Biometrics
Prof. Phalguni Gupta
Department of Computer Science and Engineering
Indian Institute of Technology, Kanpur

Lecture - 25

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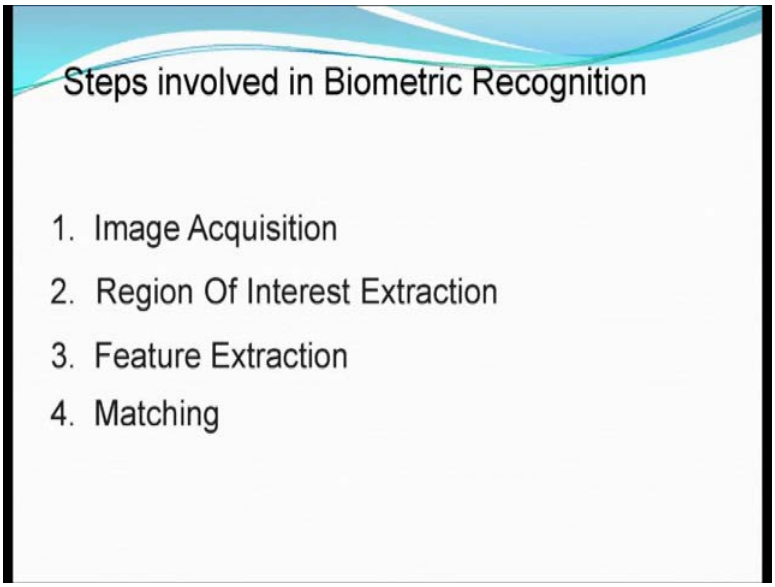

Biometric Recognition and the author of the paper work David Bank because these are tested in biometric permission.

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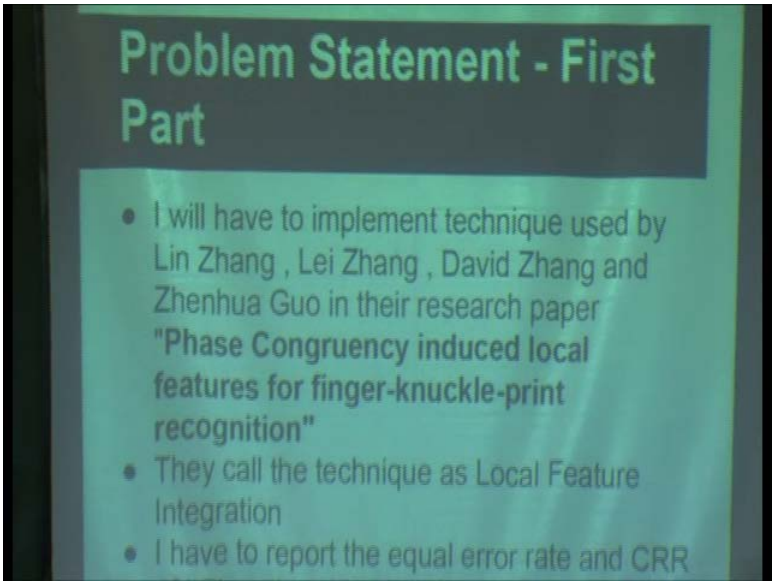

I have to do feature extraction and matching. It was actually implemented. I have implemented the technique of which is represented in this paper. They call the technique as local feature integration and LFI have to report the equal error rate and CRR part of the question. Second part of the question was implemented as local features.

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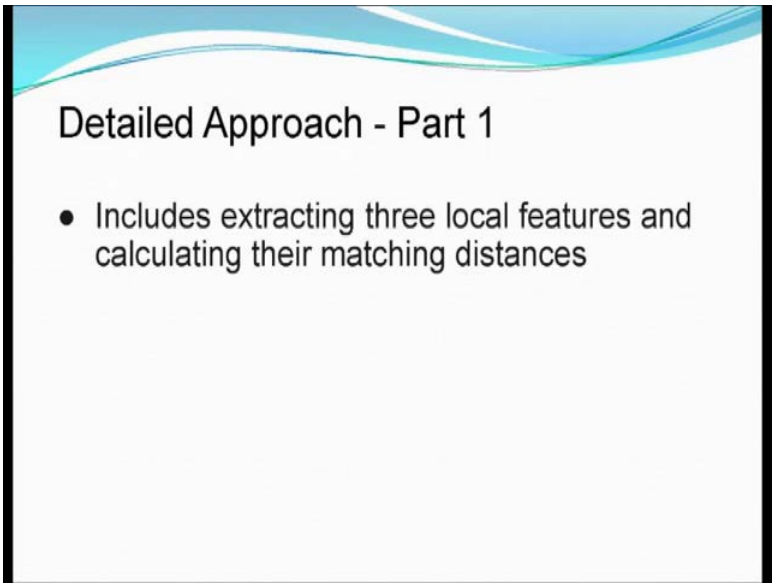

Detailed approach part 1 includes extracting three local features. First local feature is phase congruency.

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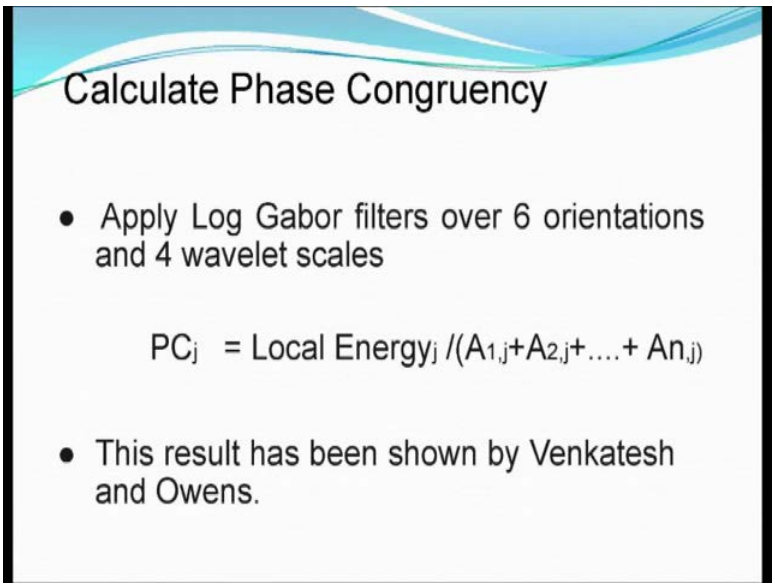

Calculate Phase Congruency. We first apply Log Gabor filters over 6 orientations and 4 wavelet scales. Since, orientation is basically the angle of the filter, and Venkatesh and Owens has previously found out that phase congruency is local energy upon phase congruency at time orientation j. J is local energy j upon submission of amplitude over all this case as that orientation.

For this, we calculate PC. We need local energy and amplitude first to calculate amplitude.

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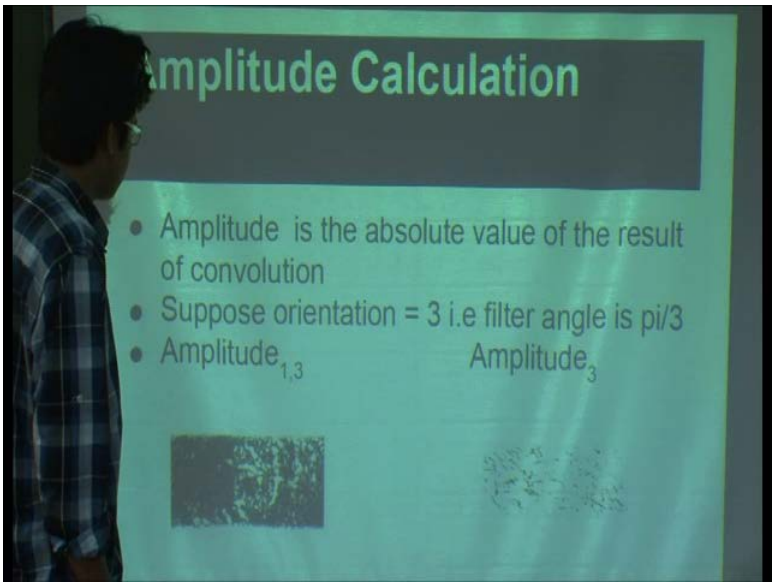

So, let me take the log when we are applying the Log Gabor filter. We get imaginary values of the congruency results. Amplitude is nothing, but the absolute value of the result. So, suppose the orientation is 3 and scale is 1, I got this amplitude and I have to come over all this case.

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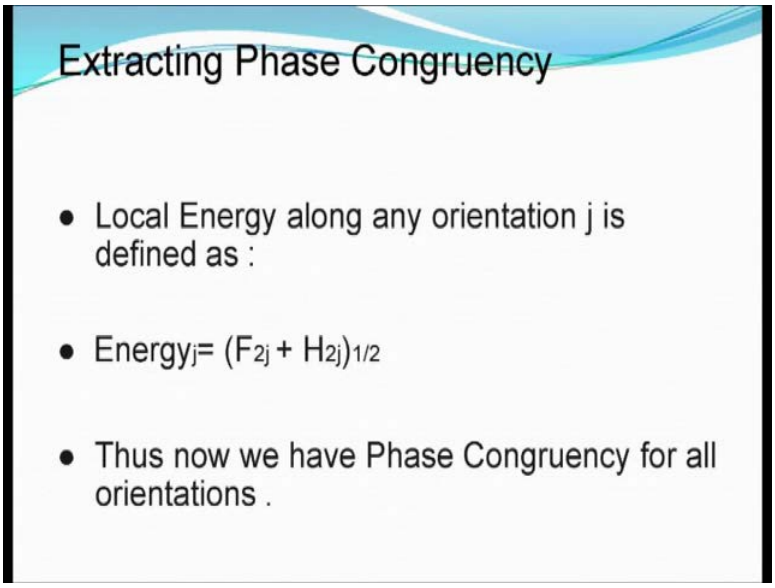

So, after that I will get the denominator from this equation to get the energy. We first sum the real part of the congruency results over all skills and at that particular orientation. Then, we sum the imaginary part of the congruency results over all skills and the energy we find as the absolute value of.

So, now we have phase congruency for all orientation. So, the final phase congruency will be over maximum on all phase congruency among the orientations. So, like the orientation for which PC is maximum, the m, this will be needed in calculating phase, local phase feature. So, local orientation of this is the second local feature. They are calculated by base function E. We have calculated previously that it is the real part of real force.

