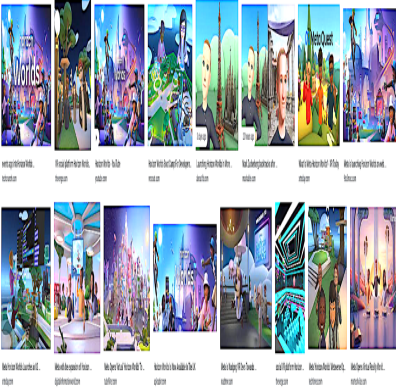




Quantum VR

Description

A widely cited article in IEEE states the goal of virtual reality (VR).

“The overarching goal of VR is to generate a digital real-time experience that mimics the full resolution of human perception. This entails recreating every photon our eyes see, every small vibration our ears hear, and other cognitive aspects (touch, smell, etc.)” (11).

By this reading, a fully-fledged virtual reality system needs some means of delivering sensory information to eyes, ears, skin, and muscles, as well as organs of sound, taste and smell. It also needs to respond to and provide feedback for movement of the whole or parts of the body. Ideally, this sensory interaction is accomplished by apparatuses that are light, comfortable, impose minimum restriction on the body, and do not inhibit movement, breathing, or other bodily functions, and are without cables and hand held controllers.

An invisible network of connections to other users who are to share the same VR world is needed, and a persistent 3D model of the co-inhabited virtual world supplemented by data that interacts with the body’s various sensory channels. To mesh the virtual with the physical as in augmented reality (AR) requires further sophistication.

Apart from the hardware requirements of VR and AR, the computational requirements are enormous, especially if the systems are to inter-operate without detectable latency (delays).

“humans process nearly 5.2 Gb/s of sound and light. The fovea of our eyes can detect fine-grained dots, allowing them to differentiate approximately 200 distinct dots per degree (within our foveal field of view)” (11).

If they are to integrate with the capabilities of the human body then just the visual aspects of VR and AR make huge computational demands.

Assuming no head or body rotation, the eye can receive 720 million pixels for each eye, at 36b/pixel for full color and at 60 frames/s, amounting to a total of 3.1 trillion (tera) bits! Today's compression standards can reduce that by a factor of 300, and even if future compression could reach a factor of 600 (the goal of future video standards), that still means 5.2 Gb/s of network throughput (if not more) is needed (111).

The heavily constrained environments of immersive 3D video games at best provide experiences close to cinema standard visuals. But the results in the case of persistent, shared virtual worlds as in SecondLife, Minecraft, and Meta (Horizon Worlds) are at best cartoony.

According to the same article, quantum computing presents one solution to the data challenges of VR and AR:

Exploiting recent advances in quantum computing could enable this giant leap where certain calculations can be done much faster than any classical computer could ever hope to do. For VR, quantumness could be leveraged for:

- Bridging virtual and physical worlds, where the classical notion of locality no longer matters
- In terms of computation power, where instead of serial or even parallel computation/processing, quantum allows to calculate/compute high-dimensional objects in lower dimensions, exploiting entanglement and superposition (114).

To the chimerical nature of effective fully immersive VR add the possibilities afforded by emerging technologies. The authors of an article on the subject suggest that quantum computing offers the promise of much needed speed and parallel processing. From a computational point of view, the movement and behaviours of physical objects in the world do not behave as if following sequences of instructions, but operate in parallel.

a quantum computer has the power to create a virtual reality simulation indistinguishable from the original. This is due to the fact that, computation in a quantum universe is completely different from computation in a classical universe. Our universe is a quantum universe (2).

By several accounts, quantum physics offers mathematical models and theories that predict effectively the behaviour of certain elements in our world. Some quantum theories hold to the proposition that there are many worlds a multiverse. Others point to the inevitable entanglement of observer and the phenomenon under observation. If we occupy a quantum world, then a computer built on quantum principles would indeed hold promise for effective VR, which expands hope that we may yet accomplish the impossible by appealing to methods that are as yet impractical. See post: [Quantum Internet](#), [Parallel worlds](#), [Quantum entanglement for designers](#), and [Ultimate VR](#).

References

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