13 May 2015 - Digital Shoreditch - Simulation Singularity by Andy Fawkes - Transcript

My background is in training and simulation. I'm very interested in artificial intelligence and the idea that computers will become almost as intelligent as humans, and then eventually even more intelligent—the concept of the Singularity.

What interests me from a simulation perspective is whether there will come a point where a simulation is just as good as the real world. That's what I'm going to talk about.

Here is a real video alongside footage from a game. It can be difficult to tell the difference. If you look closely enough, you can eventually spot which is which, but it shows the direction technology is heading.

So, what is a simulation?

Without getting too technical, the key components are a model, the ability to run that model over time, and data. It's very easy to model and simulate a simple pendulum, but simulating two connected pendulums is much more difficult because the system becomes chaotic. One of the best examples of a chaotic system is the weather.

When you see headlines about improvements in weather forecasting, they sound impressive. But considering how much computing power has increased over the past 20 years, and the number of sensors distributed around the world, the progress is actually quite modest. That shows just how difficult it is to simulate weather accurately because it is such a chaotic system.

There are other situations where we can model the system but don't have enough data. We don't know where every asteroid is, but we know what would happen if we detected one on a collision course. A volcano is almost the opposite: it's relatively easy to gather data, but we still can't model volcanic behaviour accurately. There are systems that remain extremely difficult to simulate, and it's not clear whether we'll solve these problems anytime soon.

You might ask why I'm talking about this. The reason is that simulation technology is advancing rapidly. Across many different fields, our ability to model systems and collect the necessary data continues to improve.

This is a great visual example. It shows only 30 years of video game development—from Atari on the left to the PlayStation 4 on the right.

The same trend is happening in virtual reality. VR isn't a new idea, but new entrants such as Oculus Rift have transformed the field.

Part of my own background is in battlefield simulation, where environments increasingly resemble the real world. These simulations use real physics, with tank shells modelled to behave as their real-world counterparts would.

There are many other types of simulators. This is a US Navy and NASA spacewalk simulator. The cost of simulation has also fallen dramatically, allowing people to use

sophisticated simulators at home. We now have flight simulators, engineering simulations and medical simulations, and not all of them require a computer.

One example I find particularly striking is gambling. Around 15% of gambling in the UK is now virtual. People can bet on simulated horse races, tennis matches and other events that don't actually exist.

If we consider simulations of black holes, those objects are so far away that we're effectively simulating the past. That's an interesting philosophical point.

Here, Google is simulating traffic on a Monday morning around London's M25.

We've also heard about the Internet of Things. The huge amount of data generated by connected devices can now be fed into simulations. Companies like Google can use that information to predict what is likely to happen next.

Another important aspect is the relationship between simulation, artificial intelligence and robotics. Boston Dynamics, now owned by Google, originally started as a simulation company. If you can develop and test algorithms in simulation, you can then transfer those same algorithms to control real-world systems.

One particularly fascinating development is training robots inside simulations. This work emerged only recently. Rather than learning directly in the real world, robots can safely learn inside a simulated environment before applying that knowledge outside. It's similar to putting a robot in a car and allowing it to learn how to become a robotic chauffeur.

Simulation, therefore, can serve as a unifying platform that brings together many of these different technological developments.

That is one of the main ideas I wanted to leave with you.

My final few slides touch on the philosophical implications.

Children—and adults—spend a great deal of time in Minecraft. Does that become their world? We've already seen similar ideas in Second Life, where people have even married within the virtual environment.

This image shows a simulation of a simulation: a simulated holodeck inspired by Star Trek. As we move into the future, the distinction between simulation and reality becomes less obvious.

Of course, we also have to mention *The Matrix*. I'm not going to show the familiar green code, but the interesting concept is the Construct, where you simply download whatever knowledge or skills you need for the day.

That raises an important question: who decides what your world is? Who decides what exists within the simulation?

If we go back nearly two and a half thousand years to Plato's Allegory of the Cave, it's worth revisiting. The prisoners see only the shadows projected before them. Their world is, in effect, a simulation, yet they believe it is reality.

These are not new ideas created by computers. Humans have always questioned what is real, what is simulated, and who determines the reality we experience.

My final point is that, although I'm enthusiastic about artificial intelligence and find it fascinating, we shouldn't forget that the human mind has evolved over millions of years.

Our brains are remarkably good at deciding which information matters. Sometimes they remember the wrong things, but they constantly replay the past, imagine the future, dream and run mental simulations of possible events.

In many ways, our brains remain the ultimate simulator.

Although I believe the Singularity is an important idea, there is still a fascinating philosophical dimension to all of this.

As we move into the future, I'll leave you with one final thought: your brain is still the ultimate simulator.

Thank you for your attention. That concludes my presentation. It was deliberately brief—about ten minutes—because I simply wanted to leave you with some of these ideas.

I'd be happy to take any questions.