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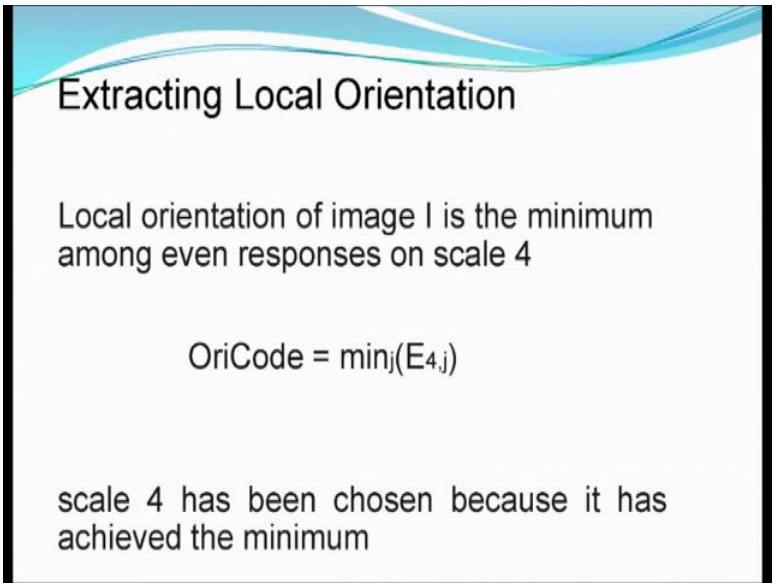

That orientation j, they use scale force because it gives them the maximum result, but then phase is defined as the result in which they are given h j and f j, where the summation of even to the real part of the congruency result and imaginary part of the congruency result, and to calculate the phase code map, we have calculated that m value which we found out earlier.

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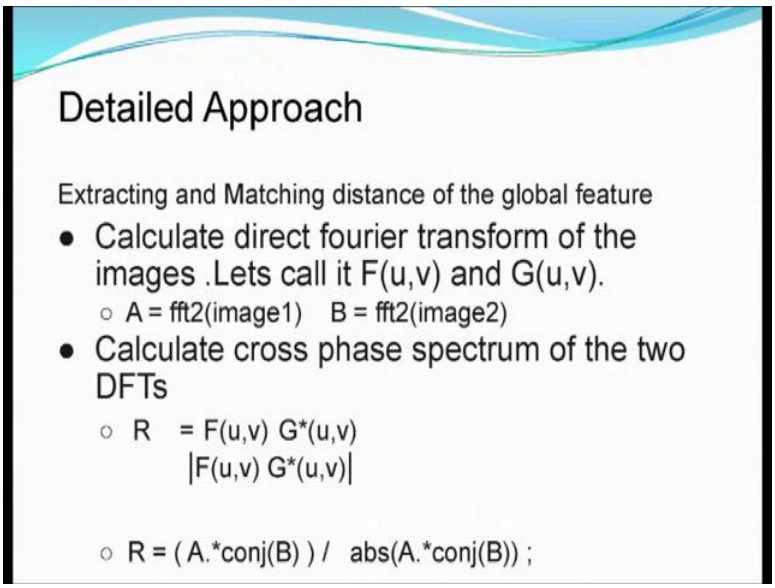

So, the global feature they use were the Fourier coefficients, and they have calculated it by first transforming the image, first transforming the Fourier, transform of the images and then, finally cross phase spectrum and then, finding the POC function.

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The peak and POC function will denote that how similar the P images and to get the global distance, we have just done 1 minus peak of the POC function. This is the result I got. Actually 68 percent was the CRR and ER was quite bad. Sir this is the claim I think because the database, yes sir. Even I calculated the same code which it was using the phase congruency without any change. It also not gave me the correct result. Accuracy is 68 percent, but ER which was vary above 20 because there are several parameters, and I would say you have matched same image and it is giving you what source one. Yes sir, it worked, it worked even one [FL].

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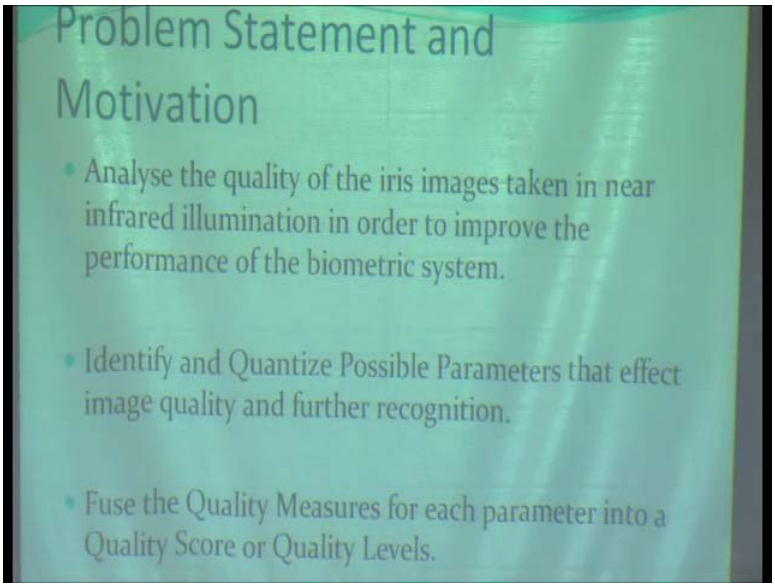

Hi sir, I am Kanish. Topic is iris image quality estimation that I would have to analyze. The quality of the iris images taken near infrared illumination, I have done that for the data set of interval and identify the possible parameters that with image quality and then, try to the course every for the parameters and therein into quality level. Just a recap of the last presentation and the quality are of two types, univariate or bivariate. Univariate attributes are those which assess the quality without having any reference images with, and bivariate are those which assess the quality with respect to some reference images.

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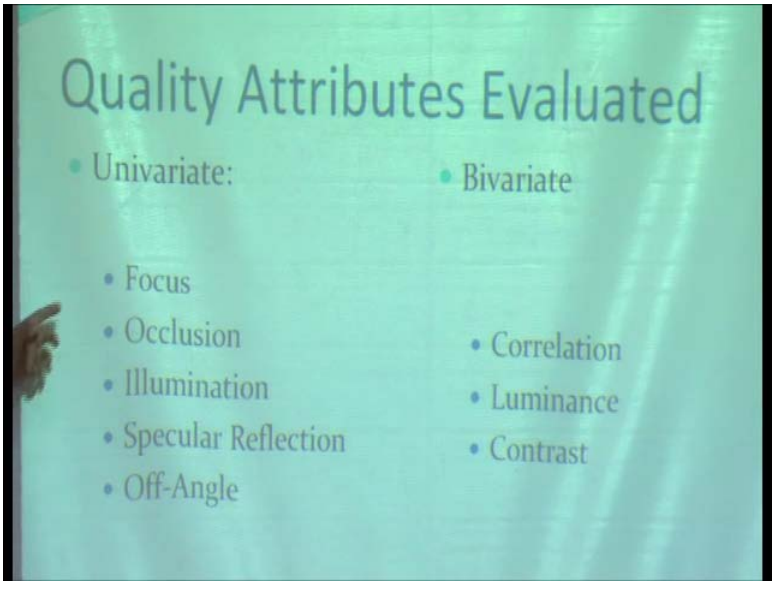

These are the quality attributes that I have used in this focus, occlusion, illumination, specular reflection, off-angle and correlation, luminance and contrast. The difference between the earlier work and my work has been in focus of finite orientation of contrast.

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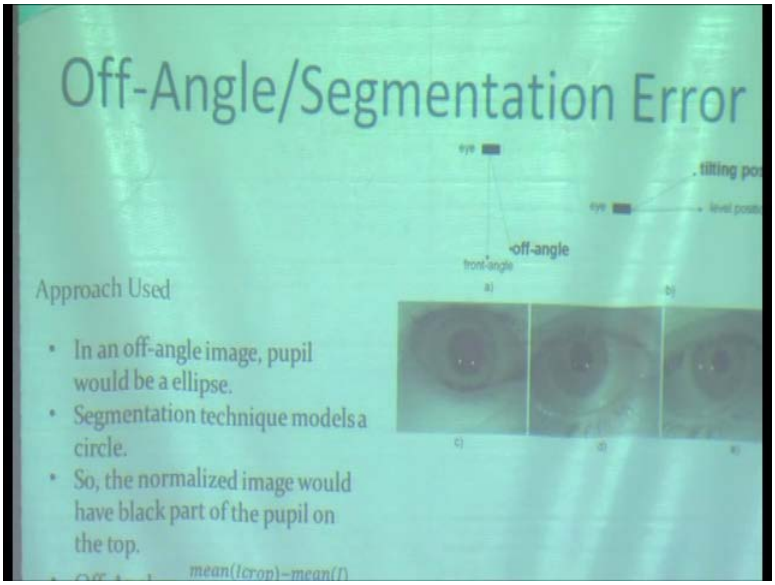

Actually, the idea of the approach was I got whenever you try to segment any match using segment integrating operator. What it does is it assumes the people and the iris, but where an off angle image that is not true. So, in my case, I was expecting that the segmentation that I would be getting would be such that I get this would be having some part of the people at very close radius.

So, I analyze the top layer as in the top 10-20 pictures of the non-matched images and I saw what is the intensity of that and then, I use this formula, basically this is the top image and this is the average in density just to have normalized major for all the images, and then, sir actually it is not necessary that these values stay under 255 as in this time when you go above that for the database. Yes sir. Mean average mean value, right. Yes sir, this would actually be when this is following this. This was going. What is the maximum value of mean? The maximum value of mean then. What is the beam number? 0. 0. Yes sir. So, this mean minus mean. Yes sir. It is probably a mistake. Actually, I calculated the value for this and over 1. Sir, this mean this is a mistake. Actually, this is now what I am believing. The mean it can be greater than the mean I got. So, this in turn,

there is a negative sign. Absolute value, yes or no? So, isn't it clear that you are correcting. You have to put this in positive value of these results.

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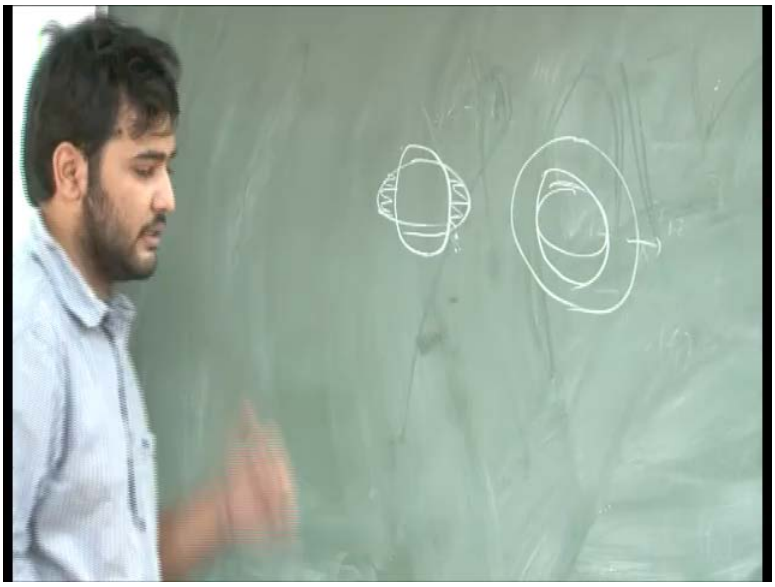

Then, actually this did not create the results because when I assume people would be elliptical, I imagine the people to be like this and the segmentation to identify the circular people as this. So, this black part would have been in my normalized image. This is what I was trying to analyze, but some of the cases when the image goes, what happens is the whole of the l x was enclosed and instead of this, the white portion of the eye ball was included. So, this actually did not have very good results.

