Indian Institute of Technology Madras
Presents

NPTEL
NATIONAL PROGRAMME ON TEECHNOLOGY ENHANCED LEARNING

Introduction to Modern Linguistics

Lecture – 10

Production of Speech Sounds
Cardinal Vowels

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Good evening ok I will continue to talk about production of his speech sounds and the other day I told you that vocal cords have a very complex structure they perform a variety of functions we are you know can you name some of them we are able to hear one another because of vocal cords we are able to whisper because of vocal cords we are able to bring a variety of tones because of vocal cords.

And you know similar social functions are performed by vocal cords many people have called vocal cords something like a resonator of furniture which carries voice to a distance the other day we also saw how vibrations can change and changing vibrations produce different kinds of voice tones okay all of these things can be computed can be computerized you can synthesize you can create artificial voice to a large extent a lot has happened by way of engineering a lot has happened by way of human understanding of the production of speech sums let us summarize the other day I also said that.

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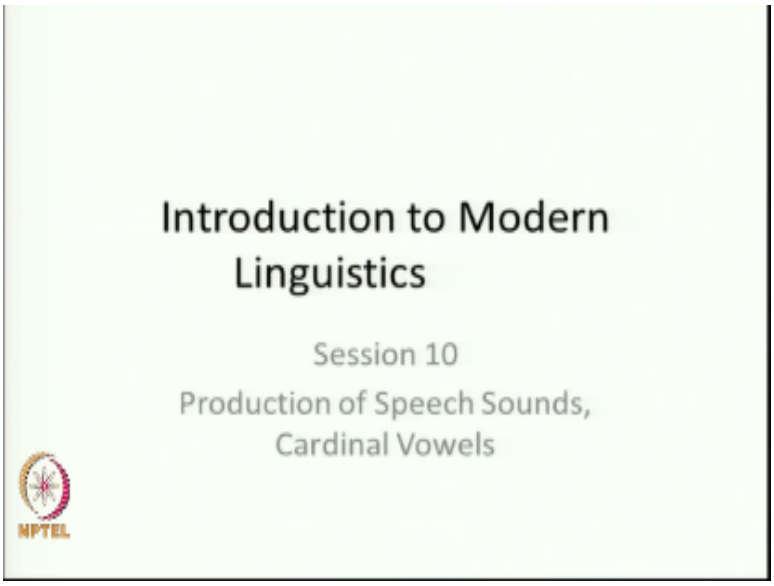

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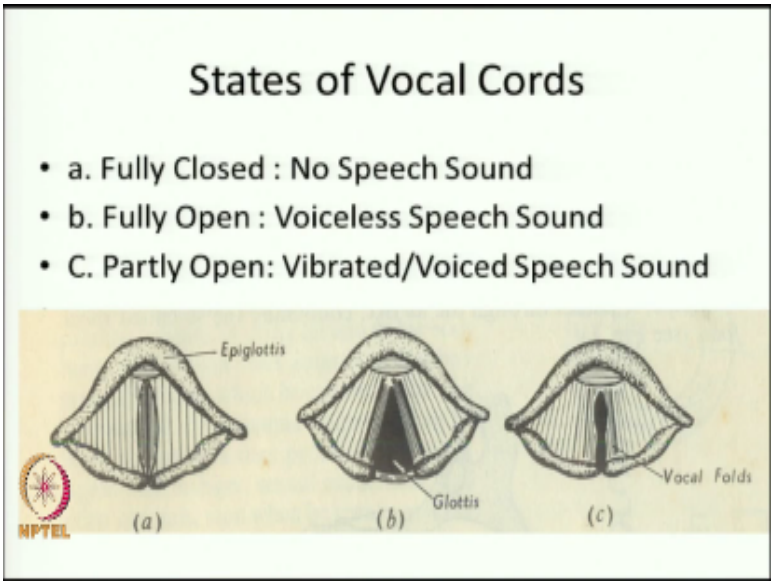

Primarily vocal cords can be in one of the three positions ok do you remember I also said that it is because of the vocal cords that men sound different from women and both men and women sound different from children why do men sound different from women please speak louder students and the camera can catch you the length is different length of what length of a retinoid cartilage what is it retinoid cartilage is different among men from women how long is it among men among men it is generally speaking 21 millimeters.

Among women have it about 18 millimeters long and in children it is shorter that is why you know our voices differ but you know each individual it is not that you and I and all of us have only 21 millimeters it could be a nano millimeter more or less just as no two people here are the same height same length same weight same complexion there are some you know minuscule some minor differences so is it there also in the air it annoyed cartilage and that gives us our unique voice.

Similarly there can be in a very loose very generalized sense three positions of the vocal cords vocal cords can be in three thousand different positions in hundreds of thousands of different positions but if you classify them you know what we do in sciences is we impose arbitrary classification on natural data natural data are not all as clear cut as we see here three positions do you understand yes or no please.

