Remote Sensing Essentials
Prof. Arun K. Saraf
Department of Earth Sciences
Indian Institute of Technology Roorkee

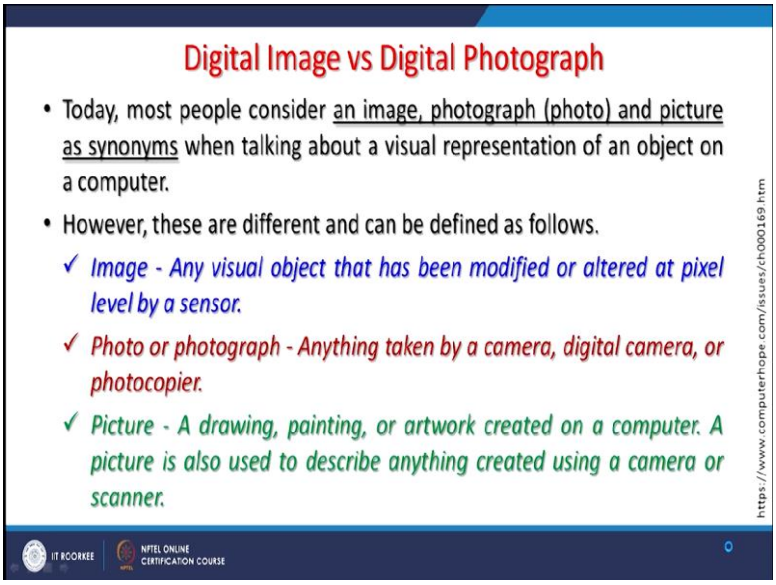
Lecture - 40
Digital Image vs Digital Photograph

Hello everyone, and welcome to a discussion on digital image versus digital photographs, a lot of people get confused about and digital photograph and digital image. So I thought that I will have a complete separate discussion son this topic and to make things very clear about and these 2 things and because, as we know that a picture is a very old saying that picture tell 1000 words and I have added it to that seeing and the satellite image can 10,000 words.

So and this is because a lot of interpretations after normally analysis of satellite and a lot of interpretations can be done the same, because we have also discussed that satellite remote sensing is a generic technology. So, a single satellite image can be used by different experts 4 different applications one may use for mineral exploration, one may use for water exploration.

One may use for vegetation related studies and one may use for you know planning and natural disasters and other thing. So, the same image can be used by various people. So, that is why this saying that the picture tells 1000 words and whereas a satellite image can tell 10,000 words. Now, let us come back to our original discussion that is about digital image versus digital photograph

(Refer Slide Time: 01:55)



And so before this in advent of computer invents and of modern sensors and or a digital cameras and we the photographs were taken on a film and that used to be the technique also a you know sometimes these were you know exposed on a filmed directly sometimes on a paper, of a different kinds of paper of course, photographic paper and then used to have these kinds of prints and those are and not basically.

We cannot use word digital, they are when be they were taken by camera using a film then we used to call as a photograph now and because on aircraft also we are employed and which equipped with these cameras, film cameras and to take the photo of part of earth and we used to college aerial photographs. So they were basically and these were taken by camera and on a film or for negative film, and then prints were generated and those were called photographs, whether it is a handheld camera or air mode camera.

But in case of these, when we say digital photograph, that means the photograph has been scanned and it has been from analog, it has been converted to digital format. So, we can call as a digital photograph, but it still is would not called as a digital image because it has not been you know developed as a digital image is generated through sensors on board of satellite or even with the current digital camera technology and because these are analog, the photographs are analog.