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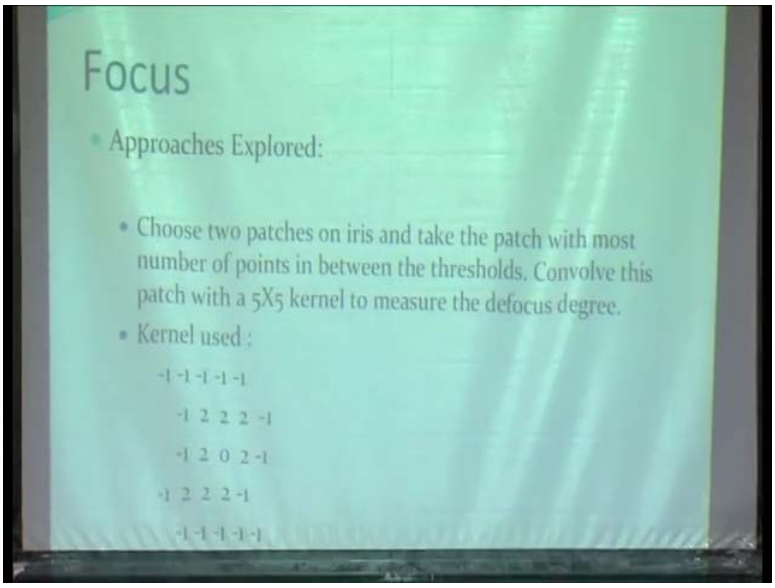

Then, I come to focus. So, focus I selected two regions of interest on the iris and I took that region of interest which had maximum points in between the thresholds. The thresholds selected were 30 and 40. It was then this kernel would be applied and then, the focus parameter was. So, this image, the focus parameter was 40 2 2 1 4 0. As you can see, this is a bit blurred one and then, you can see the final results. The maximum value what I got for the database was 0.32 and the minimum was around 0.11. Actually I am not sure for that this is again first another image 0.1520.

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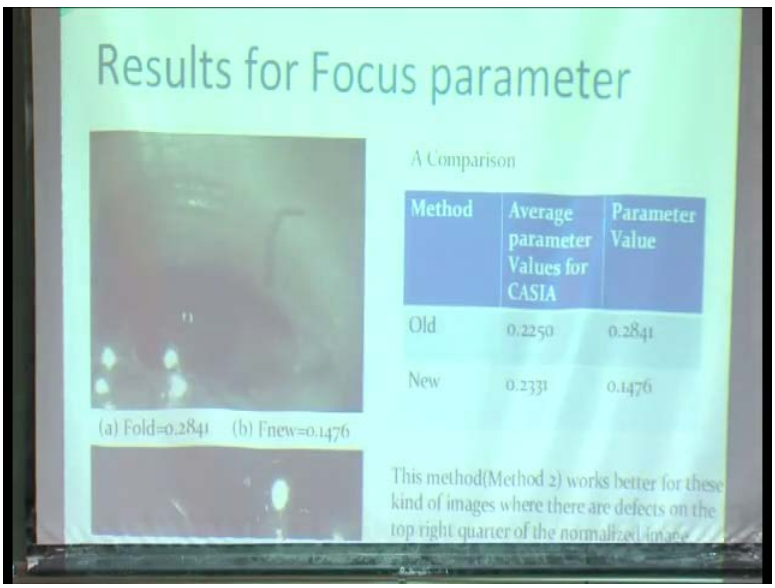

So, how is this method better than the previous one? Suppose as I had mentioned earlier, in earlier presentation, suppose there are some latex in the region on the iris normalized image. What the previous method was doing was it use to take the top half as if the top red quarter of the image evaluate the values of the convolve image, but for that case as in this actually the focus of this image was very poor, and because of this bright values, the relay method shows 0.2841 for this image, wherein the average values for the CASIA database was 0.2250. My average values were the CASIA database was 0.22331 and for this image, 0.4476.

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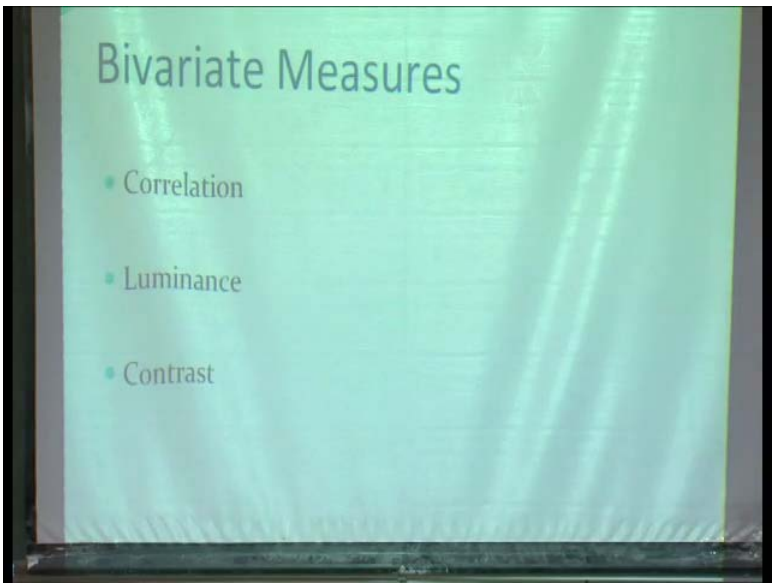

These are the results for focus parameter on this. All these results are based on the c i double. Now, I come to the bivariate measures. Now, in the bivariate measures I can rotate the image in one-dimensional RA and standard deviations between the two images and mean of both the images.

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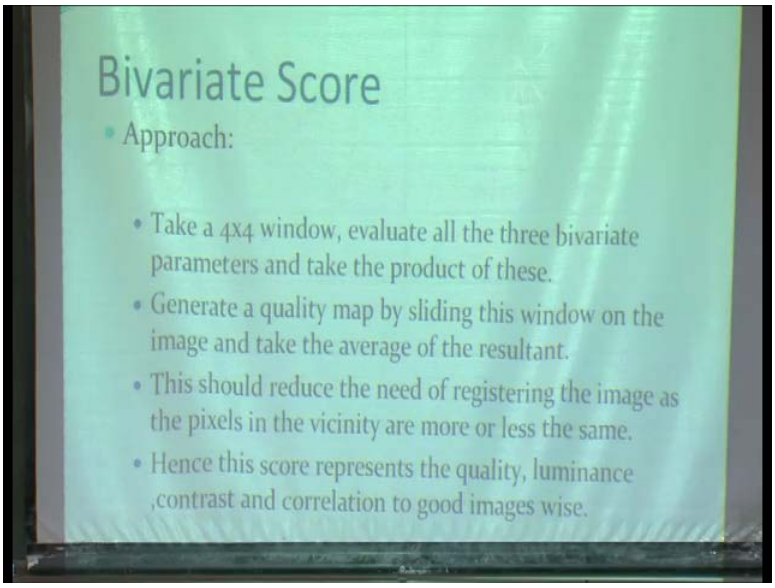

Now, as in the last class, there was a problem when you could not actually if say, there is a shift in. Then, it requires some image registration, but the approach that I have taken, I took a 4 by 4 window to evaluate all the three parameters and then, I took the product of these. So, this was sum and average by sliding down the video on the entire.

So, actually this indeed reduces the need of the registration because assuming that in a iris code do not change very frequently as when this in a 4 cross 4 window, the images can be assumed to have several values. So, these are the results of the bivariate score. This is called rate and this is called 5 4 7 and this 6.82.6740. Basically, these bivariate score is not absolute measure of quality. It just measures in terms of contrast and with respect to certain good images.

Now, I come to the bivariate contrast measure. Now, this is a plot versus the new contrast versus the old contrast measure. So, as you can see in the image, there is quite a correspondence between the old and the new methods as in the value here lie close to each other, and that is why I concentrated here. So, it is almost evaluated the same thing as the old method, but the method is completely different. It is bivariate and it compares to some images.

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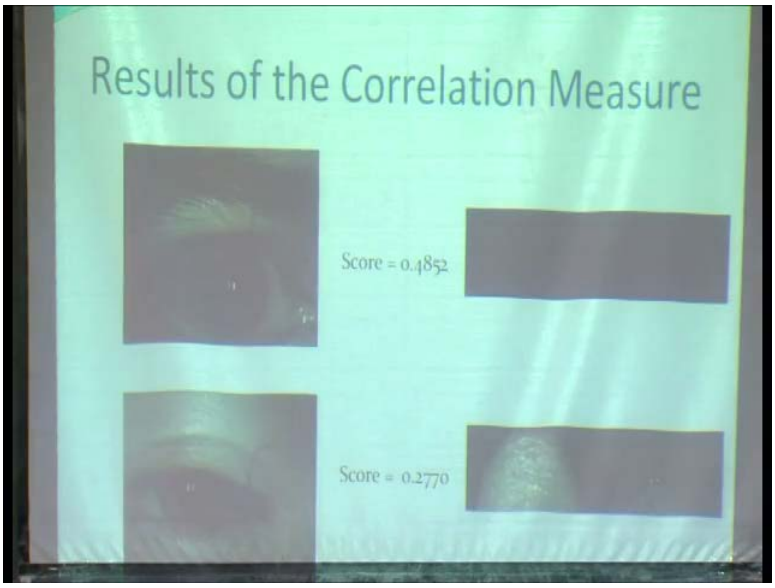

Now, I come to the images. As you can see, this is a very poor image. These are the results that I obtained. The most important thing in while selecting the iris images was I tried to take care of. So, as you can see this is a very image and four of these are suffered because of that.

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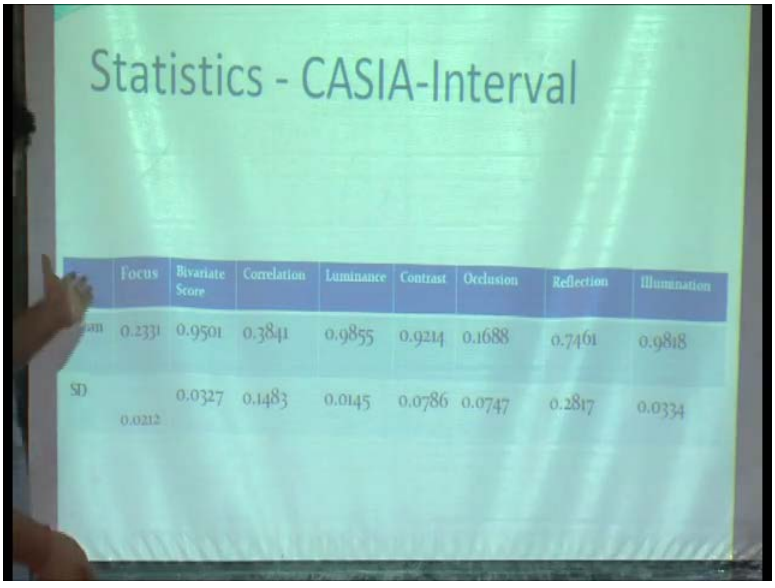

Similarly, here the bivariate measure came out to be about the same, both these images, but for this image, this 0.298 there are because it is included. These four came out to be

0.1159. These are the statistics for the CASIA interval. I will evaluate over these measures and this is the old, but the images those are not analyzed.