You know the nature has greater variety far greater variety than just to say black and white there is grey there is brown there is yellow there are other colors in between so similarly vocal cords can be in many different positions but for the sake of description for the sake of study we say that vocal cords can be in one of the three positions what are the three positions look at the look at the screen and there can be position A what is it in position a vocal cords are fully closed tight shut no air can come out of the lungs no air can get into the lungs okay.

In that case no speech sound can be produced except some one or two in some languages sounds like you know where you do not require long there where air in your mouth is manipulated okay or you can say I know where air in front of your mouth is manipulated but these sounds are limited few and far between many Indian languages do not have click as a speech sound some African languages have it but by and large no speech sound can be produced when the vocal cords are in position A.

When they are in position B can we produce the speech sounds or country what is your guests yes or no can we produce the speech sounds yes we can produce his speech sound but they are these sounds are not audible at a distance okay maybe with effort you know with effort because you know the context you know what I am talking about but suddenly if I start describing the

idles that are sold in Warangal after it has become Telangana okay you would not understand because the context is new to you okay.

So you know when vocal cords are in position be then speech sounds are possible but those speech sounds cannot be heard at a distance see what is the position vocal cords are loosely together partly open loosely together if there is sufficient air pressure then air can pass through the vocal cords and in the process the vibrate okay they open and close they open and close you know they are like this passing air scents them vibrating and you know that produces noise in speech sounds possible there or not possible there what do you say.

Speech sounds possible there and these sounds can be heard even at a distance so let us summarize these vocal cords in position A that is tightly shut no or nearly no speech sounds possible vocal cords in position B speech sounds possible but come on please but voiceless cannot be heard at a distance speech sorry vocal cords in position C speech sounds can be produced and can be heard at a even at a distance that is voiced sounds please write.

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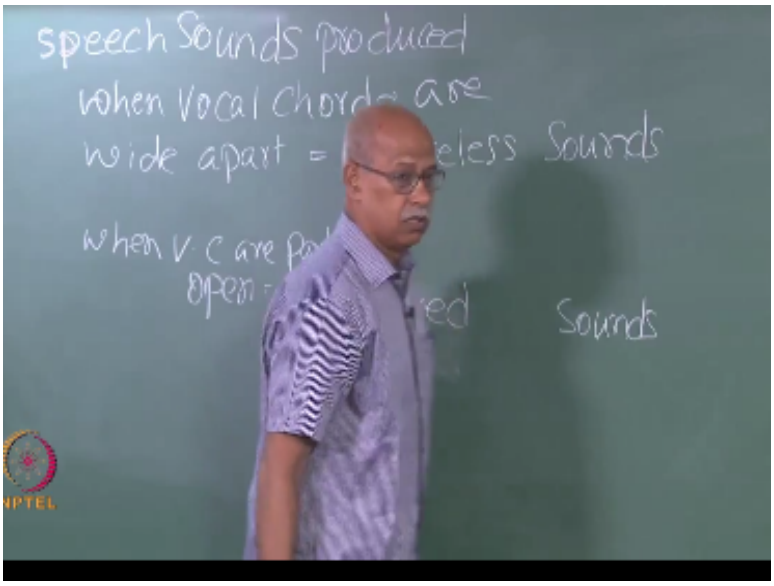

In speech sounds produced when vocal cords are wide apart okay they are called please remember it please remember it for the rest of your life not only this course these sounds are called voiceless sounds it is a contradiction it is a contradiction how can there be a voiceless

sound every sound there is voice but okay for the sake of technical description we say these are voiceless sounds by which we mean that sounds are there of course.

But vocal cords are not vibrating in the production of these sounds these are voiceless sounds what is the example of a voiceless sound I as in house okay as in fan okay I as in see I as in sun okay I as in sit or Shh as in sure as in share as in shine these are all voiceless sounds okay but speech sounds produced when vocal cords are partly open loosely together they are sorry they are what is the opposite of voiceless voiced they are voiced sounds what is the example of a voiced sound plenty in each language we have more voiced sounds than their voiceless sounds.

Otherwise we would not be able to hear one another okay all vowels are voiced lots of consonants are voiced what our vowels voice sounds voice sounds are those sounds in the production of which vocal cords vibrate say for example keep your finger here and feel the vibration this is voice song or this is why some but no vibration therefore this is voiceless sound is it voiced or voiceless voiced or voiceless, voiceless voiced, voiced or voiceless voiced okay that you are able to hear it that it vibrates here okay.

Means that this is voice sound if it does not vibrate the vocal cords are wide apart then that sound is voiceless close your eyes and tell me in the production of voice sounds vocal cords complete the sentence by okay vibrate in the production of voiceless sounds vocal cords do not vibrate in other way look at it the other way round voiceless sounds are those in the production of which vocal cords do not vibrate and voice sounds are those in the production of which vocal cords vibrate.