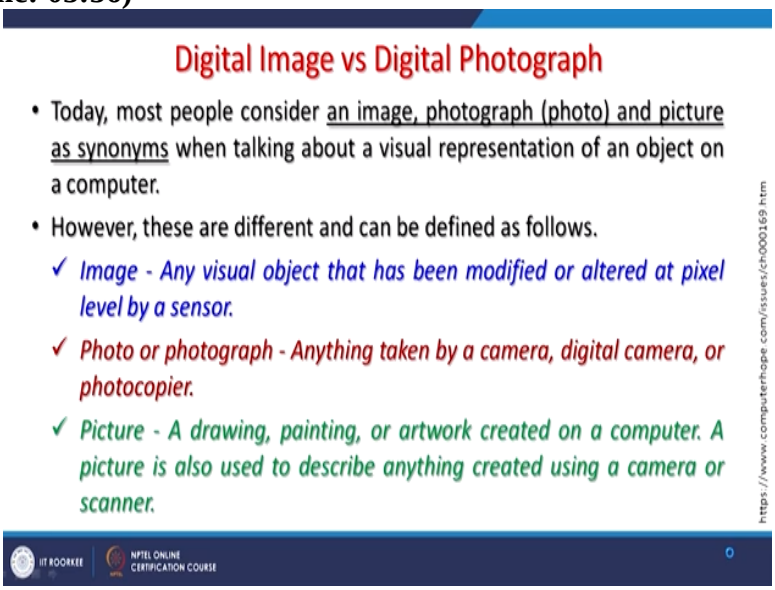
And they behead this you know, silver coated films, very sensitive films, and just is a few seconds of exposure used to record different reflection or different parts of the earth or face of human. And these photographs were generated. So, this when we started this digital era,

and it is basically we started with the satellites and sensors based sensors and to capture the photos instead of, you know, basically films. So these were in instead of on films or a negative form, they were taken as in digital forms.

So the as we know that digital photographs could be presented in view with a computer. But then they are how they have taken that matters that decides whether it is a photograph or an image, as you know, in case of image, then we see a spatial resolution. So if I see an if I take an example 10 meter spatial resolution. So, for 10 meter by 10 meter ground area 1 aerial, you know aerial average of say reflection has been recorded as 1 pixel value. Let me repeat again and for a 10 meter is spatial resolution.

Satellite image and for individual pixel save 10 meter by 10 meter 100 square meter area, an aerial average of all the reflection has been taken and recorded as a pixel value. This does not happen in case of photographs, because it depends on the, you know, on the grains of silver or material which are pasted on the film. So, they are, the technology or concept is completely different in case of photograph, then compared to the satellite images.

(Refer Slide Time: 05:56)



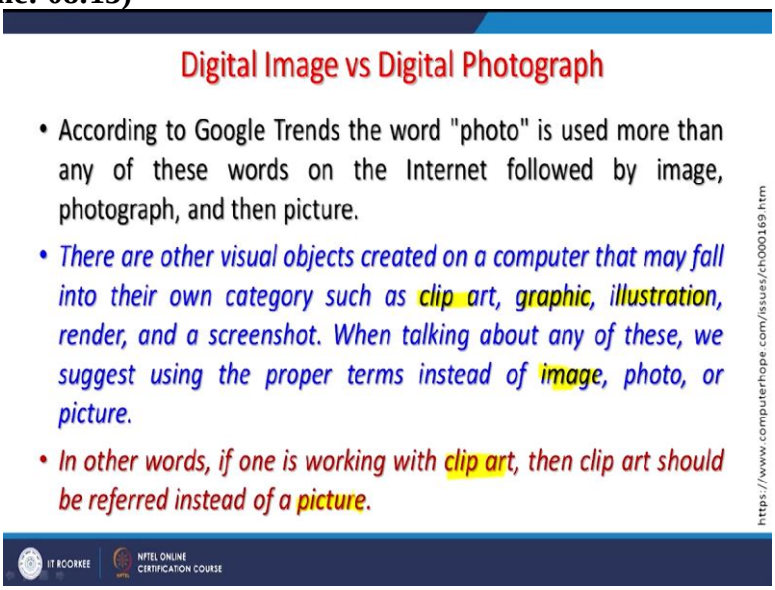
Now, these photographs are also called snapshots because they are being taken just in few seconds by exposing that film through the camera and lenses, whereas a digital image is not a snapshot it is scan line by line and then images created as happened in case of airborne sensor. So, the you know it there should not be any confusion about an digital image and digital photograph or an image and photograph.