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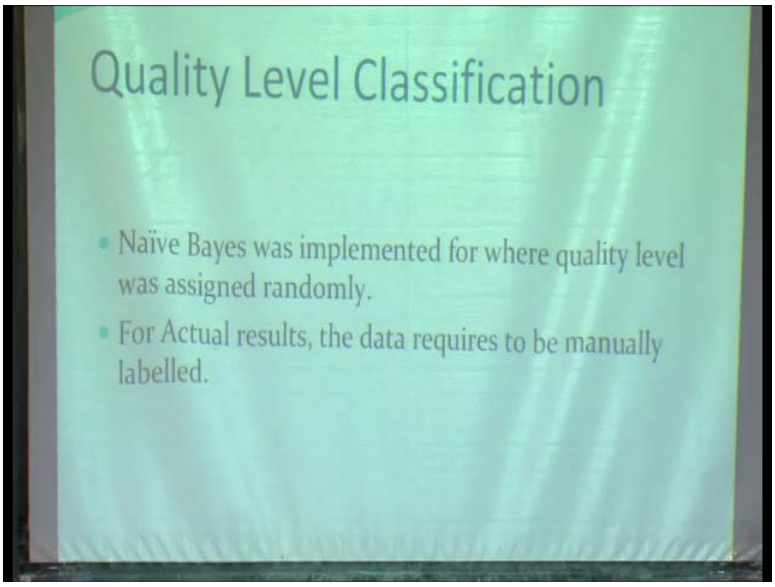

Now, the quality level classification, but since that it requires manual labeling, all the data points of the quality as in one person, I just sit down and say, this is a good quality 1 to 5 or how many classes were involved. So, this was not manually rated and the result is, sir the results of contrast came out to be very good, and the result of correlation was good, but I cannot, you know since it was not tested in a very large data set, then I cannot say that it is, but the results that I got for some images was very nice and for focus, I believe it was better than the last part. Justify otherwise. Actually, I could not use an algorithm to give the results, otherwise that could have been a good parameter.

My name is Lakshya Khurana. My roll number is Y9305. My project was the finger knuckle print image enhancement.

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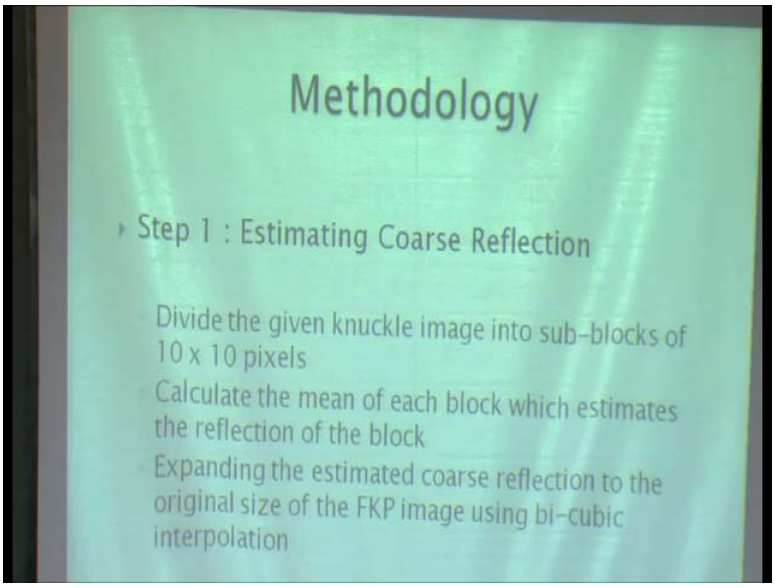

The problem statement is if I have given a finger knuckle print image, and I have to enhance the image for better recognition, so the method that i use, so I divide the given image into sub-blocks of like 10 by 10 blocks. Then, cut in pixels and then, I have to first actually uniform the brightness of the given image. So, first I divided the given image in 10 by 10 blocks and then, calculate the mean of every block and then, using I expanded this image to the original size using the bi-cubic interpolation.

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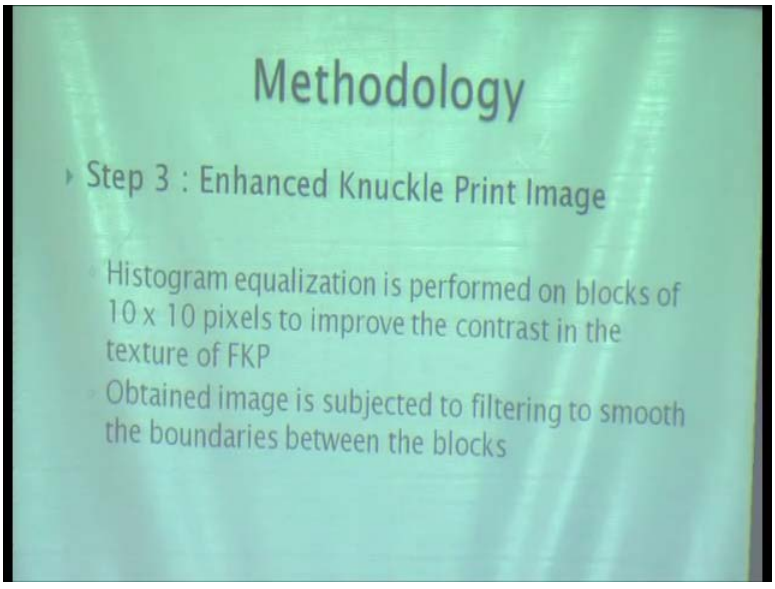

So, after that obtaining the uniform brightness, the image that I got from the previous set, I subtracted the image, some parameters to obtain the uniform brightness of the image and after that when I got the uniform brightness of the image, then how the enhancing like calculate the histogram equivalent of every 10 by 10 block. This 10 is chosen by several other time 9 10 11. So, the histogram equalization is being calculated using for every 10 by 10 block and then, I use the different filters, average filter and sharpening filter to obtain the required image. These are the results for the given data set. This is the original that I have been given.

What is the first term? This is for each like k. So, each 10 by 10 block, this is all. Calculate the sum for this bi-cubic interpolation. So, it does the bi-cubic interpolation and after that for each 10 by 10 block, it calculates the, so this is the subtraction [FL]. Actually what I wanted that part to go back to image. The results actually what I wanted in this, you remember what i wanted. I wanted the lines should be visible. Finger print [FL], so that I wanted to see with in my project topic was face detection was applied using the canny and then, the mean of the pixel.

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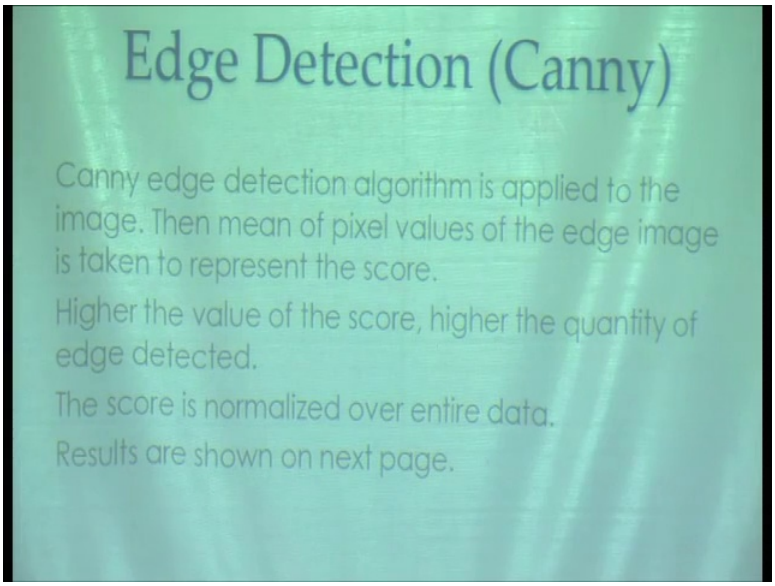

So, the mean of the pixel giving me a very over, the whole database and higher value, it represents the database. The images will be better.

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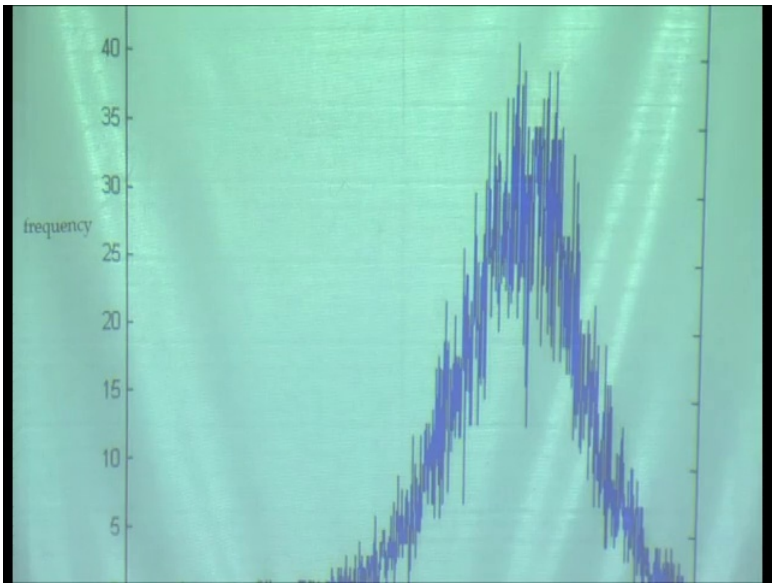

So, the graph is plotted for the whole database, the frequency and here, one value represent 0.01 value score. So, you can see that how much score is how many images for that. So, as this mainly many images lying in this area and for the top image is they have very less which have got very better as edge detection.

So, due to selection, these images are clearly visible, but these images have a very good edge in them and we can see in these images. The edge is there, but there is just single edge. There is no bifurcation or other edges coming out of this and the values are, so that scores are represented and you can see that for same user, the value is coming very good. So, as per the image was, then the image was taken because the same user has first taken that time they are.

