the feature analysis model was proposed. Now what is the feature analysis model?

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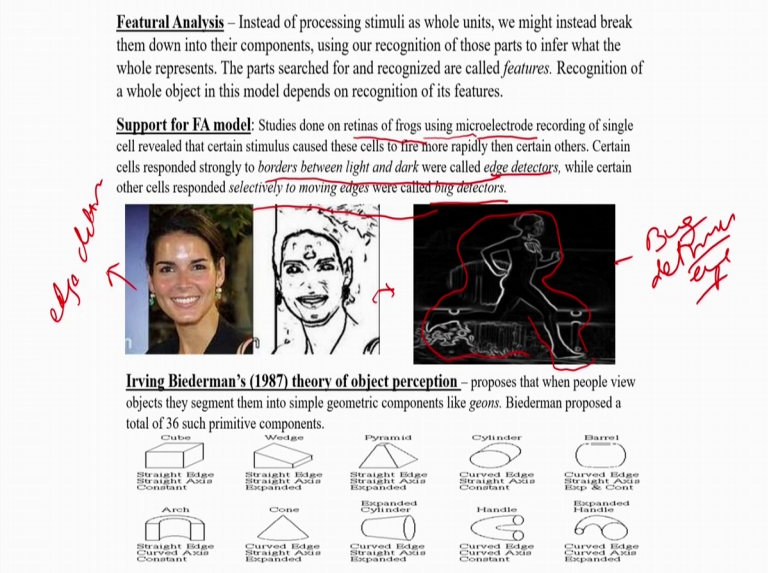

Feature analysis model says that when a perception happens when we perceive things from the visual environment, we look for units basic units which are called features. We look for features certain features on to a proximal stimulus which is coming which is being inputted true from the retina onto the visual processing area.

So, then when looking for when looking at a stimuli, looking at a complex environment or stimuli, we generally do not perceive the stimuli at as a whole, but we break the stimuli into its several part into stimulus into its different features and we look at these features, perceive these features, integrate it back and that is how we go ahead and recognize a particular object.

When I enter my classroom, how do I make this idea or how do I perceive this classroom. The idea of a classroom or the perception of this is a classroom is made by several features of the classroom for example, there is a door, there is a certain kind of edges and angles which suggest which is a door or there is blackboards and certain ideas about what features a blackboard should have, what is the background, what is the foreground and that kind of a thing is there.

So, when perceiving something or when looking at an any environment finding out the basic features or breaking a hole or breaking a hole in visual environment it is too intense different features, helps us in identifying an object much successfully and much faster than gobbling up or then interpreting the whole object as a whole.

There are several support which is out there for the feature analysis model. For example, the idea that while perceiving something the first step in perception is identifying pictures starts by works on frogs on retina frogs and so, what scientists what researchers did in a was they implanted micro electrodes into the retina of these frogs. And they found out that these micro electrodes, they responded according to how the retinal cells responded and say they found out that there are certain specialized cells onto the retina which goes ahead and responds in certain ways in indifferent ways. For example, two cells or to groups of retinal detectors have been found one is called the edge detector the other is called the bug detector.

Now, the edge detector is that group of cells in the retina which become active or which fire more when a frog retina or a when a frog actually sees or forms a border between dark and light area, and this group of cells are called the edge detectors. So, within the retina itself there are group of cells which actually respond to the visual environment to the input from the visual environment and separate them into its different features. And so, one of the features of any percept is the contours or the edges of where the figure in the background is banking up to what the gestalt is said the first step or the first process in any perception is figure background effect and. So, this particular experiment gave ideas that in the retina itself there are group of cells, which actually make you distinguish between the edges the light and dark fine of edges.

Similarly, retinal cells in frogs have also been known to identify movements. So, if there is a movement these retinal cells actually go ahead and respond more vibrantly, more actively than other cells and these are called the bug detectors. As you can see when we actually see this woman this picture of a woman here, this is what the retinal image is. If you look into it this is how the retina responds to and this is been captured from a human eye through micro electrodes and what you actually see is we do not see colors, we just see this kind of an interpretation, this kind of a black and white contours in to it.