I will give you 30 seconds to write the definition quickly okay why sounds are these voiceless sounds are those right we are not looking at position a because few very few speech sounds in any language are produced from position a of the vocal cords correct all right let us move on okay how are different kinds of sounds produced how are different kinds of speech sounds produced because you know.

We have more than a few we do not have only two or three we do not have only Wow or Bow Wow we have more we also have Wow, Wow you know when we see something wonderful we say wow when we see the same wonderful thing twice we say wow, wow okay but we have more we also say ah when we see an old man and an old woman sitting with a begging bowl on the road we also say ah when we see two people we say ah you know we can say we can produce a variety of songs.

How do we produce those variety of sounds from the same vocal cords we said only two kinds of sounds are possible voiced and voiceless do you get the question you know in Sciences particularly answers are not important because no answer is constant in science answers keep changing in Sciences sometime we believed that earth was the center of universe then we believed that the Sun was the center of universe now we believe that neither of them is the center of universe they are all in constant motion etcetera.

Sciences are important because they ask new and disturbing questions they always ask why and how so the one question here is same Airstream are you with me same Airstream same organ performing their functions in the same manner or similar manner how can this apparatus how can this machine produce a variety of different kinds of sounds look at the answer.

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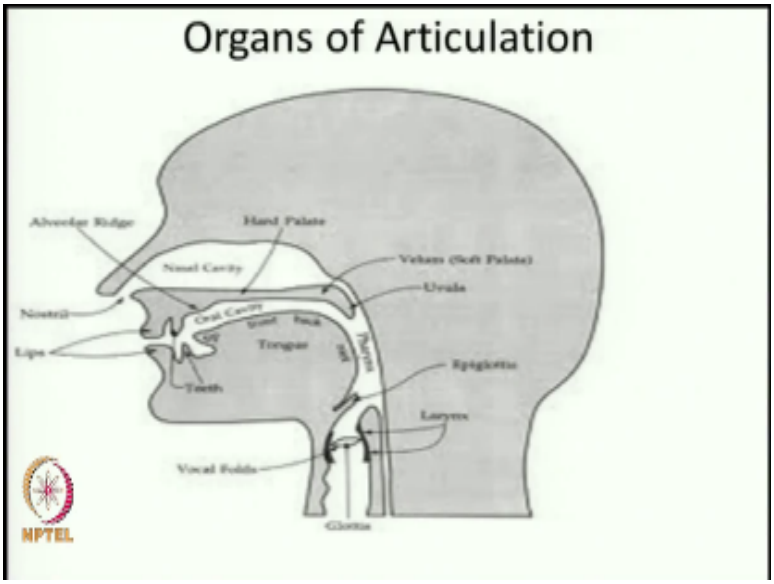

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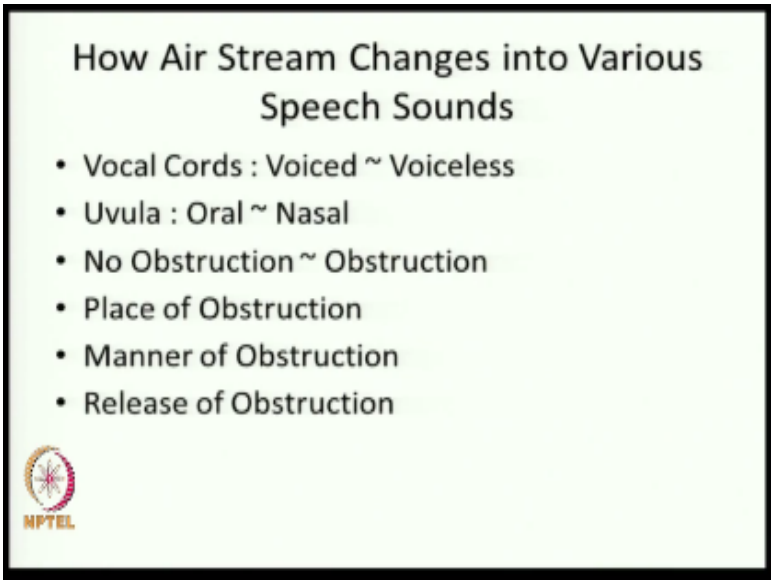

You know they interact and through permutations and combinations if you have only three letters A, B and C and you can combine any with any and how many combinations do you get AA, AB, AC then you get BB,BA,BC then you get CC,CA,CB or AC you know there are some ten or fifteen combinations can be done with only three letters right similarly you look these are the parameters what are the parameters look at the screen the vocal chords either they are either the produced voiced sounds or the produce voiceless sounds.