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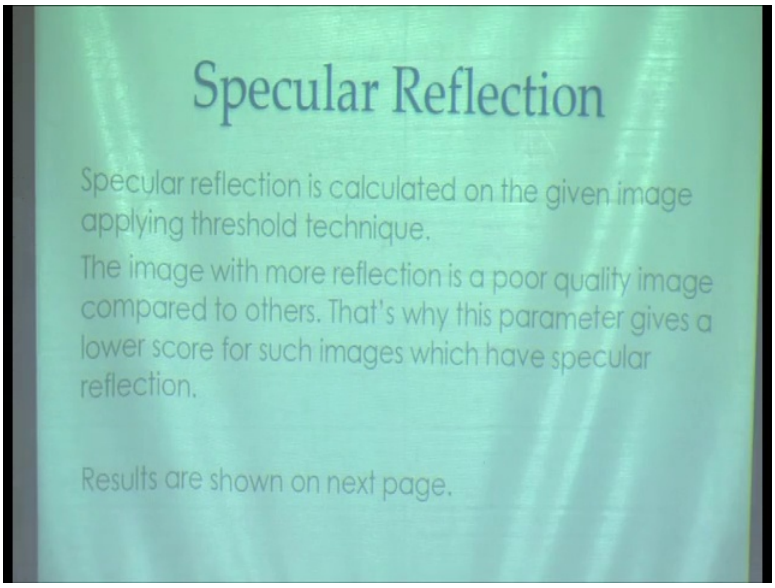

Now, there another I use was specular reflection, and for specular reflection, I use threshold technique and the image with more poor quality image compared to others. The parameter gets here. The majority of the database gets very less of the images have specular reflection and these are database images. These images have nearly zero specular reflection and these images you can see due to this specular reflection, the edges are not visible. So, good quality images and bad quality images and then, finally, I apply entropy and I take the image, and divide it in 10 cross 10 block and calculate entropy on each of the block, and the mean was taken on using the weightage and weightage was calculated for each block on the basis of the edge parameter I defined earlier.

I take the mean to define the entropy of the whole image, and the score was again normalized on the database. So, the score was actually taken through to actually on the whole database taking the longer time as it on a small database, and I got these and again we can clearly see that these images are showing edges, more edges on prominent values. There are again small edges are coming. These images are having, but in these images we cannot see other bifurcation and difference because the database was very small. So, I have taken only, I have only [FL]. I can show the results [FL]. I have checked all.

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So, you can do one thing [FL]. You show things [FL]. Yeah I was talking about fusion techniques like we can see in this specular reflection. These images which are top one, they do not have specular reflection, but they are very dark. So, I was talking of giving less weightage to the specular reflection part and more to the entropy which is giving me for now good results as [FL]. Dividing into blocks and during that also you have done on the whole image.

On the whole image if I [FL], if I am using only one parameter, then dividing it into one, but I have to take a weightage. So, I have to use another parameter for them. So, when entropy I use my previous edge parameter or less weighing the entropy, I could get some other parameter also. I would like to show. Thank you.

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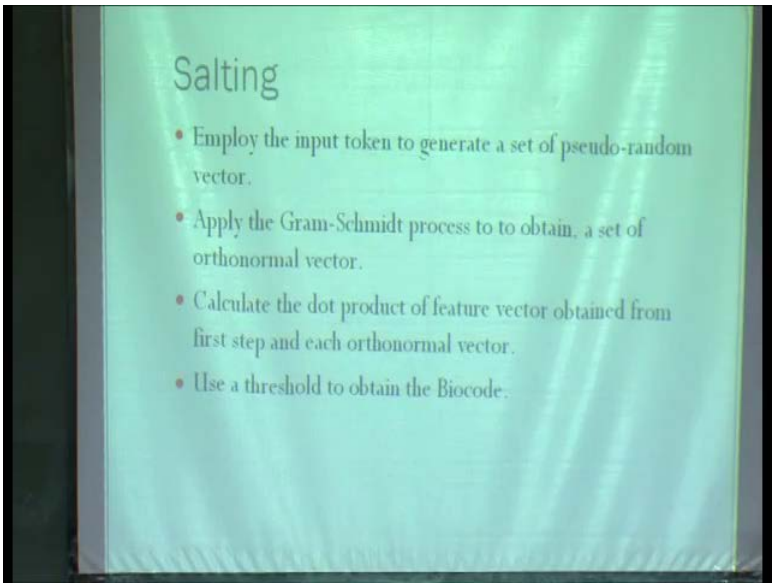

This is basically to generate a random matrix and take it back. Basically registration part and generate a token matrix and associated with a k key and then, generate a token matrix again, and as a matcher for the matching purpose.

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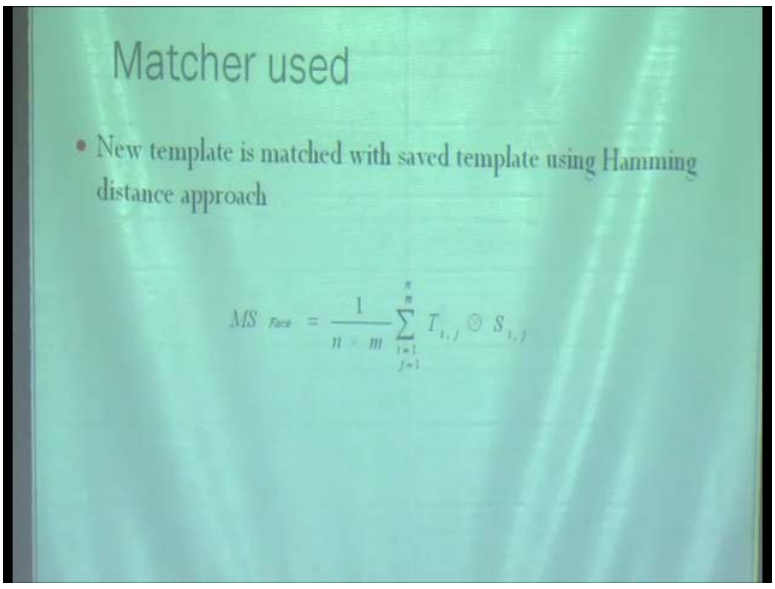

I have used the hamming distance approach and for the template I tried it on the transform in palm one was, and second it is phase difference and apart from the classic approach when basically and after that I need a salting. Basically a value x and when come again for the verification in the logging.

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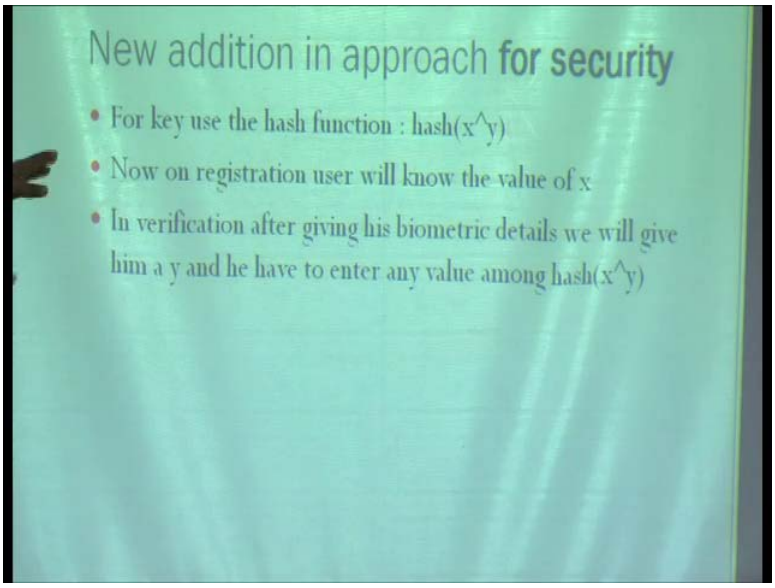

So, the design basically after the biometric data, we will provide, then we have to enter the.

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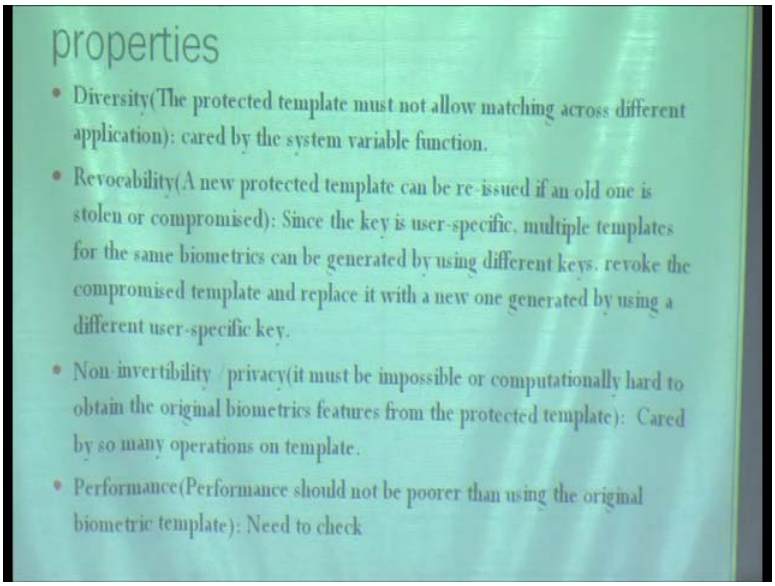

These are basically production of skills diversities system variable. Two systems cannot use the same biometrics and it is covered. Since, we are storing the matrix template by using a peak, so you can replace it. If the current template is so and non-invertibility or privacy is cared by and performance, this is the part I need to check. Basically i have just

got the database which I have to work out. So, I build the registration part, verification part matching and I have used this.

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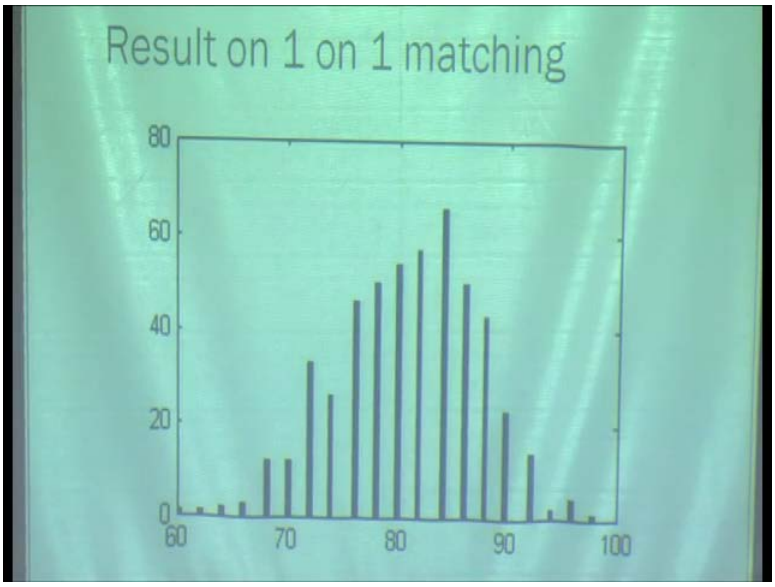

Basically, now I am do this and data of 500 templates. I just tried basically I showed the first template and then, on the verification, different template and this is the matcher actually just [FL]. When can you complete the whole thing? I am giving you up to fifteenth. I must get the feedback, otherwise I do not know whatever I have told you that whatever you have given otherwise. Sir, basically my project is on biometrics. I am working on principle lines extraction from the given palm print.

