**John D Carmack**

**Bio**

John D. Carmack was born on the 20th of August 1970 in Kansas, USA. He is a game programmer and a virtual reality programmer. He co-founded id Software with John Romero, Tom Hall and Adrian Carmack. Id Software made huge technological developments in video game tech for the PC, through games such as Wolfenstein 3D, Doom, etc. Their work was hugely important in the development of 3D computer graphics technology and in game engines that are heavily used throughout the industry. They were also heavily involved with the creation and popularisation of the first-person shooter genre. Carmack’s engines have also been licensed for use in other influential first-person shooters such as Half-Life, Call of Duty and Medal of Honor. Carmack is currently CTO at Oculus VR, probably the most well-known name in the growing and much hyped virtual reality tech sector. He was introduced to video games at a young age, playing the arcade classics such as Space Invaders and Pac Man. He attended the University of Missouri-Kansas City for two semesters before dropping out to work as a freelance programmer.

Eventually he was hired by Softdisk, a software and internet company based in Louisiana who produced disk magazines. They hired Carmack to work on Softdisk G-S, a publication for the Apple II. Working here introduced him to John Romero and other future id Software members. This team were later moved onto a bi-monthly gaming publication for the DOS platform. While still at Softdisk, Carmack, Romero and others created the first Commander Keen game, which was published by Apogee software using a shareware distribution model. Afterwards they left to form id Software.

While at id Software, Carmack was the lead programmer for the Commander Keen series, Wolfenstein 3D, the Doom series, the Quake series and Rage. In 2009 ZeniMax Media acquired the company. Carmack joined Oculus VR as their CTO on August 7, 2013, and in November he officially resigned from id software to work full-time at Oculus. His reason for leaving was because ZeniMax did not want to support the Oculus Rift.

Carmack’s role at both companies became integral to a ZeniMax lawsuit against Oculus parent company Facebook, where they claimed that Oculus stole ZeniMaxs virtual reality intellectual property. The trial jury absolved Carmack of liability, although Oculus and other corporate officers were held liable for trademark, copyright and other contract violations. In 2017, Carmack sued ZeniMax, claiming that the company had refused to pay him the remaining $22.5 million owed him from their purchase of id Software.

John Carmack is also a well-known advocate of open source software. He has released both the source code for Wolfenstein 3D and Doom, and has released the id tech 4 game engine as open source (the Doom 3 engine).

**Tech**

John Carmack is best known for his innovations in 3D computer graphics. He has pioneered and popularised the use of many techniques in computer graphics and video games, which are still in use today.

He created adaptive tile refresh for the Commander Keen series. This is a graphics technique specifically for sidescrolling games. PC graphics in the early 1990s wasn’t very good, and this technique compensated for its poor performance. The previous generation of PC graphics hardware did not have the ability to sidescroll in hardware, which meant that it had to be done in software by redrawing the entire screen every frame. Adaptive tile refresh reduced the computing power needed for sidescrolling games to within reach of the available hardware and thus made such games possible on PC. Its principal innovation was using several EGA hardware features to perform the scrolling in hardware rather than software, and it then also tracked the moving graphical elements to reduce the amount of redrawing done every frame.

Carmack also popularised the use of raycasting in video games with the game Wolfenstein 3D, where he was the lead programmer. Raycasting is the use of ray-surface intersection tests to solve problems in computer graphics and computational geometry. It uses a set of geometric ray tracing algorithms. These algorithms operate to render three dimensional scenes to two-dimensional images. Essentially Wolfenstein 3D (and other id Software games until the release of Quake) aren’t 3D, they are 2D faking 3D. The software at the time was not capable of rendering 3D that sophisticated, so they had to work around it. All the maps used in game are essentially 2D top down maps, which is how they are handled by memory. This technique finds where the player is on the map and their line of sight, every frame the game runs a ray clockwise through the players line of sight, drawing whichever walls it hits, and the height of the wall on screen is determined by the length of the ray when it strikes the wall, creating the illusion of depth. This is why in Wolfenstein 3D all walls are the same height, there are no stairs or multi floor maps.

He popularised the use of binary space partitioning (BSP) with the Doom and Quake engines. This is a method of recursively subdividing a space into convex sets by hyperplanes. This subdivision allows a representation of objects within the space with a tree data structure known as a BSP tree. The tree allows rapid access to spatial information about the objects in a scene that is useful in rendering. BSP trees are now often used by 3D video games, particularly first-person shooters with indoor environments. In games, BSP trees containing the static geometry of a scene are often used together with a Z-buffer to correctly merge movable objects such as doors and characters onto the background scene. For Doom, this technique was used with an efficient front-to-back rendering method, instead of the traditional back-to-front approach, and a special data structure to record parts of the screen that have been drawn and those yet to be rendered.

He also created a shadow volume technique for 3D graphics, commonly called Carmack’s reverse. He created this technique for Doom 3, for which he was lead programmer. Shadow volume is a technique used in 3D graphics to add shadows to a rendered scene. It was first proposed by Frank Crow in 1977 as the geometry describing the 3D shape of the region occluded from a light source. A shadow volume divides the virtual world in two: areas that are in shadow and areas that are not. The stencil buffer implementation of shadow volumes is generally considered among the most practical general purpose real-time shadowing techniques for use on modern 3D graphics hardware. The process of this technique is to; render the scene as if it were completely in shadow and then for each light source, construct a mask in the stencil buffer that has holes only where the visible surface is not in shadow and render the scene again as if it were completely lit, using the stencil buffer to mask the shadowed areas. The normal method for achieving this is call a depth pass method. The variation popularised by Carmack allowed the normal depth pass method to work for all camera positions by reversing the depth, instead of counting the shadow surfaces in front of the objects surface, the surfaces behind it can be counted just as easily with the same result. This solves a problem with the normal method where the eye is in shadow, since shadow volumes between the eye and the object are not counted, but introduces the condition that the rear end of the shadow volume must be capped, or shadows will end up missing where the volume points backward to infinity.

It's quite clear from all this that John Carmack is a hugely influential software engineer, and he has recognised for his achievements multiple times. He and id Software have been awarded two Emmys for technological innovation, he has won both the BAFTA Fellowship Award and the Game Developers Conference Lifetime Achievement Award, and has been named in multiple lists of the most influential people in computer gaming and tech.