

The History of Computer Graphics and Animations

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Abstract:

Computer graphics are creating and manipulating visual content using computers. It consists of 2D and 3D graphics, rendering techniques, and tools to generate images, animations, and interactive experiences. Ivan Edward Sutherland created the first computer graphic design in 1963 called Sketchpad. The process of taking sequential photos of drawings or models to give the impression that they are moving is called animation. Animations are breaking human boundaries by making it easy to depict fictional/fantastical worlds and worldly elements. Allowing us to break away from the grips of science and create unique fiction. Animations are now also a major part of the educational field as many schools are teaching students through CG and animations which makes learning much more fun and immersive. Due to their unparalleled visual experiences, computer graphics and animations have long since changed a wide range of sectors and communication. CG made it possible to create Japanese anime and cartoons for enjoyment. Incredible amazing effects, captivating environments, and distinctive characters in motion pictures and video games. Additionally, CG is greatly improving education by using interactive animations to make complex ideas look interesting and approachable. CG is used to create 3D models, visualizations, and data analysis. In more practical domains including engineering, medicine, and architecture. This improves diagnostics and decision-making increasing productivity. Computer graphics have made it possible to push beyond the limits of science, education, and creativity. CG has also encouraged innovations and fundamentally changed how we see and engage with the world. Their influence will only increase, creating a plethora of opportunities for mankind's future.

Keywords: Graphics, Animation, Models, Fictional, Rendering, Visual, CG (computer graphics).

Introduction:

Ivan Edward Sutherland, who is recognized as the father of computer graphics, invented Sketchpad, the first computer graphics program, in 1963. The primary purpose of Sketchpad was to create mechanical elements on a computer screen. Initially, you had to develop programs that interfaced directly with the graphic hardware to make basic computer-generated imagery of mechanical pieces. During the 1970s, a lot of "Graphic Libraries" were created to help with the problem of rewriting the software from scratch every time you worked on a new project. However, the majority of these libraries only worked on specific operating systems which were also an issue.

Thus, in the 1980s, ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION) initiated in creation of a standard CG library which was named PHIGS. It was claimed to be the final solution for creating Computer Graphics across all computer platforms. But it failed as not only did it provide a library of functions for creating 3D graphics it even specified how to store and organize your graphic data. Which all the programmers hated. Thus after many failed attempts to create a fast, efficient, and usable on many different platforms came GL and Open GL. Silicon Graphics a hardware company from the 1990s created GL(graphic library) and OpenGL the best and only real-time 3D graphic standard to be used across different variety of operating systems. GL and OpenGL are in use to this day. After GL and Open GL came OpenGL ES (2003) which could even run on some cell phones and WebGL (2011) as in its name is a javascript API (Application programming interface) made for rendering 3D CG and 2D CG which is compatible with every web browser and doesn't require any kind of plug-ins. Along with GL and OpenGL another well-known and widely used computer graphic standard was released in 1992, created by none other than Microsoft. The only issue with direct3D was that it could only be used on Microsoft Windows-based machines and some consoles.

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Computer Graphics:

As Computer graphics one of the biggest if not the biggest technologies that revolutionized the world also influenced the animation and filmmaking industries. Animation: The process of taking sequential photos of drawings or models to give the impression that they are moving is called animation. Émile Cohl who is also referred to as the father of animation created the world's 1st hand-drawn animation named the Fantasmagoria made in 1908.

From that point on animations have only evolved and kept getting better and better. Walt Disney and Roy O. Disney two brothers who founded an animation studio by the name Disney in 1923. In 1937 Disney released the world's 1st fully animated feature film which was a great achievement from the entertainment perspective. In 1995 Pixar's Toy Story marked a major milestone in the CG and animation industry as it was the 1st 3D animation movie. But animation wasn't an invention only to be used in the form of entertainment rather it was boundless. When CG was invented it also gave animation a big boost as now animations could also be used in movies where characters and the terrain were real and not hand drawn. Animations and CG didn't stop there as now they are being used in every possible field let it be Education, Architecture, Designing, Video games, Advertising and marketing, Medicine and healthcare, Aerospace and automotive, science and research, virtual reality, interior visualization, social and cultural, commentary, music, Simulation and training.

Entertainment and Education:

Animation is being used in every field possible, but it is highly used for Entertainment and Education. The childhood of new age kids have changed significantly as they are growing up watching cartoon and anime (used for animations specifically made in Japan) thus our current education system may bore them or may not seem interesting thus our education system is also picking up animations a way to teach children more effectively. With being immersive and interesting to watch animations can make even most complex concepts seem easy. As animations make learning more engaging and captivating for students especially the younger students it helps them learn in a more effective way. As its basic science that what you see stays in your memory longer than what you hear, animations make use of this basic knowledge to help students memorise difficult concepts with ease. While being engaging animations are also highly interactive as it allows students to participate in the learning process as they can manipulate and observe the outcomes of different experiments which deepen the understanding of the subject.