Because photograph is a snapshot and recorded on a film whereas or even digitally it can be and this I will give you also example or little later and how were these differences between digital image and digital photographs we can now put a very systematically that in case of image, any visual object that has been modified or altered at pixel level via sensor because at pixel level, area level average is being taken and therefore, be instead of a real thing, it is an image of that pixel has been recorded as one single pixel value.

Whereas in case of photo or photographs, anything taken by a camera or digital camera or photocopier and for against that green, which is matter density of greens can improve the quality of an image or photograph, but, that is still we called as a photograph and they also sometimes a word is used as picture. So, when we if we want to differentiate between photo and picture that is a picture is it drawing painting or art work created on a computer that can be called a picture.

Picture is also used to describe anything and which is created using a camera. So, there is not much a difference basically between a photo and a picture and taken by a camera. Digital camera, but there is definitely a lot of difference between an image and you photograph no matter where there is a digital or analog.

(Refer Slide Time: 08:13)



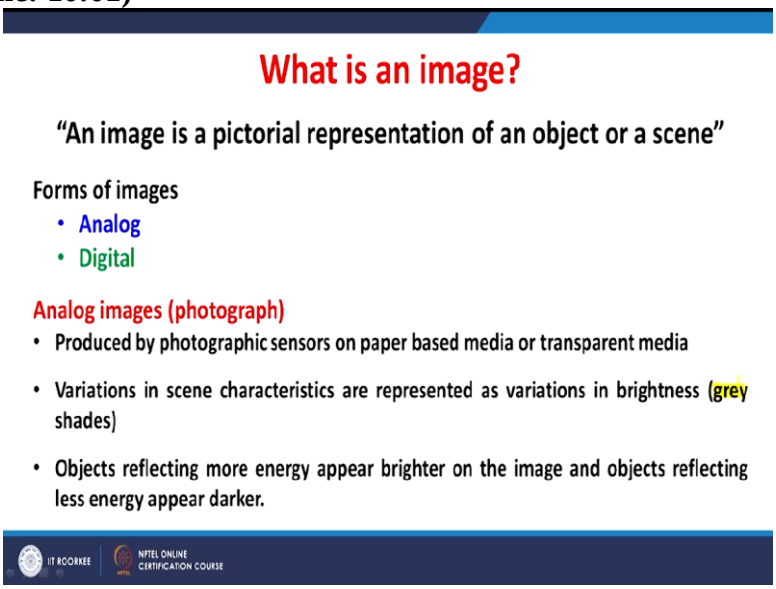
So, like if we see the in Google or the trends about the photo, which is used more than of any these words on the internet followed by an image photograph and then picture, so, photo word is most common and sometimes people say satellite photo, if we say satellite photo that

is not the photo of the satellite, but the image taken by the satellite of part of that earth. So basically, it should have been the more appropriate word.

In case of satellite imaging is the image not the photograph though there are satellites, like these geostationary satellites, which take snapshots, and then we can call them as a satellite photographs or satellite images, but they are basically should be put in the category of photographs. So, there are various visual objects which are created on computer and that we fall into their own category such as clip art graphic illustrations.

So, we put them sometimes in the category of a picture or a photo and some may use word image. But that is not appropriate for such things like clip art graphic or illustrations or figures. So, what we basically say in other words that the clip art and other things are really pictures, not photographs. They have been created by some artists using maybe using computers or hand drawings. So now let us define exactly what is an image? The image is a pictorial representation of an object or a scene.

(Refer Slide Time: 10:01)