Similarly, bug detectors have been found. So, when you see somebody running, the bug detector which is there in also in the human eye it responds something like this, as you can see it actually goes ahead and responds in this way it is responding to the motion of this person whereas, in this case it is responding to the edge detectors are responding to the edges, the differences between what the figure background would be or what are the contours which basically makes this woman there.

So, this is basically the direct output from a edge detector and a bug detector into the human eye. And what does this really mean it means that at the level of the eye itself the features are separated out. Now what are the basic idea or what are the basic support which was which was provided to the feature and is model was by it someone called Erwin Biederman, look at the image that I am drawing.

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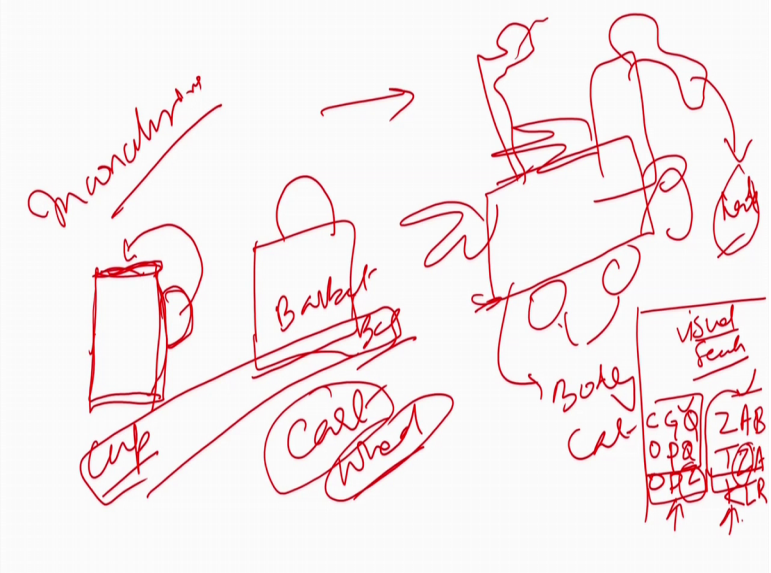

What does this image look like? And so, most of you will be able to tell me it is some kind of an cart with wheels into it and. So, these are the wheels, this is the body of the cart, and this is a handle for pushing it and so on and so forth. So, basically this image that I have drawn is basically an inconclusive image, it does not make any conclusion does not fit into any template pre existing template, but even when this image makes no meaning most people or people like the viewers that I have are able to make at least some features extract some features out of it for example, this is a cart it has wheels. So, basic which basically means that it can move, it has a handle which can make it move, and then it has some kind of nose I do not know why it is that is the kind of things.

Basic support by Biederman was provided that even if an image an inconclusive image like this was presented to people were able to identify this and pro this provides support the fact that people respond to features, and these features are what gives rise to interpretations to the bottom up process of how perception really takes place.

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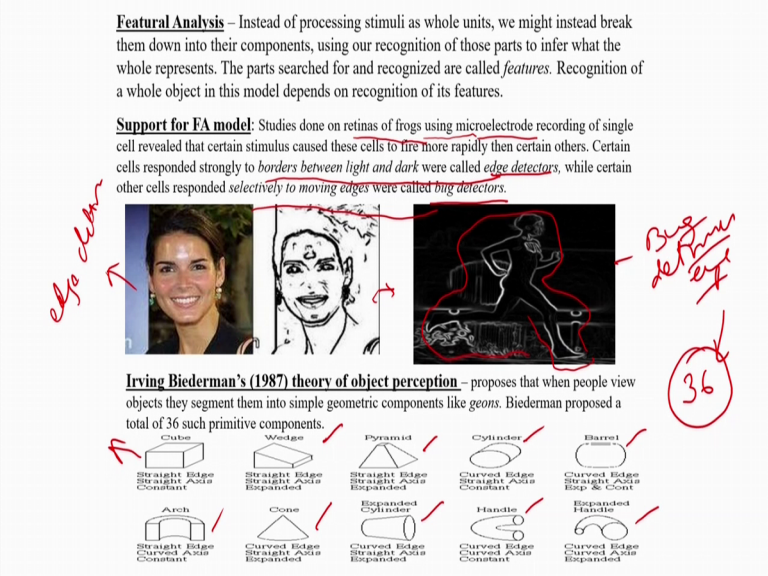