Literature Work:

Animation is playing a more and more important role in the classroom with the advent of computers. Lots of content have been developed for various disciplines or professional trainings. From picture galleries to complicated numerical simulations, animation provides us a complementary learning experience. The traditional education methods usually lacked effective approaches of illustrating an intuitional and clear content, while animation can compensate through the use of new software and hardware techniques. The most common animation content is developed by using either Flash or Java based technologies. From the perspective of animation application, there is more room in teaching in the classroom compared to other learning approaches.

Childhood has changed rapidly over the past few years and the methods that we use as teachers and educators of children and young people should reflect these changes. Children learn best and most when they enjoy what they are doing. Using animation as a tool to encourage and develop children's learning is not only fun but effective! Use of animation in special education has gained great attention recently. Therefore, the use of animation for helping individuals with special needs has become an important research question and this study aims to examine and discuss the role of using animation as a tool to enhance learning of individuals with special needs. This is a qualitative study in which document analysis was used to collect the data. Results revealed the trends in using animation in education and the benefits of animation for enhancing learning of individuals with special needs. This study tried to provide a comprehensive review on the effectiveness of using animation in education and discussed the existing and possible benefits of using animation for individuals with special needs. Results are discussed with relevant literature and recommendations for further research and practices are presented in the study.

The computer graphics and vision communities have dedicated long standing efforts in building computerized tools for reconstructing, tracking, and analyzing human faces based on visual input. Over the past years rapid progress has been made, which led to novel and powerful algorithms that obtain impressive results even in the very challenging case of reconstruction from a single RGB or RGB-D camera. The range of applications is vast and steadily growing as these technologies are further improving in speed, accuracy, and ease of use.

Motivated by this rapid progress, this state-of-the-art report summarizes recent trends in monocular facial performance capture and discusses its applications, which range from performance-based animation to real-time facial reenactment. We focus our discussion on methods where the central task is to recover and track a three dimensional model of the human face using optimization-based reconstruction algorithms. We provide an in-depth overview of the underlying concepts of real-world image formation, and we discuss common assumptions and simplifications that make these algorithms practical. In addition, we extensively cover the priors that are used to better constrain the under-constrained monocular reconstruction problem, and discuss the optimization techniques that are employed to recover dense, photo-geometric 3D face models from monocular 2D data. Finally, we discuss a variety of use cases for the reviewed algorithms in the context of motion capture, facial animation, as well as image and video editing.

Basic competence in research methods and statistics is core for many undergraduates but many students experience difficulties in acquiring knowledge and skills in this area. Interest has recently turned to serious games as providing engaging ways of learning. The CHERMUG project was developed against this background to develop games to support students in learning about research methods and statistics. As a first step in designing the CHERMUG games a narrative literature review was carried out to establish whether similar games, animations and simulations already existed. Search terms used in the literature review included varied terms for digital games, simulations and animations, terms relevant to the twin goals of learning and engagement in games and terms for research methods and statistics. Application of the inclusion criteria led to 26 papers which were considered relevant. Synthesis of the papers suggested that there is reason to be optimistic that a game-based approach might be effective in learning in this area.

Computer Graphics is one of the most important, far-reaching, sophisticated, and glamorous endeavors of the computer field. It can be useful to every discipline that employs to advantage the computer. At the present time it is available for all the major computer areas—input, output, programming, and debugging. Whence did it originate? Exactly what is it and how can it be used? What are its future trends? These questions are considered in this article which divides Computer Graphics into two main divisions—passive and interactive. This article describes the most popular subdivisions of passive graphics—microfilm recorders and plotters—in detail. Computer Animation and Computer-generated movies as well as the main types of display devices are included under interactive graphics. This survey article considers the history of all the main types of computer graphics; discusses the typical hardware and main attributes as well as the advantages and disadvantages of each type; presents a section on computer-aided design, and a section on computer graphics professional groups and societies; and in its conclusion indicates some of the pitfalls of this powerful computing tool.

Future Scope:

There are already many new applications of computer graphics and animations, new world changing technologies like VR (Virtual reality), AI (Artificial Intelligence), Machine learning through AI have already been invented. These new technologies will only keep on evolving further and someday will also achieve realism. Web and mobile graphics which are heavily dependent on animations and graphics will become more engaging. The gaming industry which is the fastest growing industry heavily using animations and graphics will continue to push human boundaries creating more realistic and improved experiences for the masses. CG and animations will also keep advancing in the Medical and scientific fields. The day isn't far when you will be able to customize your own house or office using Computer graphics. Animations and CGI will touch new heights going further beyond than human comprehension becoming much more immersive and intruding to watch cartoons and anime.

Conclusion:

Throughout the history of computer graphics and animations, we have witnessed a remarkable journey from starting to only help in a singular field to transforming into a technology that is used in every field known to mankind. From the early years of the 1960s pioneers like Ivan Sutherland laid the groundwork for computer graphics. As the technology advanced the capabilities of computer graphics also grew. In the 1970s we saw the emergence of 2D animations. In 1995 we saw the 1st 3D animated movie. As of today CG and animation aren't just bound to entertainment but have also been very omnipresent in other fields like education, science, and architectural industries. They have revolutionized our very way of thinking and perspective toward tech, communication and even learning complex concepts. In all Computer graphics and Animation will be opening new horizons for human kind. As the world keeps evolving the dream of a digital world may not be as far as it seems.

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