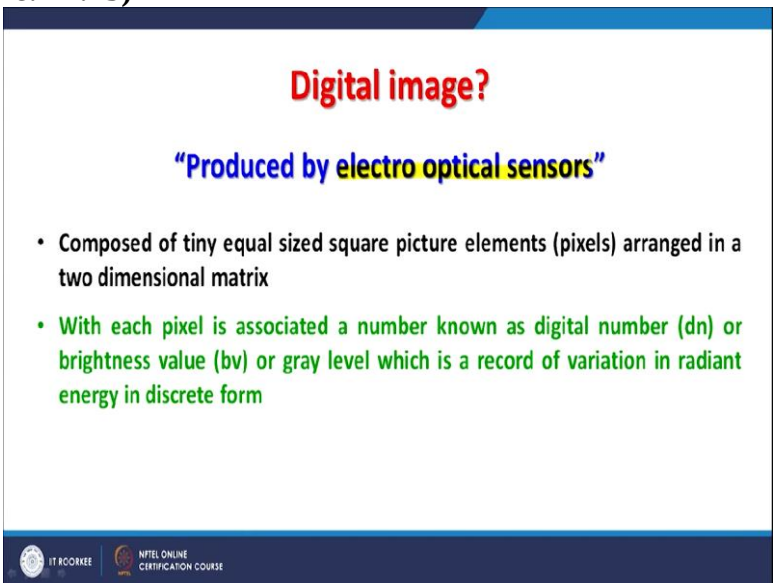


That maybe of a human if it is taken by a digital camera or maybe part of the art if it is taken by space borne sensor, there are different forms of images the images can be analog images can be digital or analog images, sometimes say we may call as a photograph, so photograph when we defined photograph that is produced by photographic sensors on paper and based or paper or film based on media or transparent media.

So, when we say film, it is transparent media, when we say paper, then it is simple media and the variations in the scene characteristics are represented as variations in the brightness as grey shades. Though, here it is talked about grey shades but there can be the coloured photographs also an object reflecting more energy as that also is a common in case of image also an objects which reflects more energy will appear in photographs or images.

As brighter and objects which are reflecting less energy will appear darker, that is true in both the case what exactly digital image how we would like to define digitally made produced by electro optical sensors.

(Refer Slide Time: 11:25)



Now, here I am some sensors may not be exactly an optical sensor, but it still we may call as digital image in case of an like remote sensing or in thermal remote sensing. Again the things may be a little different nonetheless produced by electro optical sensors, lenses are always there so and there are you known CCDs or other electronic things are there. So, that is why this electro optical sensors, when these are used to produce an image.

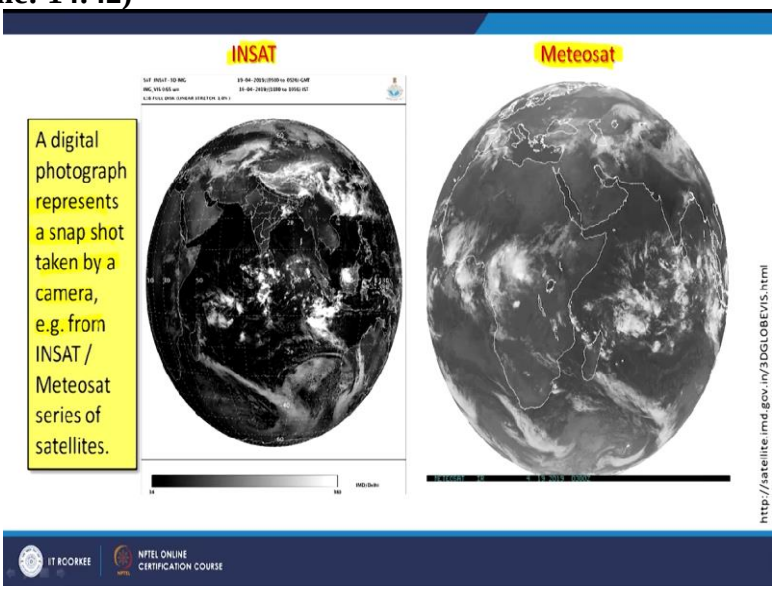
Then we call as a digital image and which is composed of tiny equal sized square picture elements that is pixels arranged in a 2 dimensional matrix, this is a typical (())(12:18), where each pixel or each cell would have the same size and the same it will always have a square and that way it is digital image created but in case of photograph, the greens which are on the film or on the paper may not be having the same size and therefore, there is a difference here and the pixel is representing aerial average of a particular area.

If it is having one meter resolution that means one is square meter area of the ground or a face it is a presenting as a 1 single pixel value. So, each pixel is basically associated with a number or pixel value sometimes we also call digital number or brightness value, in case of grain label and records the variations of radiant energy, which is in the sun form and after object reflecting more energy is said that will record high number of value and more brighter.