Now it Biederman propose the conceptualization or something called geons, and what pi Biederman says that these geons are something called geometric ions. So, Biederman gives the idea or suggests the idea that unlike the ions in chemistry, there are something called geometrical ions or some basic shapes which are available and according to Biederman there are 36 basic shapes which are available in the visual field and most perceptions that we have are actually interpretations of these 36 basic shapes. So, that is what say what Biederman says and he says that any kind of interpretation or any kind of change in perception can occur by changing the arrangement of these geons.

So, these are the be geons if you look into it, this is the shape of a q, this is a wedge pyramid cylinder barrel, expanded handle handle, cylinder, cone arch these are some I am showing you some of it, but there are different geons available and what Biederman says these are the basic geons these are the primary geons which are required geometrical lines which are required and if you look into this most visual field or most interpretations most perception that we have is actually a combination of these geons. And to say that these geons if you change a geon, you can change the meaning of an object what do I mean by that?

Let us look at this. So, this is the rectangular geon this is the semicircular geon. So, when I look into it right now the rectangular geon and the semicircular geon, it looks like in cup. But as soon as I change the arrangement of this geons, I put this here and then this

cups now become a basket or a bag and this is what the Biederman says. All I need to do is change this geon from here to here to move this position arrangement of geon and then you start seeing these two things together and that is what bitumen says.

So, as you interpret it is basically features that make you make a perception, and bottom up processes generally use the feature analysis model for making any kind of interpretations.

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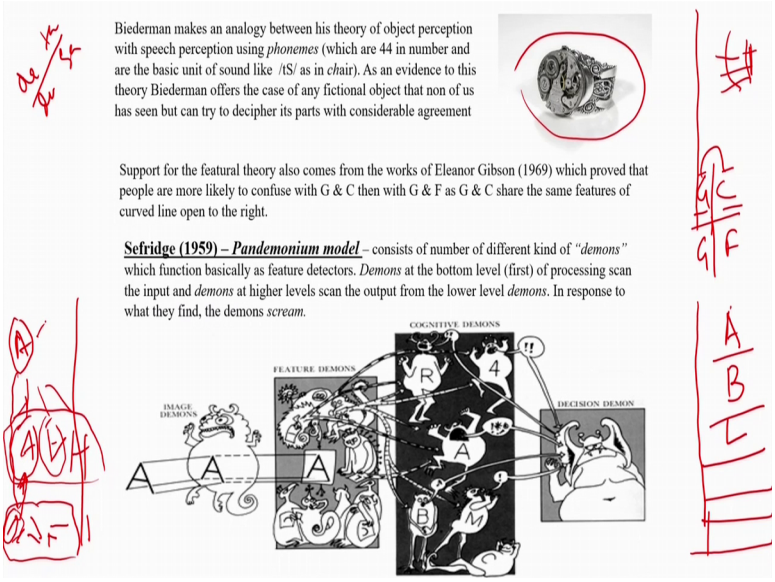

Now Biederman concept that these 36 geons are necessary for forming all basic shapes into the world, he analogs this into the idea or he contrasts this into an idea of sound perception. And he says that there are a compares his theory of 36 geons with the 44 basic fundamental which are available. So, as you would know that there are 44 different phonemes and these phonemes the basic sound structure, we will study phonemes into the in the chapter on sounds on and so, there will study what phoneme is, but right now what the idea here is that this 44 basic sounds they combine together, they get together to give all the English songs which are out there and. So, what Biederman says is that, this idea of looking at his 44 phonemes and making all the sound is similar to his idea of having 36 geons making all the shapes which are out there.