Similarly when air comes up to the vocal up to the uvula here can you see the arrow yes or no please okay when the air comes near the uvula there is a choice it can be either oral or it can be nasal or it can be nasalized so there is that choice so the second choice is either the sounds are voiced or voiceless all the sounds are oral or nasal all the sounds can be produced with or without obstruction you see any number of obstructions can occur the tongue can block air and then release it the tongue can block air here then release it lips can brought air block air and then release it .

So through obstruction and through release of obstruction a variety of sounds can be produced not only that obstruction at different places using obstruction here between soft palate and

tongue gives you sounds like ah ha please eat but now see tah-tah see the entire thing da da da da is it at the same place once again ca ca ca ca please see now say Papa Baba is it at the same place do you feel the obstruction at the same place no obviously not.

When you say caca gaga the obstruction is look at it here between the back of the tongue here back of the tongue and soft palate but when you say paba the obstruction is near the lips both your lips come together only then do you say pa but when you say tha da da da na say it where is the obstruction if off the tongue and where you know her not hard palates magesh teeth that is why you know in our system of writing.

We call the symbols for these sounds are called by organ of articulation Papa Baba are Oska be labial sounds da da da da na our dental sounds but look at cha-cha sate say the entire thing cha-cha-cha you know where do you get the sounds from middle from hard palate the tongue here you know the center of the tongue center of the tongue rises towards the hard palate Oh blocks air and then you get cha cha ja na but come further back when you have Kaka gaa gaa where is the obstruction.

Say cha and ga please say it alternately cha cha ga cha cha ga they feel at the same place do you feel obstruction at the same place yes or no please no obviously was not still loud let the camera catch it let the rest of the world think that people at IIT are not sick you know they are as robust physically as they are perhaps mentally okay the obstruction occurs at different places.

So please note mentally you know that the point of obstruction and release of obstruction create give us two other parameters what are the other parameters number one vocal chords voiced or voiceless then we have oral or nasal then we have obstruction or no obstruction then we have place of obstruction where does the obstruction occur then we have manner of obstruction all obstructions are not the same kind say for instance when you say pa bah bah bah both your lips are together say it.

Can you say with only one lip try and say Papa with only one lid not possible right no matter you may be an Olympic champion or you may be je topper but you cannot do powerful without

both your lips but look at the other thing when you say it is partial open there is some gap between the two teeth correct you know you can feel air coming out okay so manner of obstruction is differ also differs it is not the same in some places you can have total obstruction.

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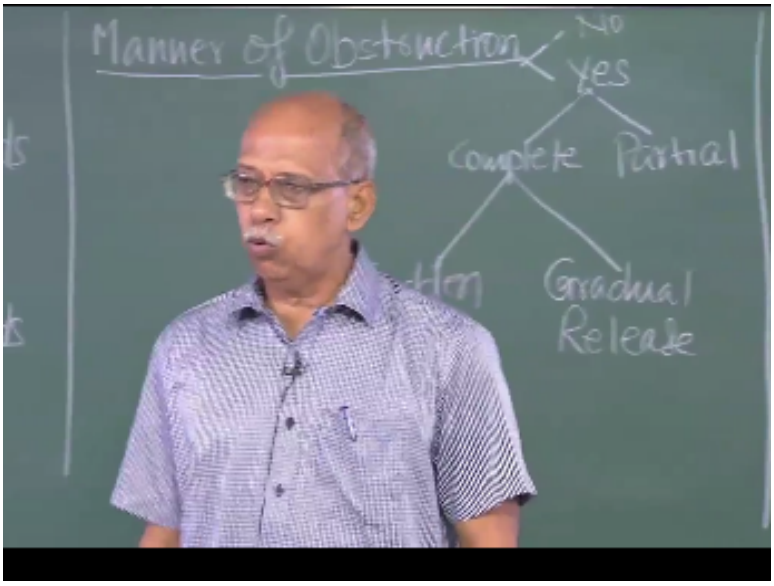

Manner of obstruction can differ either you can you have you have either no obstruction okay none at all after vocal cords no obstruction flows freely or there can be yes obstruction okay but even over between the years you can have many different kinds you can have complete obstruction you can have total obstruction when you produce okay when you produce pop there is total obstruction unless both your lips come together unless both lips tightly shut the oral channel that sound cannot come out okay.

So you have Papa ba ba ma but when you say are shh not total obstruction it is partial obstruction okay it is partial obstruction the part of the passage is constricted it is so narrow that the air goes but air goes with friction and in the process there is noise okay so another parameter is place of obstruction sorry manner of obstruction and their commander of obstruction can also differ either there is please complete no obstruction or there is yes obstruction yes obstruction can also be two or three different kinds either there is complete closure or there is partial closure.

So you know these combinations give us different kinds of sounds or the voiced or voiceless or the oral or nasal or the obstructed or unobstructed or the partly obstructed fully obstructed ask the questions once again or the voice voiceless then are they oral or nasal then complete the partly obstructed okay then there is release of obstruction alone is not enough if you keep your mouth shut there will be no noise there will be no speech sound.