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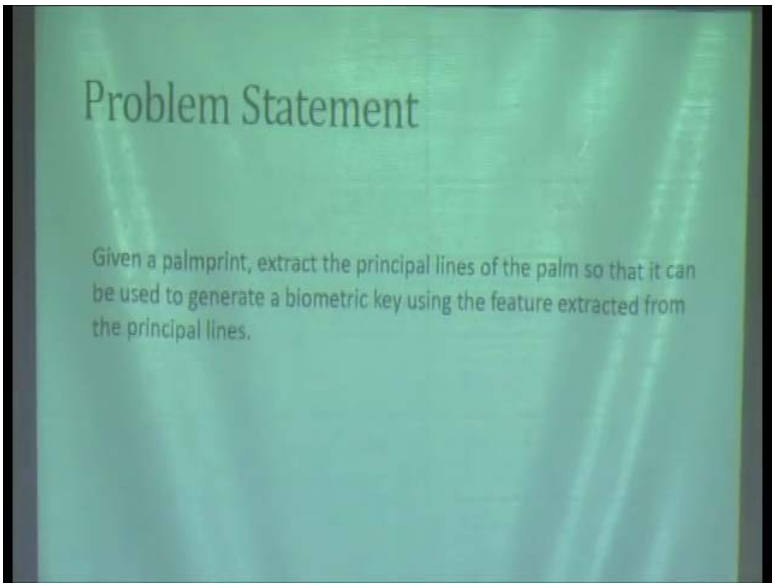

So, the problem statement is to give a palm print. I have started the principle lines of the palm, so that it can be used to generate a biometric key.

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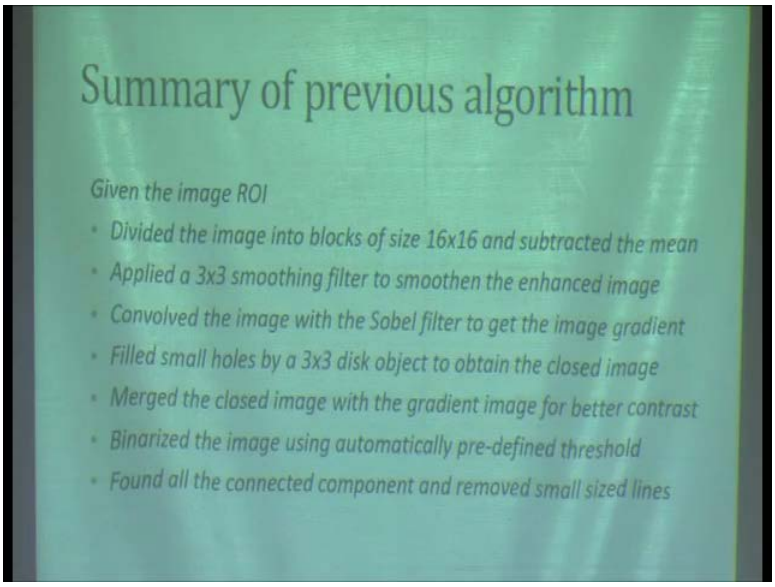

So, previously I implemented an algorithm. So, what that algorithm did was, it divided, it enhanced the image by dividing into block of size 16 cross 16 and subtracting the mean. Then, I applied smoothing filter and then, the convolving image to Sobel filter to get setting the lines to be edged. I detected the lines using the Sobel filter and then, small holes filled by closing the image and these holes and this image was merged with the

gradient image, and the binarized image was created from this by automatically pre-defined thresholds and then, the connected components are found and the big connected components presented as the principle, but we saw that this algorithm was not giving good result. So, we implemented another algorithm.

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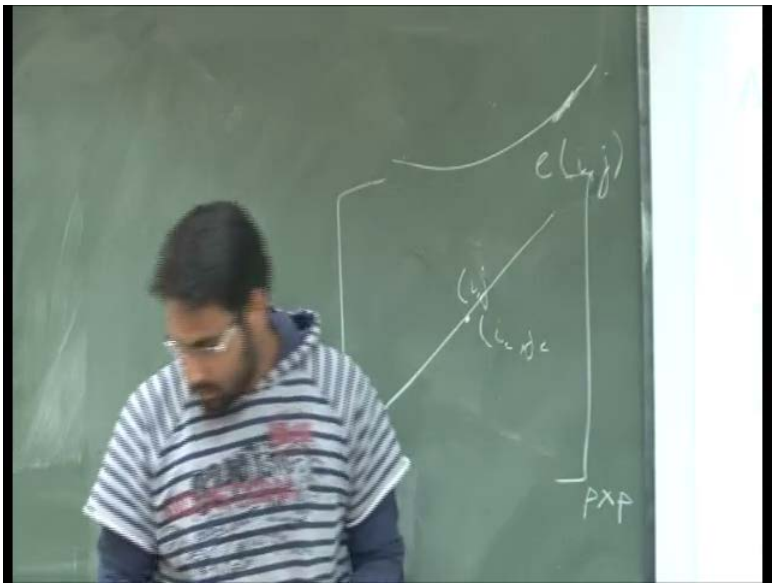

In that algorithm, we defined basically a kernel of size p cross p which is z t, where p is any number. So, for any l k denotes a line that is being formed using this calculus. So, for example, if this is the kernel, then these are all for different values of k. These are the lines. So, for k is equal to 0, this is the rank. K is equal to 1, this is the rank. So, k is basically used as slope.

So, from now, given a line what we do is for a given image, we place the kernel at the middle. Let say the center of the kernel is i c, j c and we place the kernel over i,j of the image and for this line, we calculate what is the sum over this length and we do it for all values of l. So, for every line, we see that we calculate that summation over this line per point. Then, the assumption is that line can be considered, palm prints can be considered as a straight line in this in small locality.

So, if it is a palm print of this kind, then at this point, it should be giving minimum value. At this point considering that in palm print is dark, darker than the remaining image, so the minimum value would be at this angle. So, taken that into account, we calculate the minimum of this point and store it and call it the store it as e i j per point i j from this.

This we do for each and every point and we get the energy image. So, we get the energy image. So, from this energy image, this is the matrix of all the e e i j points. From the energy image, we need to like here as you can see the prominent lines are visible. So, the principle lines are actually visible here.

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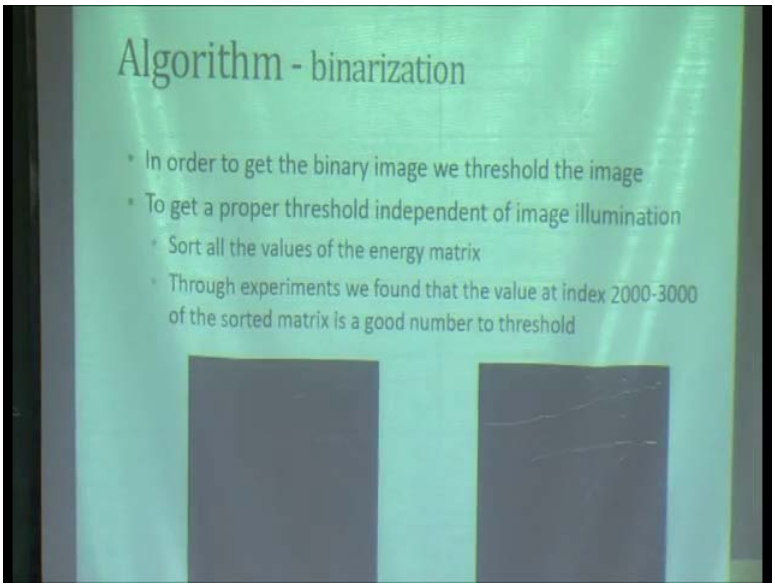

So, from that we extract by thresholding, we extract the lines. So, the thresholding done is not automatic. So, all the values are sorted into a vector and experimentally, it was observed that the index 2000 to 3000 was good for thresholding the value that stored at this index. So, using that as an index was there then. Now, given this we still have to remove the wrinkles from the palm prints. So, what we do is, we have two assumptions that a palm print cannot go in this form like it started here at some angle, and it basically if the slope change by more than 90 degree, this cannot happen assuming this and the other thing is you remove some of the general wrinkles.

Most of the wrinkles are basically if the palm prints run in this direction. Most of the wrinkles run in some other direction. So, using these two properties, what we do is we consider two intervals for each point. We have calculated this energy and stored this angle, so that what is the theta value for which is minimum. So, we store we have taken the minimum value.

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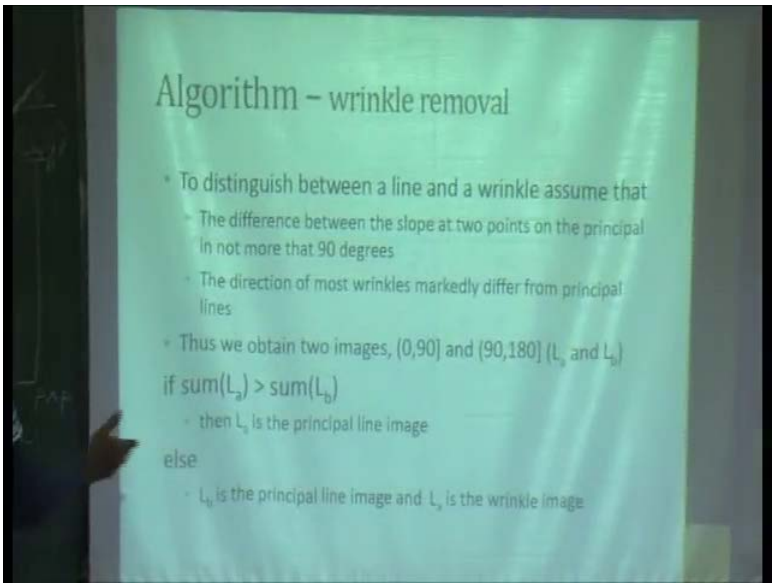

Then, we know that whether it is less than 90 or greater than 90. So, for less than 90 and greater than 90, we have two images, two different images.

So, now we compare the sum of energy, let say 1 is l a, and l b and other is l b. So, some of the energy of l a and l b are compared, so that you know assuming, we assume that the energy of the image containing the principle lines would be more than the other what are they interacting. So, using that we can give the following. So, here are the wrinkles that are there and here are the lines.

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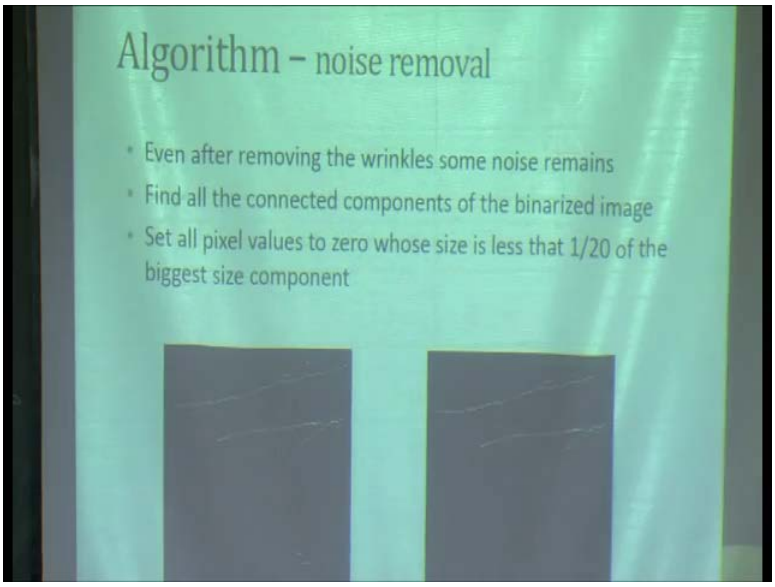

So, now apart from that, not only this, we have to remove the noise that is there like you can see these are the noise. So, we find again all the connected component and instead of like taking the best top four connected components, we remove the bottom part of the connected component. So, these are the lines that are extracted and this is there. So, we have removed this using this pending connected component. Then, the results that are obtained, these are the lines and this is the yellow one is the line that I have obtained as compared to previous algorithm in for this particular image. The previous algorithm did not perform well, and this was the best that it would perform one as compared to any other image, and this is the performance of this algorithm. So, it is totally better than the previous.

