

Request for Feedback on the Graphics and Interactive Techniques Knowledge Area of the Draft Computer Science Curricula 202X (CS202X)

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Abstract

Computer science curricular guidelines have been published since 1968. A steering committee comprised of members of ACM, IEEE, and AAI began work in Spring 2021 to produce the next set of guidelines for undergraduate computer science programs, currently referred to as CS202X. Unsurprisingly, the graphics and visualization knowledge area has substantively changed and expanded during the ten years since the most recent set of guidelines was published in 2013. In the current revision, we have expanded the number of knowledge units—which are the topical subdivisions of the knowledge area—and renamed the knowledge area Graphics and Interactive Techniques to align with premier graphics conferences: e.g., Eurographics, SIGGRAPH, and SIGGRAPH Asia. The first draft of the new guidelines was announced at the SIGCSE Technical Symposium in March 2022. We seek feedback from the Eurographics community on the Graphics and Interactive Techniques knowledge units: Fundamental Concepts, Basic Rendering, Geometric Modeling, Computer Animation, Visualization, Advanced Rendering, Immersion (MR, AR, VR), Interaction, Image Processing, Tangible/Physical Computing, and Simulation.

CCS Concepts

•**Social and Professional Topics** → Computing / Technology Policy → Computing Education Programs → Model Curricula

1. Introduction

CS202X is the latest in a series of undergraduate computer science curricular guidelines. ACM published the first guidelines in 1968 [AC68]. IEEE began collaborating in the effort in 1991 [TA91]. The latest guidelines were published in 2013 [AI13], which were themselves revisions of earlier guidelines [CC08] [JT02]. CS202X marks the addition of a third collaborating partner—the Association for the Advancement of Artificial Intelligence (AAAI). The Graphics and Interactive Techniques Subcommittee consisting of Amruth Kumar (Ramapo College), Dave Shreiner (Unity Technologies), Erik Brunvard (University of Utah), Jeff Lait (SideFX), Kel Elkins (NASA), Ken Schmidt (NOAA NCEI), Paul Mihail (Valdosta State University), Susan Reiser (UNC Asheville), and Tabitha Peck (Davidson College) requests feedback on the draft CS202X curricular guidelines.

2. Background

Traditionally, graphics at the undergraduate level focused on rendering, linear algebra, physics, the graphics pipeline, and phenomenological approaches. At the advanced level, undergraduate institutions are increasingly likely to offer one or more courses specializing in graphics and interaction: e.g., gaming,

animation, virtual and augmented reality, visualization, and tangible computing. In order for students to become adept at the use and generation of computer graphics, many implementation-specific issues must be addressed, such as human perception, data and image file formats, hardware interfaces, and application program interfaces (APIs). In response to rapid advances in technology, the graphics and interactive techniques section of CS202X attempts to avoid being overly prescriptive in order to remain relevant for the expected ten-year life of the document. Where particular APIs or languages are mentioned, they are noted as examples relevant to 2022; in effect, a snapshot in time. With a balance of theory and applied instruction, computer science students who learn content from the included knowledge units should be able to understand, evaluate, and implement the related material as users and developers.

Graphics as a knowledge area has expanded and become more pervasive since the CS2013 report. There are many reasons for this growth. The now ubiquitous mobile phone has made the majority of the world's population regular users and creators of graphics, digital images, and immersive and interactive techniques. Advances in technology allow animations, games, visualizations, video editors, and immersive applications that in 2013 had to run on desktops, to now run on mobile devices. Additionally, the amount of data grew exponentially since 2013, and both data and visualizations are now published by myriad sources including news media as well as

scientific organizations. Revenue from mobile video games now exceeds that of music and movies combined. Computer Generated Imagery (CGI) is employed in almost all films.

In an effort to align CS2013's Graphics and Visualization knowledge area with premier graphics conferences such as Eurographics, SIGGRAPH, and SIGGRAPH Asia; we have renamed the knowledge area Graphics and Interactive Techniques (GIT). We retained all of the original knowledge units: Fundamental Concepts, Basic Rendering, Geometric Modeling, Advanced Rendering, Computer Animation, and Visualization. To keep up with the expanding footprint of the field, the following new knowledge units have been added to the draft: Immersion (MR, AR, VR), Interaction, Image Processing, Tangible/Physical Computing, and Simulation.

1. Conclusion

The CS202X Graphics and Interactive Techniques draft was developed by a subcommittee consisting of both industry and academia representatives and was first presented 3 March 2022 at SIGCSE [KA22] in Providence, Rhode Island, USA. Both the CS202X Steering Committee and the Graphics and Interactive Techniques Subcommittee request feedback from the Eurographics community on the draft curricular guidelines.

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