Image Signal Processing
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Lecture 17
Real Aperture Camera

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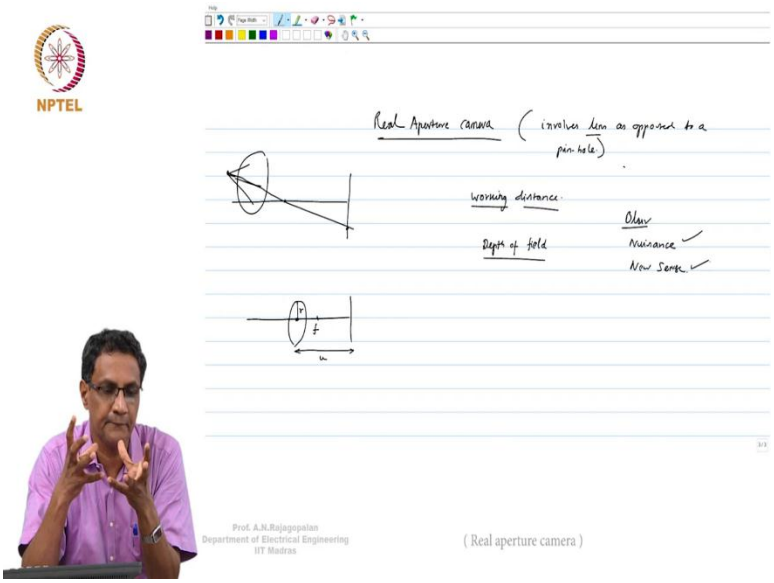

What is called real aperture camera? And also it is also apt in a sense because I wanted to show those examples because you saw the blurring and all that happening. Those getting is not a real camera will give you. It is not true that every time you end up only seeing focusing and all that. So that is why I thought you can take a look at those examples, look at how these challenges go up and then kind of take a foot backwards.

And then examine what will happen in a real aperture. So, this is a more realistic. So real aperture (()) (0:57) involving lens, so involves lens as opposed to a pinhole. Of course one reason why you, why of course use a, one of main reason why you use a lens is because if you had simply a pinhole a camera and suppose you had a 3D point there, then you have your lens here.

So what will happen is even though this is very emitting, so many rays, so many light rays from itself. So, there would be the central ray, that is (()) (01:42) that is able to see through it center and it is coming and hitting your image scenes are there. So if you have a lens here probably gather all of this and then bring them all, then it means that you can actually cut down on the

amount of time that you need to expose your camera to this, even here you did not get enough light but you will have to wait much more.

Because you are not able to gather all the rays inside. So you will have to wait a lot longer and also of course, there are so many other things why you want to use a lens, but maybe because you want to gather all the lights that is out there. Now in the process what really happens is, so the processing, you start involving a lens then some of those things that we have that we assumed till now no longer hold in the sense that till now I simply said if you have a pinhole big intensity then start work with it.

Now what can so which it basically this I never used this notion or something being in focus and something not being in focus, in those classes you were use that only in this practical application I told you something called blurring. So a lens even if you were to assume a static world when you have a lens then a lens brings along with it its own set of features.

One is what is called relay what we call is a working distance, a working distance. What that means is? Means is that when you have a lens, of course you have a certain focal length. Then you will actually keep the sensor plane some sort of a distance from the lens and the working distance is like saying that at what object for those lens settings, so it is like this.

So when you have a lens you will say that here is my image plane and I keep my lens right there. And of course it is has an aperture through which all the light rays will be gathered. Now this could be a distance at which the sensor plane is from the center of the lens. And then this has a certain radius r and then maybe, then you have a focal length and so on. So once you once so fn, let me call this is as u. So this working distance means at what rate, where should I can keep this object, so that the object appears in focus.

As far as lens is concerned it is not true that you can keep the object wherever you want and still will be able to focus. Now, each lens has its own sort of a characteristics. The other thing that it brings along with it is what is called a depth of field, a depth of filed. Depth of field is the (sensitive) sensitivity of a lens in terms of how much would be the change in blur when there is a change of depth.

For example, I do not know if you use you know what you call microscope an optical sort of microscope or some industrial microscope, use a microscope you will see that the depth of field

is in terms microns. So if you keep a PCB something under rate and if you looking at the track and even if the small something that you cannot even see with your naked eye, but then there is a small sort of the depth change in the trap then it will be (()) (05:02) will show up. It will show up in the fact that something will be focus and something will be blur. So you know that you are not, so you know that these two are not and these are the same (()) (05:09).

Whereas take a regular camera and try to move around you will see that, even in your own cameras you would have seen that something appears in focus so when you in actually shoot the first thing that it does is that is an autofocus mechanism. The autofocus actually assumes that when you actually click a camera it assumes that the central way, center way, what you call center of the image plane. What are the object lies there is what probably you are interested in.

So, for example, I will not keep a camera here if I am interested in that boy there I know would not. So when we keep a camera, it means that something over there was of interest to me. Then therefore this is a called, it is called hunting so this guy hunts, (()) (05:49) camera hunts for a certain for the length setting that which you can bring the object that it believes you are interested in focus.

So again so this blurring in all it has I think I told you this for if not let me tell that. So all of this, so when you talk about blur there are some people that think that it is actually a nuisance. And there are people that think it makes nuisance. So it is all in the mind, one guy walks away, walks away from all the charm that the blur can bring to you simply because he thinks that it a nuisance. This another guy who makes his life out of it simply because (()) (6:37) makes nuisance. So, I think it will be a important thing anyway.

So, I am saying so this blur so the ability to not be able to focus all the points in a kind of a 3D world. Simply because they are not at the same depth it comes at a cost. On the one hand you might say that the cost is that I am not able to focusing thing. But on the particular other hand, you should also realize that such a thing also brings with a notion of information about the world.