This I did for images of CASIA and these are the results on CASIA. So, some of the lines like here, this line is missing as in because here there is a prominent which we could not, but for most of the lines are detected and the result was much better for the poly u. So, in this most of the lines are detected.

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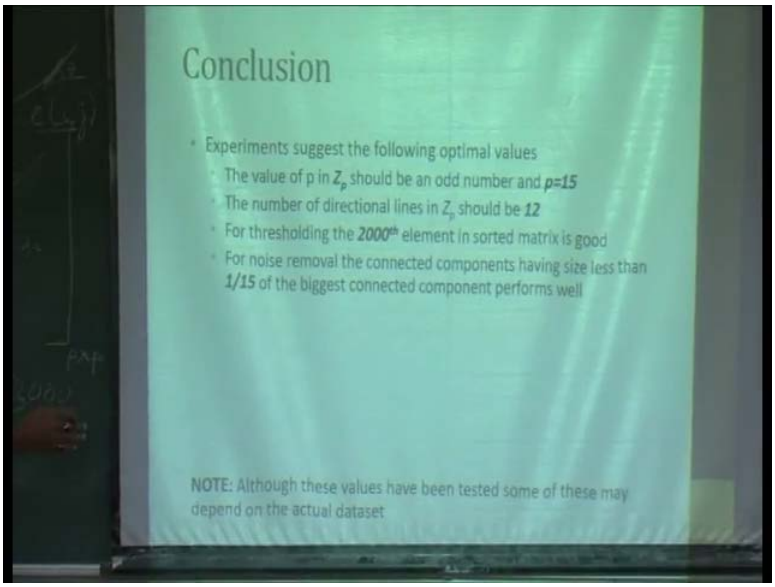

So, even in this case, you can see there are too many wrinkles, but still it detects the principle ones and only experimentally we carried out to determine the value of z p, and like the size is optimum. When it is 50 or less than that, it does not find the lines or more than that the computation time is much more and per the number of direction lines which was to be 12. So, for less than that again the same case is there. What is the accuracy of?

So, as in accuracy, what is if I get some? So far I did not run manually for checking it. I had to run it for all these things are. So, I did for 40-50 images from the database manually checking it to find out some key based on this is stable and find out some value. That is the second part that we had this problem earlier, but you said that you extract people and in that part considering the images that because this kind of image I can show that I just wanted to show that for even for like here, there are too many wrinkles here. There problem of illumination as a, but still and try to find out how much.

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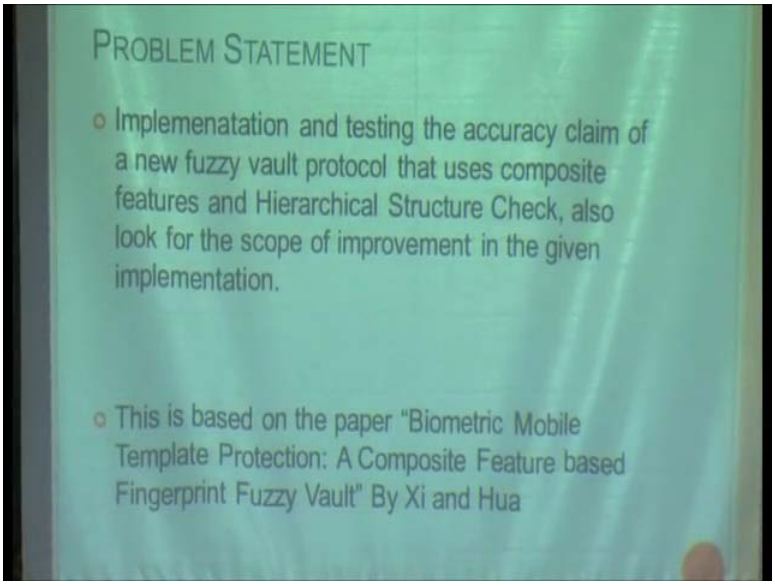

Good evening everyone. My name is Adarsh Kishan. My project title is finger print based fuzzy vault system. What I was given as to implement this paper “Biometric Mobile Template Protection”. Using a composite feature vector, I will just brief you. Fuzzy vault system requires two steps.

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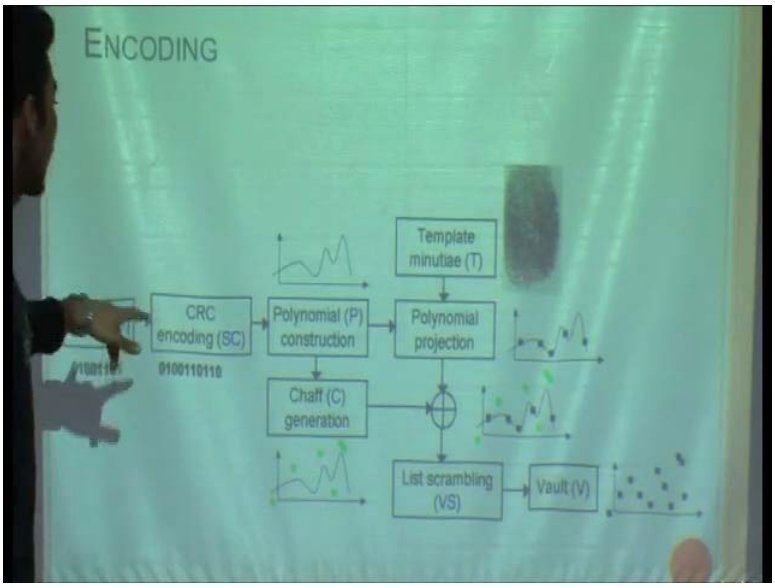

First the encoding phase and there is the decoding phase. In the encoding phase, we register a user take his fingerprint, store a composite map of the feature. This is the whole encoding phase. There is a secret key. As in the secret key, we find a CRC polynomial and then, we are using this secret key and then, we add some small points and then, using the initial template, the user we create some points in the system that we call the decoding phase. The user comes with query minutiae. From this query minutia, we create the composite vector and then, back of the system find out what are the genuine points in the system.

The genuine points that we get are large enough to reconstruct the whole polynomial. Then, we reach the key, the biggest problem that there is another interesting idea that this paper proposed was to it assumes that during registration, we can assume that a user gets a good ID image, but why verify it. Can be the case that the finger print, the quality is even. So, what it does is, it takes for example, this is the template image and we can see that only a portion of it. So, what it does is while matching it divides the image into nine portions and try to make each of the nine portions with the image. If any one of these matches, then we consider it does not match. This is the composite feature that the algorithm creates from.

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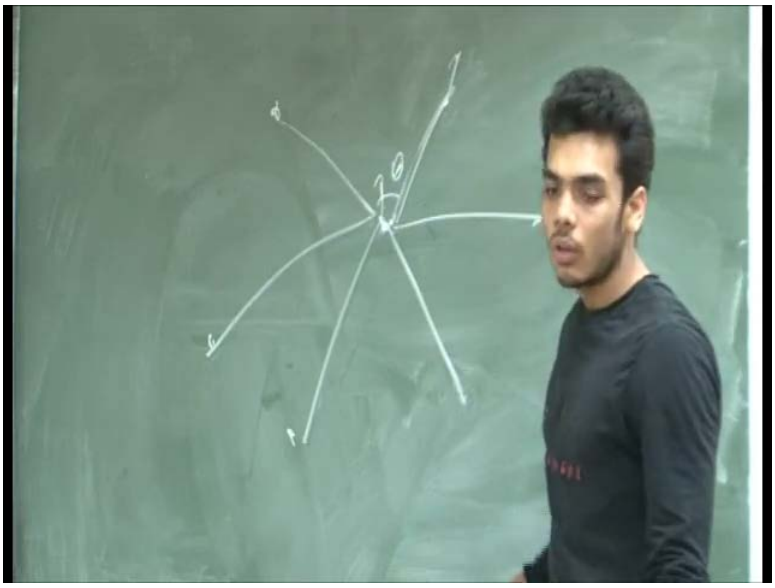

For example, these are the minutiae vectors that have x y coordinates in the theta value. So, the composite effect that we make is from the center point. We join all these edges and store the distance value. The difference in the angle and the relative angle of this value. So, for each minutiae point, we have a composite vector. So, total we will have a composite vector will images in the system that composite vector will have n minus 1 features, and there would be some line n of this. While implementing, I first supported in (()), but there were some issues with this because I got complexity taking some time. So, I moved to python.

The system actually has more than lab required parameters that the threshold at various levels. The paper does not mention most of this threshold value. So, I have to assume something and the current implementation does not perform well because of various threshold values. I have tried to tune it to some extent, but for that it is necessary for the testing. I have taken the IIT rural database. It is a database that has 500 individuals and there each individual gets two set of data.

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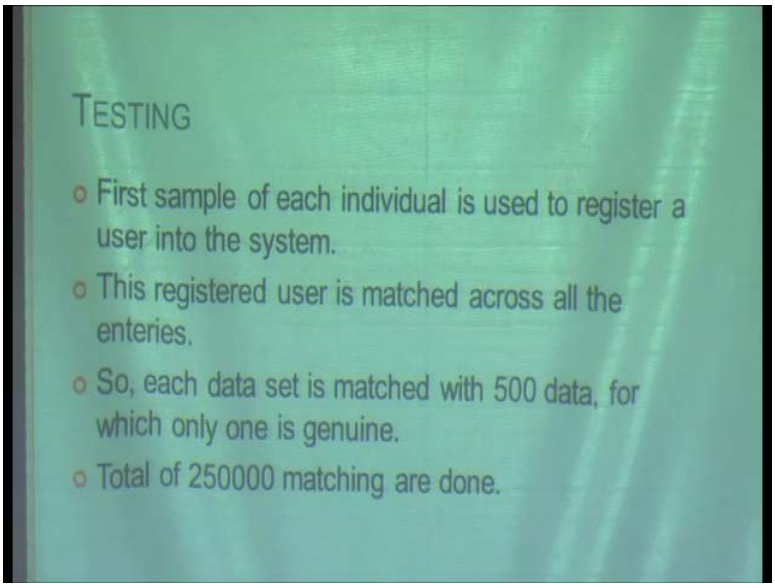

So, for the testing what I have to do is take an individual, use that image to register that individual and tested across the other 500 entries, but generally the IIT rural database is considered to be low quality database. There are images that have quality more than three. So, the total matching was around 2.5 lakhs. It took me quite some time to do this. If I did a serial job, it would take something around three days. So, I tried to parallelized it and assign it. What I did is simply the data divided the data set.