And he says that the if you interpret a phoneme differently to phonemes differently a different sound would be produced. For example, the da and ta phonemes are most confused whereas, the da in sa phonemes are less confused, and this is one of the basic

tenants of the or support of this model of feature analysis model of perception or top down processor. So, Biederman shows us this particular this particular thing, and he says that when we see this particular image most of us are at least able to tell us that this looks like clock the reason why this looks like a wrist watch or a clock is because it has mechanical parts, which tends to move has a strap and so on and so forth. Although we all know that this is not a watch and this is no no idea of a watch

Now, support from Ge Elna Gibsons 1969 theory of perception of similar letters also support the idea of the feature analysis model. Now what Elna Gibson found out, he found out that items or words which have similar shapes, which has similar features are confused more than words which are different shapes and. So, what Gibson said is that it is easy to confuse between visual inputs of G and C, then to confuse between G and F. The reason being that G and C both have a circular geon which is attached to a another small geon which is there, but if we look into G and C they the circular g on is not there here we have a circular geon here, we have some other kind of a geon, and that is the reason how these confusions occur.

So, confusions occur because G and C smas they share the same features or with each other. Another support for this feature analysis model comes from the work of nicer, who says that in a visual search task. So, what nicer did was he gave a visual search task to his subjects and what was the visual search task? The visual search task was easy he had letters like this written and within these letters of having a semi circle he hid a letter with straight angles.

So, as you can see there are GCQ and something like this where am and on the other hand he had letters like this. Now when he showed these two displays two subjects he found out that finding a z in this case was easy whereas, in this case was it was difficult why was that? Because in this case z was very distinct, z had features which are very is distinct from all other letters in this percept whereas, in this case what really happens is that z says some of the basic features with all other letter Z A T A t k l and. So, it is very difficult for somebody to quickly identify z into this particular visual input the reason being that features are important to perception.

He says that the more closely two items share a feature, the more difficult it will be for us to separate, but the more distinct features are the easier it is for us to understand the

percept, and what this all combines to make interpretation is that features are important for bottom up processing, a major idea in whatever processing is that features make a person. Another interesting model or another interesting study that we look into in the feature analysis model is called the selfridges pandemonium model. What is the selfridges pandemonium model is a very interesting model to look at. selfridges pandemonium model we will again discuss it in another chap another coming chapter in this course.

Now what selfridges model actually tells is how does perception of letters happen. For example, there is a letter A and there is a letter B and there is a letter L how does the visual system perceive this. Now prior to this I explained to you how the I have specialized regions which can the retina has specialized regions, which can process information regarding lines, angles, curved, edges and so on and so forth. And this information is passed along to the brain the visual processing areas of the brain, which takes this information and creates the percept or creates the perception.

Now, how are these letters perceive? Now what pandemonium model of selfridge says is that the perception of these letters for example, A starts by there are several demons he calls them demons, and I call them sub processes which are involved in the perception of A. So, if I have to perceive the letter A, it starts at a very basic level. Now since bottom up process starts at very basic levels or the first inputs that I get from the eye is that A the when an A is displayed in front of, you have something like this arched line, you have another arch line and you have a line like this.

Now, the basic demons actually read this kind of input and they forward this input into the letter demon which will then combine this into the different interpretations. For example, to arched line and a single line can mean three things in the English language. I can mean an A, I can mean a V although the V will not have this between thing and I will have a h. Now the thing is whether this is a v or h the interpretation of that takes place through this kind of a bottom up process, at the level at the first level I have the line in edge demon which will then, which will provide an input to the letter demon.

