Form + Code - Ivan Sutherland

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CART 263
April 8th 2025

Ivan Sutherland is a US computer scientist and early computer graphics pioneer, most famous for the development of Graphical User Interfaces (GUI) and emerging theories of human computer interaction. He was born in 1938, and having exposure from his father's work as a civil engineer, he became fascinated in the inner-workings of technology, science, and psychology. Originally earning his Bachelors of Science in electrical engineering in 1959 and his masters in 1960, he notably worked on his PhD at MIT in 1963 where he created "Sketchpad": a program considered the precursor to CAD (Computer Aided Design) software. After his graduate degree he served in the National Security Agency as an electrical engineer, eventually being transferred to DARPA to run its division on information processing. During his time at DARPA in 1965, he wrote "The Ultimate Display", an essay which remains at the foundation for augmented and virtual reality as well as human computer interaction. This paper describes how we have become familiar with the world, and therefore have expectations for how it functions. It then proposes that technology can allow us to familiarize ourselves with concepts that exist outside that world. At the end of this essay he imagines an "ultimate display", a room in which a computer could control the very matter inside and have a real physical impact on your body as well as your psyche. Later on in 1968, having left DARPA and taken on a professorship at the University of Utah, he would create the first virtual/augmented reality headset jokingly named "the sword of Damocles". While being a primitive piece of hardware, the sword of damocles as well as the rest of Sutherland's work has a huge legacy within every vein of human-computer interaction, and continues to influence how we interact with technology to this very day.

Sutherland's most prolific project was most certainly Sketchpad, a program built on a military rader computer. Not only was Sketchpad the first application of both object-oriented programming and a Graphical User Interface, it also influenced our basic vocabulary and thinking about computer applications. Instead of being viewed as an extension of a piece of paper, a computer screen could now introduce new techniques that only a computer could perform. As Sutherland describes, he designed it as a computer that no longer simply followed instructions, but instead inspired humans to do things we wouldn't be able to otherwise. For example, he describes how one would have to have a clear idea of what they were drawing before sketching on paper, whereas one could sketch spontaneously with Sketchpad as it allowed the freedom to do so by reducing repetitiveness and introducing modularity. In a way, this made it the first "conversational" interface. Key features in Sketchpad that constructed this freedom were the ability to manipulate geometric shapes using a tool called a light pen (a modern day stylus) to make immediate and intuitive adjustments. You would then be able to align these objects to create parallel patterns and introduce consistency to your designs. Furthermore, features like a more primitive "copy-paste", magnification of up to 2000%, and layer merging were introduced with this program. Sketchpad revolutionized design and illustration practices by allowing users to save and access designs, giving designers access to a reusable library. It specifically had an impact on drawing processes that had repetitive elements, such as those found in engineering. Sketchpad was the very first piece of CAD software, introduced new programming approaches, established GUI, and fundamentally changed how we perceive and interact with computers. Unfortunately however, as it's the first application of object-oriented programming, it is responsible for the creation of Javascript. So maybe it wasn't all good.

Citations

Wardrip-Fruin, Noah, and Nick Montfort. "**Sketchpad: A Man-Machine Graphical Communication System**." In *The New Media Reader*, 109–27. Cambridge, Massachusetts: MIT Press, 2003.

"Ivan Sutherland." Massachusetts Institute of Technology. Accessed April 8, 2025. https://lemelson.mit.edu/resources/ivan-sutherland.

Ivan E. Sutherland. "**The Ultimate Display**". DARPA, 1965. https://worrydream.com/refs/Sutherland_1965_-_The_Ultimate_Display.pdf