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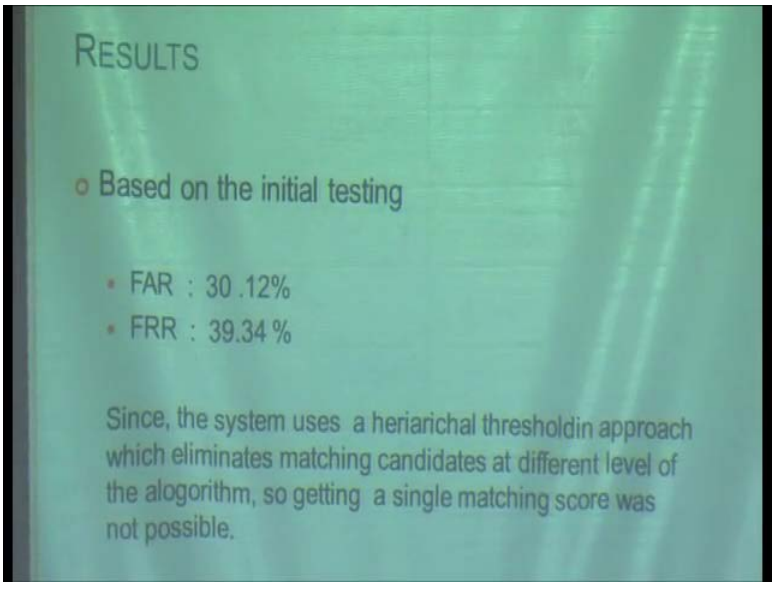

So, the current FAR and FRR rate that I am reaching is this quite high because the system uses lot of threshold value that I am not able to get them as optimum value. The board script that we have to generate, the CRC, the ERR and CRR that requires similarity parameter. Since, this system actually filters out the matching at various levels to get a uniform similarity, score for a single threshold value is very difficult. So, that approach of calculating ERR was say for example here in matching what it does is, if there are two minutiae that are to be matched, but first you try to match this, and there is a threshold value for each of the lines and if the matching for the whole of the image succeed, then it goes into another level where it tries to match each of this, each of the match the component. So, there are multiple levels in it.

Sir, it takes a lot of time to even because the parameters are not [FL]. I can do some, but i cannot guarantee it. I can just give the run in the system and see this. The input image and this is the one which after that presentation we had comparing the images. We have already got on each of these images.

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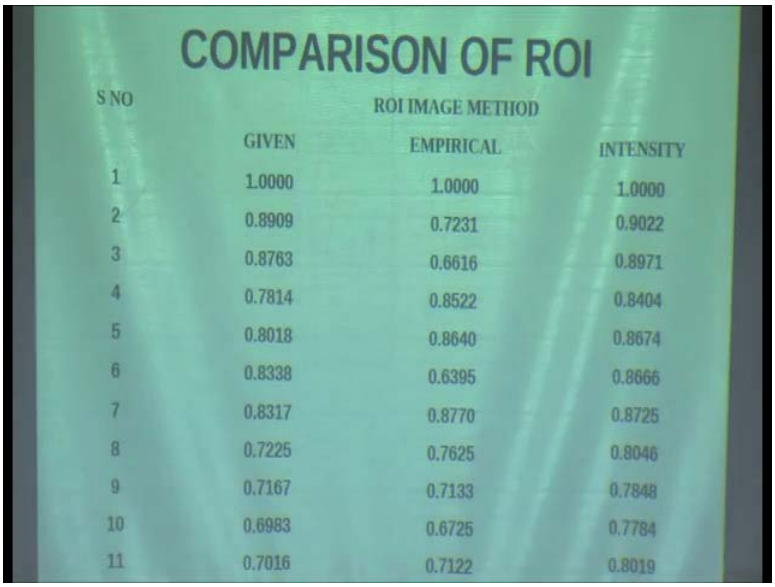

So, what I have done is that I have taken those twelve images, and what we have done is that we have taken the first image as template and the other eleven images including this one. Now, there is for a first set, we got this average is 0.8076 in the empirical ones again. We have taken one set of twelve images in total four finger that is each finger has got a full sample.

So, each of these methods I have taken correlation of each of this that is this image compared to other eleven. Then, again this image here. The first thing again that the empirical one is not as good as the one which we already got, but definitely the one which I have proposed the intensity method. That is better. So, you are saying that with the crop, otherwise you are getting 0.8909 where you matched first and second and here you are getting 0.99022. Yes. So, we will be checking the first column and the last column. So, this is the second one. Again, it is coming out that most of the time you have already matched the first image and the second, then first and third, then first and fourth and then, in all the things I have taken first image as the template because randomly I can choose any one, but even this improves that checking the best image of among those things, but I have not done that. I have taken random, then compare to the other images.

You are saying that in all of the cases when you are fixing the first and you are matching it with the rest, you are getting better correlation. Better correlation means both the methods empirical and intensity level only for few things. It is not consistent. Other than that we can say it is comparable with one which are getting from the. Is it how can you justify? Can you show that?

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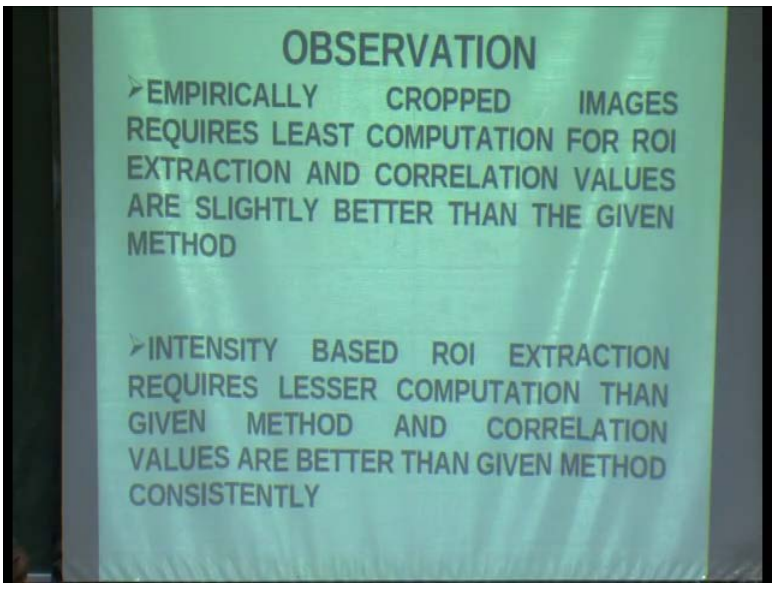

Sir I got four sets of database even other [FL]. What is the probability there you have done extract the. Sometime, it is comparable with the polymicity, this thing ROI and sometimes it is more than that, but the one which is based on the intensity we have

calculated slightly better than 9036. Now, you come to that. What you have achieved? I know that suppose you give me four parameters to be studied.

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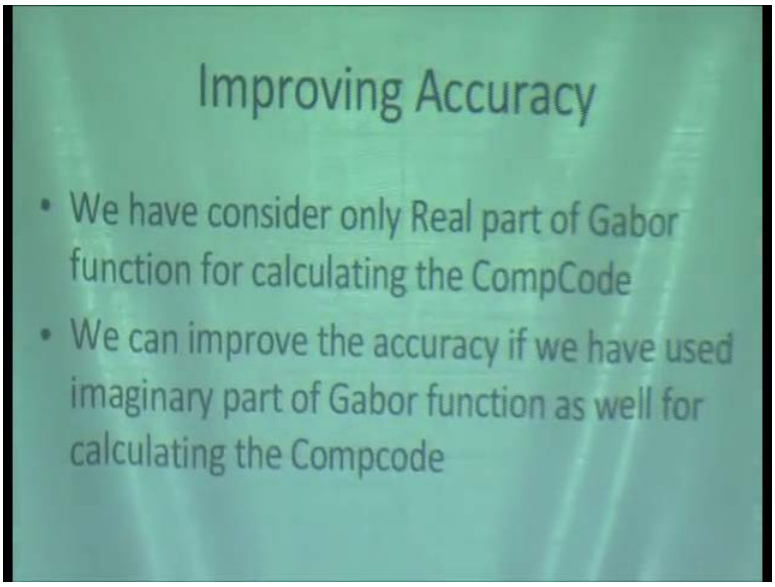

Main value of the parameter 90 percent 40 for the change we get the matching score one [FL]. Can you figure out what are the final meters [FL]? How can you justify that [FL]? If you use Compcode, it is greater than that [FL]. I am telling count even if you simply would only Compcode [FL]. Actually sir was also saying that if it is not working, 40 percent it is just like that you require, I mean you take some time, you work on it and you try to why it is 40 percent. If it is 80 85 90 percent. I say that I am saying you manually check given the image, what the code that you are generating is [FL]. After this you get me, but I will see the thing again. Only I gave the final. Yeah yeah 16, but it should be at least 18. I want to see that you obtain only Compcode. Even that is better than this from the feature [FL]. I am telling you and that is the thing that by all these projects, we wanted to when you are using I mean working biometrics. What are the different problems [FL] after that we have also coded that thing [FL].

In that case, we are taking two additional coefficients r x and r y. So, basically what is this? Basically there is a different image and we have taken another image. So, for both images we are calculating five coefficients and then, basically point make a matrix in, basically we are storing these coefficients.

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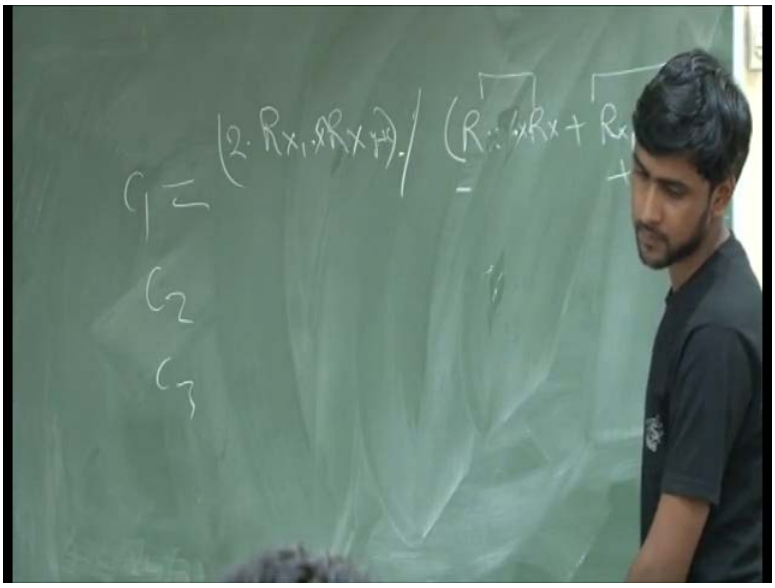

We basically, I am computing different matrix that we are using. What I am doing is basically we multiply them. Who would like to see that [FL]?