Now, the problem with selfridge model is the letter demon cannot ask back or cannot call back the edge demon for asking any questions. Also these demons letter demon or the curve demon or the demons, which interpret la land lines, and angles these demons keep

on shouting. So, there will be several dementia will be demon of a straight line, where you have a different demon of a slightly curved line on this side l line and so on and so forth. So, those demons which actually process this input when I show an a, now the demon this demon is the one which is excited and so, it will shout the most and all other demon will shout the least will not shout at all.

And. So, input from this is basically taken in and fed into up letter processor. Now the letter processor will take the idea will get the idea that there are two lines one which is slanted to the left, the other to the light, and when a straight line in between that is what is the information is coming from the I. If we look into this combine this to basically produce three inputs three things can happen with these lines three different English language letters can happen, either we have a, we have a v or we have an h, and there is a sec and another demand the highest demand which is out there which will then look at compare this with pattern recognitions with patterns which have been stored in the brain previously and say that a is the only percept and f and h are not.

Now, this kind of model selfridge model is very close to the connectivist model, which we saw in the first classes or in the first lecture of this series where will we looked at how this connectivist model really works.

We will come back to the connectivist model a little later into the chapter of language and into the chapter of memory. So, this is how the model really works, when image a is presented there is an image demon which will first start shouting because this is an image that is there and then from later on there will be a feature demon, the feature demon is there are two lines and those these feature demons will start shouting then there are cognitive demons will interpret what this is all about then there are word demons and then there is a decision demon which is the highest demon which says that this is an a and not an r and so on and so forth.

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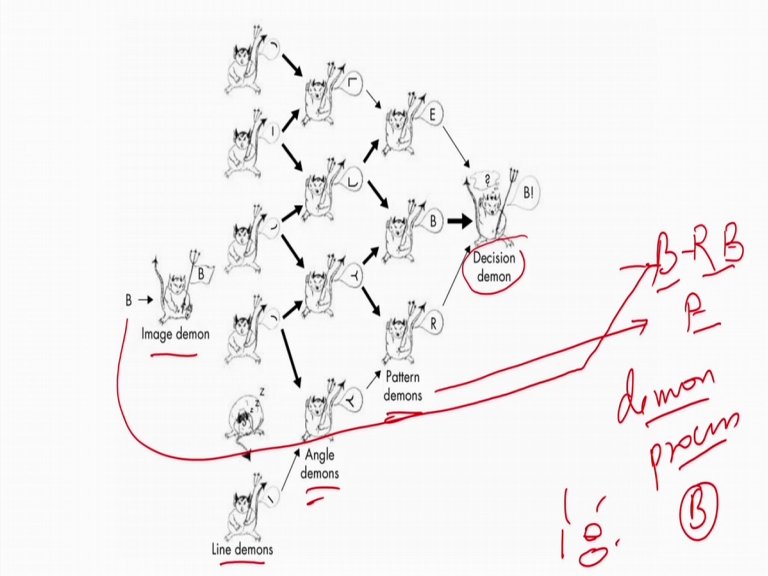

Good example is to look at it this is the B image demon, if you look here that then these are several other demons which represents various lines which are there and. So, those lines those demons which represent the features of an B will shout the most and which do not represent features of B will not shout and then there are angled demons. So, we have the image demon the angle demon think of the demon as a process of how the processing takes place.

So, how does the processing takes place? First we divide B into a line like this, into a line like this, into a line like this and then combination of this. So, that is what it is and this is how first the image demon excides then the line demon excides, then the angle demon excides and then the pattern demons because B could also mean it is closer to R, it is also closer to B it is also closer to P. So, these are the pattern demons which are there where because these are all the possibilities with this, this and this into being and then there is a decision demon which then compares this, this, this and this and says that the image that I have the input that I have is the closest match with me.

So, this is how the selfridges model really works, there are several demons and these demons are the inputs which you get from the retina. So, this kind of a model has been designed by selfridge and it is provides another greater support to the feature analysis model that when we perceive something, it is the feature that is important.