In case of grey and skill and objects which are having and reflecting less energy will be recorded in the low pixel values. When a photograph or inside we say photo is taken, it is always taken by a camera and whereas an image is taken by a sensor that is, this difference we have also touched earlier, that a snapshot or a photograph is taken by a camera in a split second or few seconds, a snapshotof a part of the or a phase or a scene is taken.

Where a sensor takes a lot of time so, a do both maybe the digital that is why digital image and versus digital photograph we are discussing. So, if picture is the most general term of any representation of a person or object or a landscape, where is a sensor maybe handheld camera or on board of satellite so, these 2 things are possible. When I was mentioning about the satellites, it also takes a snapshots, those are basically digital photographs these are not typical digital images taken by the satellite,

(Refer Slide Time: 14:42)



Because the scanning is not done it is just a snapshot, like if I take the example of insert series of satellites, they take a snapshot of a part of the globe or be also called as a disk and India in the center because this is geostationary satellites, this has been friends or a

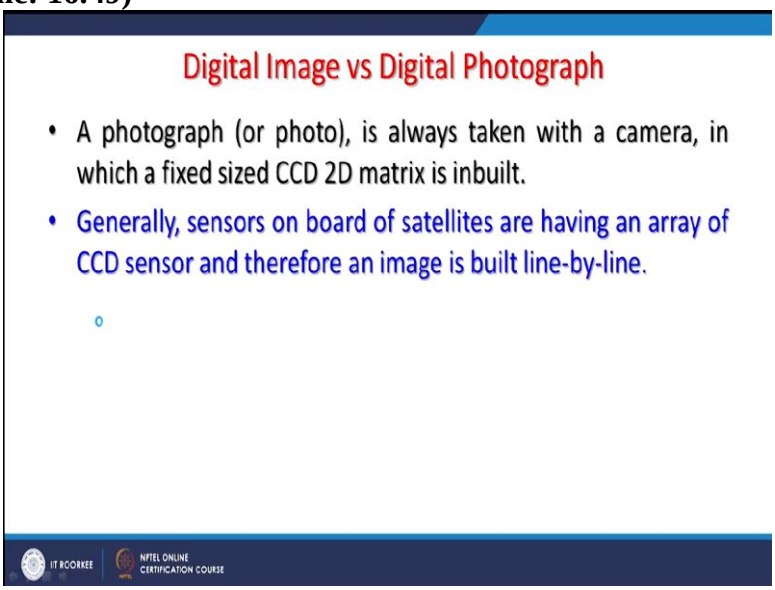
synchronized with the movement of earth and focusing over India so, India is in the center, so this is India centric disk, which is created this for it is an snapshot is taken.

It is depending on the programming maybe after 15 minutes, maybe after half an hour. Likewise, these disk are recorded, these are a snapshot though they are digital in digital form not in analog form and then these are transmitted from satellite toward start and we recorded and utilizes the advantage with the such as snapshots is that for any kind of studies related with the meteorology especially with the moment of cyclones every 15 minutes when you are having a snapshots of a part of the country and surroundings.

It is becomes very easy to monitor basically the moment of such cyclone or the I have that or the front and therefore, these play very important role for many applications but these are snapshot though in digital format. A similar example of Meteosat which is also a geostationary satellite focusing elsewhere not over India and they are also the disk is created and the same applications are also of use but these are digital snapshot.

So digital photographs represents a snapshot taken by a camera because on board you are having either inside Meteosat on many other such as satellites you are having and these cameras, digital cameras, they take the snapshot and transmit the data though the data comes in digital format.

(Refer Slide Time: 16:49)



So we call them a digital snapshot or digital photograph and if whereas a photograph or photo is always taken with a camera in which is a fixed size CCDs of 2 dimensional matrix is

inbuilt in case of digital camera which is on board of the satellites or also the quality or electronics may be different because the distance is much more and not maybe and like handheld camera nonetheless.

And generally whereas, in case of you know satellite born sensors are having area of CCDs and therefore, an image is built line by line after its scanning that is very, very important and that is, that makes one of the major differences between digital image and digital photo as satellite moves and this area of CCDs continuously cover that strip of the earth, whatever the swath depending on the swath and line by line.