That is the position of either yoga or quarrel between man and wife okay his speech sounds happen because obstruction is released obstruction is opened okay so obstruction can be released in one of the two manners okay either it can be released suddenly sudden release or it can be gradual release either it is sudden release or it is gradual release sudden release such as you see complete closure both your lips are together and your cheek is puffed and you say baa baa baa but look at the other thing you know in English particularly it sounds like as in church as it judge there is complete closure.

The middle of the tongue here rises towards the hard palate completely blocks it and then slowly it lets it go Church judge bench share shear okay in our languages it is not so gradual but in English it is gradual their total obstruction is released gradually slowly not sudden not there is sudden explosion okay so let us now revise the parameters which help us get sounds please look at the screen if you like or close your eyes and say we get different kinds of sounds because vocal cords all right you know sounds are either voiced or voiceless.

Either they are all alone nasal either they are obstructed or unobstructed either they are obstructed at the lips or obstructed at tongue all back of the middle of the tongue either they are totally obstructed or they are either they are suddenly released or gradually released please write quickly what are the parameters that give us these sounds these are the parameters voiced or voiceless oral or nasal obstructed unobstructed tongue or lips and gradual or sudden okay.

These combinations together okay give us a variety of his pitch sounds with which there is no language in the world which needs anything more than this with it with the interaction of these parameters we get different kinds of speech sounds let us come to something interesting what

is the first major class of sounds what is the first major class of sounds the first major class of sounds you know first classification okay.

As in the animal world so in the world of his speech sounds we make classification broad classification major classification and then sub classification then sub classification you see at this Institute we can say there are two major classifications faculty and staff versus students then among students will make further classification undergraduate postgraduate and the undergraduate will make further classification okay aerospace or Department wise or hostel wise okay girls hostel boys hostel okay .

There may be wise will be constantly elsewhere just as there may be students who do not live on the campus but you do not we make some broad classifications in this manner similarly in speech sounds as well we make classification the first major classification is please write vowel sounds.

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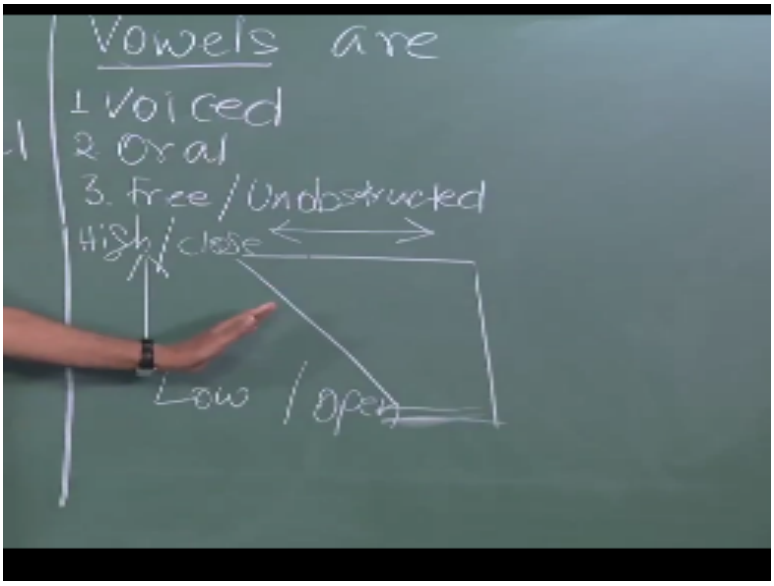

What are vowel sounds vowel sounds are those sounds please write vowel sounds are those sounds which are bobbins are vowels of others homes are number one what do you say voiced or voiceless voiced you I just see keep your finger here and follow me say it constantly vibrates so first characteristic of vowel sounds is number one they are voiced okay second are the oral or

nasal say keep your hand here and see where air comes from say do you find air coming from the mouth or your nose mouth.

The second characteristic is they are oral third care are they obstructed or unobstructed they are unobstructed once they cross the vocal cords once they send vocal cords vibrating after that there is no obstruction anywhere in the production of speech sounds they passed through the they passed through the oral passage you see here is the vocal cords they cross it they leave it vibrating and then they go through the pharynx and then through the oral passage through the oral cavity the flow freely and that is vowel sound.

So the third characteristic of vowel sound is they are free our un please give me the word unstructed lovely you are great phoneticians now okay I expect to have some 10 great phoneticians from this class now please what are the characteristics of vowel sounds vowel sounds are voice oral and unstructed projects close your eyes for vowel sounds are voiced oral unobstructed okay.