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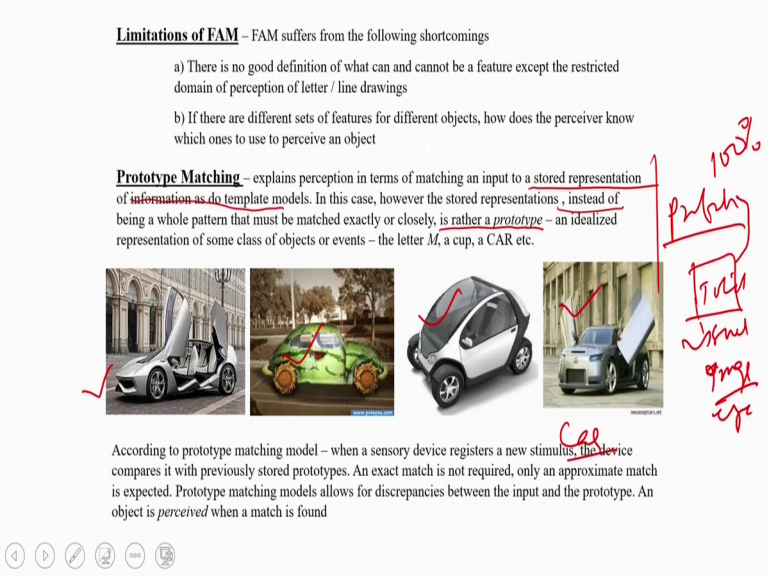

The feature analysis model suffers from some very basic shortcomings; one of the first thing is that there is no good definition of what a feature is, and what is to be expected. So, the idea of what a feature should have what is a feature should not have is not very explicit and. So, once a definition of what a feature should and should not have it is not out there we do not know what a feature, what should be a feature and how these features are identified.

Another problem is there are different sets of features for different objects and how does the perceiver know which ones to use to perceive an object for example, for different objects we have different different set of feat for a face, we can look into the eye and define a face, we can look at the nose and define a face, we can look at other features of the face for example, cut on the face and define a face. So, which are the ones which are the prominent and which are the one features which is the most for example, some people define a face define a person based on his eyes, and some people look at the cut off her face the kind of hairs are somebody has and. So, all of them are features of the face. So, which is the one which is the most important is really difficult and. So, it is one of the base limitations of the feature analysis model.

Another interesting model which adds up or which has been discussed as a bottom up model is the prototype model. Now the prototype model is very similar to the template model, but then it is an improvement of the template model what does it do? The

prototype model says that whenever an input is given to us, whenever an input is given by the visual system to the visual processing system this is compared to a stored representation of information into the brain and so, what template model loses on to the prototype model gains on to that. So, in instead of. So, what the template model, what the prototype model says is that instead of comparing the total visual image which has been provided by the eye, instead of taking this and comparing 100 percent with templates which have been stored in a brain we do some kind of close proximity matching.

What we do is how closely what we try to find out is how closely this fits on to a mental representation which is out there. So, we do not look for 100 percent matches, we look at how closely they fit the more closely a particular image a particular visual scene comes to a stored representation the more chances of it being categorized as that particular the representation. Now the basic feature of the brain, the basic desire of the brain is to categorize the brain does not has a lot of free energy. So, what does the brain generally do is takes up any stimulus which has been given to it, any kind of input which has been given to it and then categorizes the first thing that it does is categorizes makes meaning out of it.

The quickly can categorize something and makes meaning out of it the lesser it work it is required to do. So, that is what the job of the brain is, and one of the things that the prototype matching model does is eases the function of the brain or eases the task of the brain by making an assumption that the input which is coming from the visual system is matched in terms of probablic similarities rather than in terms of complete similarities.

So, instead of being as a whole pattern that must be matched how closely and that is a prototype, now what is a prototype, the idea is what water prototype is. Prototype is basically an abstraction which is generated from several instances of a event or an object. For example, for developing a prototype we need to understand that a prototype is develop from several interpretations or several instances of a particular event let us take a look at this. All four of these images are actually cars right this is a car which is a highly developed car, this is a very basic car as small car and so on and so forth, but all of them are car now, when I say car what comes to your mind.

