What makes UHD better than HD?

Transcript

Planet Earth II. One of the first BBC productions to be shot and finished for ultra-high definition. But what is ultra-high definition? And what makes UHD better than HD?

What makes UHD better than HD? [Chapter card]

Well it's all to do with detail and the number of pixels in an image. UHD has 3,840 pixels horizontally, by 2,160 pixels vertically. That's over eight million pixels. 8,294,400 pixels to be precise. So that's four times as much detail as you get in a HD image and 27 times as much as you get in a standard definition image.

Colin Warhurst, Technologist with BBC Blue Room [Aston]

Four times as many pixels sounds great in a world of photography and video where generally more pixels means a higher-quality image. However more pixels doesn't necessarily make the image any better and that's because of the limitations of the human eye.

It turns out the human eye has a bit of difficulty telling the difference between HD resolution and UHD resolution, unless we're sat very close to the screen. So to get the benefit of those extra pixels the advice is that we need to be within one-and-a-half-times-the-height-of-the-screen away. Which is only sort of here.

So if I'm here I'm not necessarily getting the extra detail given to me by UHD resolution. Whereas if I'm here the extra pixels and the detail becomes apparent. Now if you're a kid that's great because you're always sat this close to the screen.

But the rest of us might not necessarily want to sit this close to our televisions in the living room to get the benefit of UHD resolution.

Why bother with UHD? [Chapter card]

So why bother? Well pixels and resolution isn't the full UHD story. Focus in recent years has always been on improving resolution. SD to HD, to UHD. But it turns out there are actually three other ingredients that go into making a picture that we haven't really looked at changing until now.

They are higher dynamic range, wider colour gamut, and high frame rate.

Let's start with higher dynamic range. Dynamic range refers to contrast and that's the difference between the brightest part of an image and the darkest part of the image. Contrast is something that the human eye is incredibly sensitive to. Now the human eye has a massive contrast range. Screens couldn't meet that until recently with the arrival of high dynamic range. So with high dynamic range the whites can be whiter, the darks can be darker and as a result the whole image has more contrast, more pop, more punch, much more dynamic. It's a quick win for everyone. Programme makers want it. The screen manufacturers want it and the audience can benefit from it from wherever they're sat in the living room.

The second major improvement we can bring to UHD, which isn't distance dependent, is improving the range of colours that we can see on the screen. So the current HD colour space - and the colour space is what we use to map how we make colours in the TV signal - doesn't actually account for all the colours the human eye can see. So we're moving to something called a wider colour gamut and that encompasses about 99% of the colours that the human eye can see. So for example if I was filming a Ferrari in HD colour space you never actually see that specific shade of red that the Ferrari is in real life, whereas with a wider colour gamut those colours are replicated accurately and perfectly.

This film is not accurately recreating what my eye can currently see with this material. The only way you're going to really understand what I'm talking about is if you can get yourself in front of a UHD screen that has HDR and wider colour gamut content on it.

The third ingredient that could be enhanced is frame rate, with the move to something called high frame rate. UK viewers are used to watching things at 24, 25 or 50 frames per second in terms of films and TV.

However as our screens are getting bigger and more detailed in terms of resolution, some limitations in those frame rates are now starting to show up. High frame rate is anything that is 100 frames per second or more. But if you're putting more frames a second into your footage that's going to have a knock-on effect on your storage, complexity and cost. So to begin with we're more than likely to see high frame rate included when we make UHD programming.

What makes UHD better than HD? [Chapter card]

In summary what makes UHD better than HD? Well UHD resolution is obviously great and better the closer you are to the screen but combined with high dynamic range and combined with colour gamut we're going to get the contrast and the colour of the real world just as the human eye can see it. Eventually better motion may come along as well with higher frame rates. Overall UHD isn't just about more pixels it's about better

[All footage from Planet Earth II UHD HDR WCG]