The part of the earth is recorded by these satellite based sensors and there, we see a digital image or inside also we call as image and as I have said on pixel label aerial average value is recorded that maybe reflection that maybe admittance from part of earth.

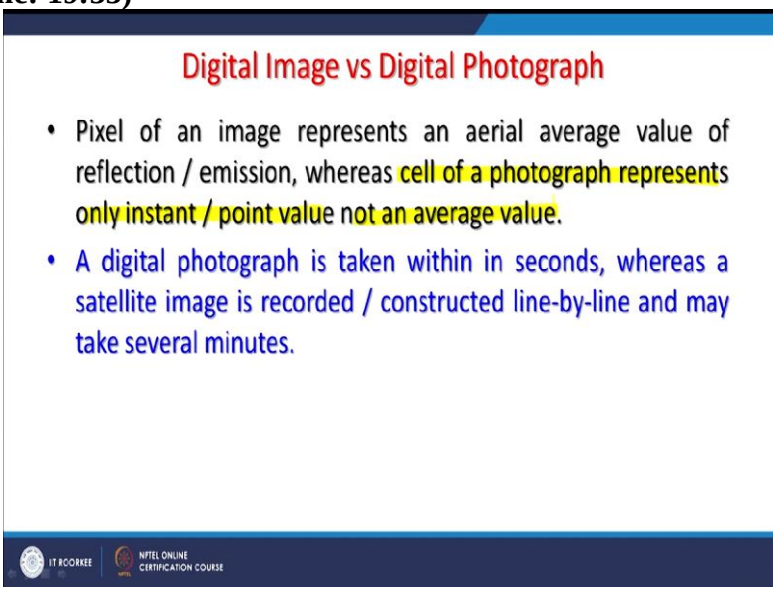
(Refer Slide Time: 18:15)

So, this like here and this is one examples is there the turning light into a digital file how this is converted? So, if you are having some objects like here, some objects are shown through lens then you are having an 2 dimensional area in case of digital photograph and then after certain processes, you get the data recorded and that becomes here digital. So far at this stage it is analog and finally, you record in a some recording device maybe a SD card or some other thing there within the camera.

So, this is the typical arrangement of a digital camera which converts your analog things capture light into image pixels, but it is still it is a snapshot. Whereas in case of satellite based

sensors like push broom scanner in and only in the previous lecture we have discussed the hyperspectral remote sensing and they are in this hyperion is it push broom is scanning so, line by line is a scan part of the earth here is the swath this is the direction of the movement of the satellite and line by line is being scanned as a snapshot of the entire scene is taken.

(Refer Slide Time: 19:33)



So, as you know the if we talk about the unit of any digital image, then is a pixel which represents an area average this I have been mentioning of a value maybe of reflection or a emission and that maybe from any kind of surfaces and whereas cell and have a photograph presents the only instant point value not an average value. It depends on the grain size basically, of their film or negative and on which this material is there and that is the instant or point of value not an aerial average value.

So, the unit in case of image is a pixel unit in case of a photograph is a that material and that material is a point of value not a continuous like in case of pixel. So, we can say that a digital image is a continuous representation through aerial leverage of part of the earth or a face or seen there is a digital photograph or photograph taken by camera, maybe digital camera is a discrete and discrete recordings, maybe into damage maybe in a digital form.

But it is discrete It is not continuous and not representing an aerial average it is average and presenting instant or point value and digital photograph as you know is taking within few seconds that is why called a snapshots where is the satellite image record recorded constructed line by line and may take several minutes. If I give you example NOIVHRR when it is flying overhead means the overhead overpasses there.

And that means when it is flying over the almost over the antenna, then we may get a construction of image for 14 minutes, 12 minutes to 14 minutes and line by line on the system itself when data is coming, you can see that how image is being built there so that is the major difference in case of image. But in case of digital photograph is a just a snapshot so this brings to the end of the discussion between the digital photograph and a digital image. one should not gets confused in the future. Thank you very much.