The idea that what a car should have is the prototype the idea of a prototype of a car. So, when I say a car, the basic features that a car should have is what is a prototype, and if I

look at this four cars what is the similarity that I find into it most cars most cars tend to have four wheels. So, the first feature is four wheels it should be driven by an engine and. So, these are all driven by an engine and so, no matter how difficult or how new a car model I come up with my prototype of a car, will actually try to match it closely with it, try to match the new model of a car which is out there which is closely with it and the kind of similarity the kind of closeness the kind of close approximations the close similarity is that the new model has with my car will tell how close the new model of a car is to my prototype of a car.

So, when making a prototype, I look at all the similarities in all instances of this image and from there I create a prototype. For the example in this case the prototype of a car my prototype of a car or anybody's protector of a car, should be something a vehicle first of all. So, it should be able to transport you from place a to b, then it should also be able it should also be able it should also have four wheels at least. So, it most of them have four wheels it should have a body, where you should be able to sit and a cover of a or as you see most of these images have that thing that prototype.

Now, in addition to a prototype is something called an exemplar and in extension of the prototype in example. Now exemplar is basically the best prototype which is available. So, the doggie dog which is available is most people believe that it is the doggies dog is a the common home dog, which is called the alsatian or the small dog which keeps in barking which most people tend to have that is the dog s dog, it should have a tail it should have a fur, it should bark and that is what the idea is and. So, this is how the dogs are compared into.

So, a alsatian is the dog s dog which is available and so, that is an exemplar. When I think about a exemplar an exemplar is the best example of a category of a prototype which is out there, and so, the most classic car for me would be a the BMW, because that car has all the features or in terms of the Indian standard the most prototype car of the car would be a Maruti Alto or is the most prototype of a car, because it has all the features of a car it gives you all the features although it may not have some of the highest versions, but it is that is the prototype of a car.

So, generally prototypes are abstractions, which are made these are mental representations which are made from several instances of a particular category, of a

particular class of events. According to protocol mathematical model matching model when a sensory device registers a new stimulus, the device compares it with pre previously stored prototypes. An exact match is not required for as closely a match of what you see is to the prototype, the easily the more closely v the way the visual input matches to the prototype the more easily it is understood or most easily I it is identified as belonging to that particular class.

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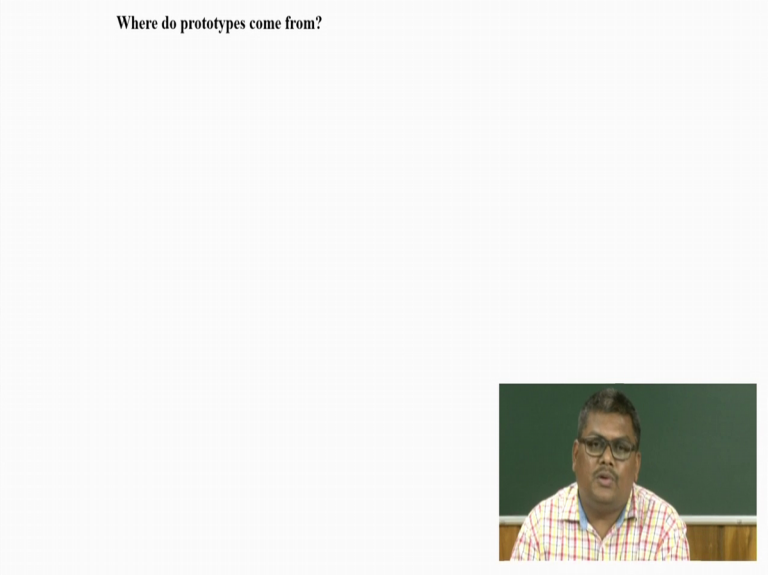

Now, the question is where do these prototypes actually come from, where do we develop this prototype.