There is no exception to this rule open your eyes now there is no exception to this rule that all vowel sounds in any language of the world be the Telugu be the English be the French be their Vietnamese no matter what all vowel sounds in all human languages have these characteristics what are they yeah voiced oral and free unobstructed now comes a bigger another question if they are all the same then how what is the difference between R and E what is the difference between E and ooh okay they are both vowel sounds how do we get different kinds of vowel sounds how do we get our e a oh I all of these vowel sounds you know in Telugu you call them swear correct in Sanskrit we call them swear.

How do we get different kinds of vowel sounds what parameters work there if you look at this area all vowel sounds are produced from this area can you see the arrow moving can you see the arrow head moving please they are produced from this area from near the alveolar Ridge to the middle of the term and back of the tongue to the soft palate they make some kind of a trapezium some kind of a trapezium okay from here to here from near the alveolar Ridge to the middle of the turn and then from the soft palate to the back of the tongue.

All of these vocal Coast's vowel sounds are produced if you raise the tongue slightly you get E say it but if you open your jaws lower the tongue then you get A if you open it only little less then you get A if you open it more than you get AH begin again open it slightly you get E okay that way you know you really you know do not get bored so you know when you say E the opening is limited E open it more and you get it is still more you get Ha still more you get HA see the degree of opening the varies now come backwards okay you say E.

Then you say HA HO when you say HO further back on the tongue so these parameters you know from here to here and from here to here they look like a trapezium okay please copy it.

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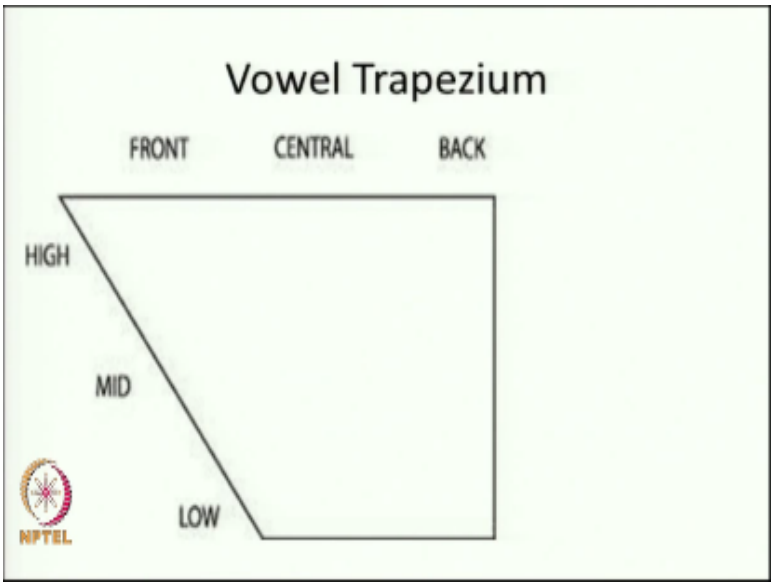

Quick this is the idealized diagram of the vowel area okay I realized do not go with a torch and look into your friends mouth and see I want to see wobble trapezium in your mouth okay God did not create such a stupid things there okay but generally you know this is the geometry of the area this is the trigonometry of the area from which we produce vowel sounds you know some sounds are at their near the front of the mouth some vowel sounds come from near the back of the mouth.

Just as some songs come from extreme closer or the you know jaws are raised or they are produced from the extreme opening jaws are lured together this area the track that you know the diagram of this area in I realized situation not in the real situation real life is much more complex but the parameters are the same okay here for the classroom purposes this is the idealized situations what is a verbal trapezium verbal trapezium is an idealized description of that area in your mouth in my mouth in our mouth from where we produce vowel sounds please write.

Barbell trapezium is an idealized representation of the area from where we produce vowel sounds area in our mouth from where we produce vowel sounds am i clear to you say yes or no please lovely your angels okay is that clear MA sure okay now what are the parameters involved are vision working what are the kinds of things we look you know horrible trapezium can have these parameters number one.

Please look at the diagram you are either at the front of it or at the back of it either it is high or it is low some in many books in place of high please right you will find clues many books say clues here they see clues both jaws are closed together when you say E they cannot come closer if you bring further closer the mouth will get short say begin with AH okay and close it as I do so there will come a point beyond which if you shut there will be no sound there will be obstruction.

Similarly there is a point beyond which you cannot open you start with E and reach AR you cannot go for the nobody can pull your you know tongue further than our jaws further than this so these are closed this is open or in many book you find it high and this is low does not matter use whatever label you like similarly this is vertical axis this is vertical axis on the horizontal axis this is what is this is front on the heart and the horizontal axis.

This is front and therefore this is back and therefore this is central ok in between in between there are many positions they look at a when you say a as an egg when you say E jaws are closed when you say AH jaws are open okay but when you say a it is in the middle it is somewhere here it is somewhere here so people take lots of other cuts okay now to describe the

vowel sounds in all languages of the world to describe the vowel sounds in the languages of the world people have thought of these parameters.

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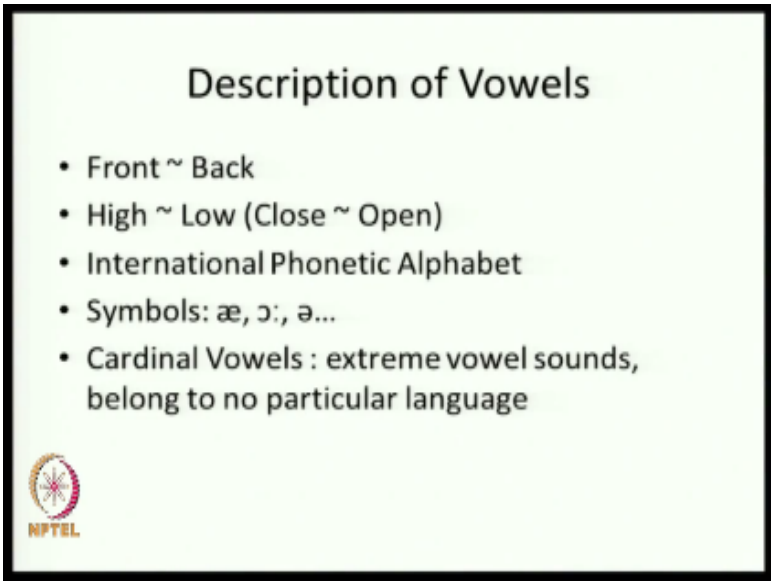

What are those please write either they are front or back or they are high or low close or open as you like okay all right say for example if howl like E is closed okay but another howl like I am using some phonetic symbols you will find them in the books or you know you can learn them I can give you link I can I think I have given you on some links already you know so they are both vowel sounds but they differ from each other this is a vowel sound.

As much as this is a vowel sound they differ from each other in only one respect that is this is high this is low or in other words this is close and this is half open not fully open but half open similarly you look to compare this with oh okay this is front but this is back there can be another vowel o as in okay as in about as in away this is right in the center it is neither fully open nor fully closed it is neither front nor back it is in the center so there can be each you know of these different positions which help us describe vowels.

But at the extreme edges at the extreme edges here at the extreme point you know four editions have decided that with reference to these points other vowels can be described therefore these extreme points are known as please right what are these extreme points these are Cardinal

vowels Cardinal vowels are extreme songs nobody has no language has those extreme songs but it is like North Pole and South Pole with reference to these two poles you can describe the rest of the earth okay.

Similarly with reference to these points okay it is not the case that in any language you have a vowel song which is produced from extreme front and extreme high or extreme close or extreme opening or extreme back there are some where here there are some where here but with reference to these points you can describe them but these imaginary vowels these imaginary vowels which do not exist in any language but which help us describe existing levels please write are called Cardinal vowels.

What are cardinal vowels Cardinal vowels are imaginary vowels at the extreme of the trapezium okay we will finish in a few moments.

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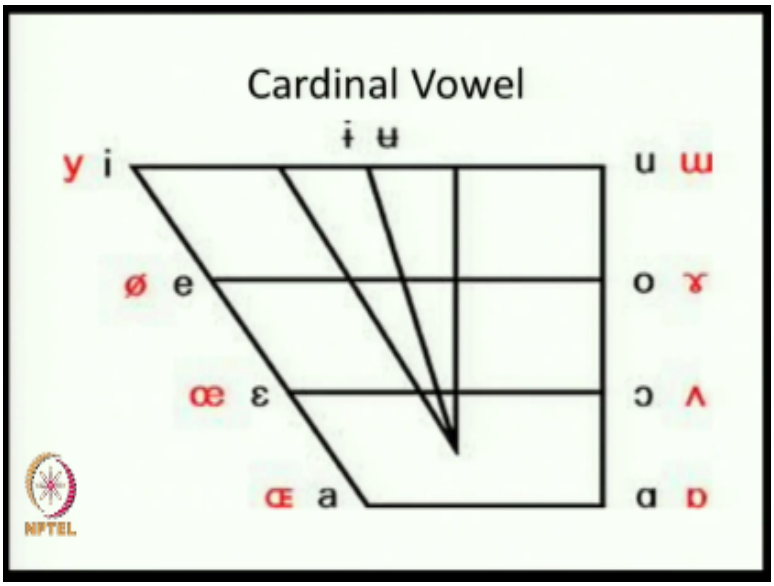

This is the shape that Cardinal of Avila look like okay if you draw a diagram these are the cardinal vowels okay look at the letters in black they are e o oo ah ah okay there are some letters in red I will tell you in a minute what is the difference between E and O they are both high but one is front the other is back there is another difference when you say E your lips are spread say it E but when you WO your lips are rounded okay so shape of lips please write.