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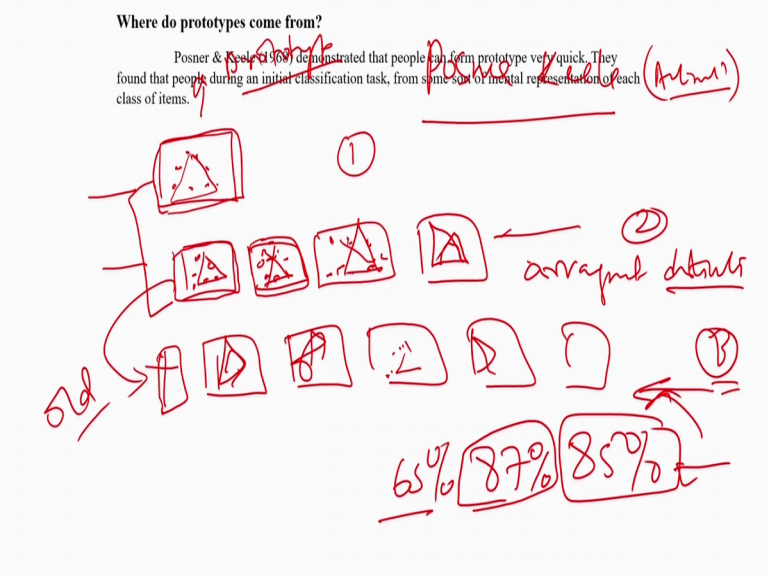

And an elegant answer to this comes from a work done by Posner and Keele. What Posner and Keele says that the development of a prototype they found out how does prototype how do people develop proto prototype, and they found out that prototype development is an automatic process and that is how prototype develops it is by mere exposure. So, what was the experiment? In their experiment what they did was initially they created a nine dot pattern like this, which they called up there which they called as the prototype.

And then with that in the first version or in the first instance they created a nine dot pattern. In the second instance they took this pattern and placed it in a grid, with patterns which are similar to this, but distortions of this pattern. So, they gave this kind of input to subject. So, first subjects were called in initially before the subjects were called in nine dot pattern like this was created which was the prototype, later on subjects were called in and they were shown the various distortions of the prototype with something which is closer to the prototype, and they were asked to classify these distortions which were there for example, this is as you can see it will form a triangle, here it will form a triangle, this is kind of a triangle I cannot draw it right here, but then this is how it should look like forms like this and. So, dot patterns are like this which closely resembles a triangle, but not a triangle.

Later on, various arrangement distortions of this prototype was done. In a third phase of the study several other distortions of the nine dot pattern was given to subjects, which were new distortions. And people were asked to classify or to basically group these new distortions what really happened? People were able. So, within this third experiment we included the original prototype, the distortions from the old distortions into it and some new distortions. What was found out that the chances of identifying the prototype which the subjects have not seen was 85 percent, and the identifying of identifying of old arrangements distortions of the original prototype were almost 87 percent whereas, classifying or identifying these new distortions, which were nowhere near the distortions of the this kind of new distortions which were there, which were ne never close to these distortions new older distortions which were there was only 65 percent.

Now, what is of interest to us is this 85 percent. So, all those subjects was not shown the prototype figure at all they were able to identify the prototype figure on their own. How does this happen? This happens because subjects when classifying something they have create a mental representation, they create a mental abstraction and these abstractions are used for classifying things or taking new things and classifying according to these representations which are this, and this is how things really work. So, this is how the prototypes really come from. So, in the next class then we go ahead we will start discussing about the top down process, this is another process model.

So, as in today's lecture we went ahead and saw what are the bottom up process model those models which take in data, and this the which actually taking data and this data build up accumulate together to actually form the percept in the next like possible in the next lecture, we will go ahead and discuss about the top down model those models which are theory driven which a motivation driven which help us in perception.

Thank you.