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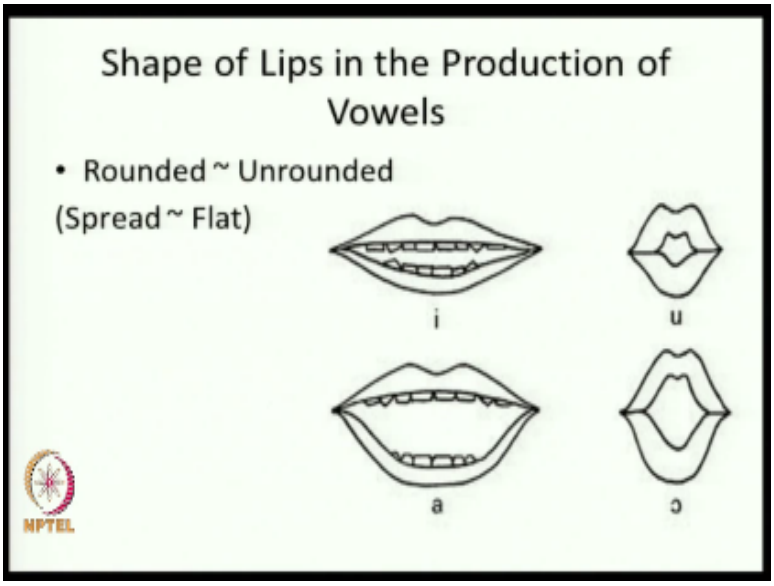

The shape of lips also plays an important role in the production of speech songs in the production of vowel sounds okay height of turn part of tongue and shape of lips production of vowel sounds is influenced by height of tongue then part of tongue and then shape of lips in other words it can be either high or low okay as in E or R when you say e it is high or closed when you say R it is open or low okay.

Part of tongue when you say e it is the front of tongue but when you say o it is the back of them when you say oh it is the center of tongue third factor is shape of lips shape of lips can be either flat look at the screen when you say E can you round your lips and say E try it can we round your lips and say okay similarly you know when you say ooh when we say ooh our lips are rounded can you spread your lips and say can you spread your lips insane no we cannot .

So that is the third factor okay come back to it the vowels in red show those minority sounds where front vowel is rounded and back our village sprint in most languages of the world okay E is produced with spread lips wo is produced with rounded lips but it is possible you know because in nature in God's world anything is possible we say people have five fingers but some people have six fingers we say people have 32 teeth but some people have 34 teeth okay

All right it is possible you know it does happen usually people are born one at a time but sometimes you can have two people coming at a time okay they are inseparable friends correct so in nature freaks are possible similarly here it says that in that case if this vowel is going to be rounded then the other vowel will be spread okay the opposite of you know the pair is front and back what are the pair's front and back close and open or high in low similarly rounded or unrounded please right you can have rounded or unrounded okay.

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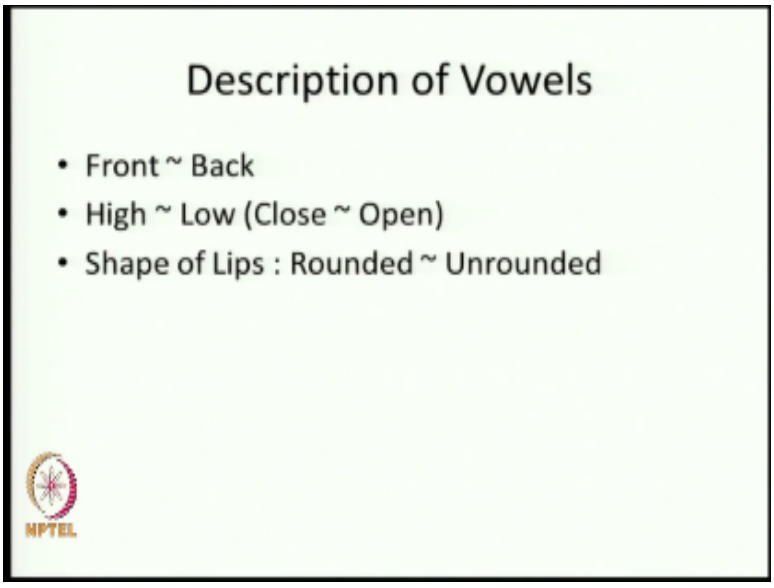

These are the pairs this is how vowels are described either they are front or back or they are high or low or they are unrounded okay to summarize now all vowel sounds are what are the characteristics of vowel sounds all woven sounds are voiced and free okay what is the vowel trapezium it is an imaginary area which describes what which describes the area in our mouth from where we produce vowels how do vowels differ from one another either they are front either they are front or back either or they are high or low close or open or they are rounded or unrounded great you are you guys are you know sure thank you have a good evening.

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