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Reference letter for Philip Carr

From: Prof. Alan H. Barr, Computing and Mathematical Sciences

Dear Reader,

It is my pleasure to write a strong reference letter for Philip Carr, a Caltech undergraduate who graduated last year in Computer Science. I was Philip's undergraduate advisor, his professor in a number of courses, and also was his supervisor in several independent research projects that he chose to undertake, where he selected the topics. He is most interested in programming for Computer Graphics and GPU applications, but he has many other skills in addition.

Philip is thoughtful, energetic, creative, proactive and diligent, communicates well, and expresses an enthusiasm that makes him a pleasure to interact with. He is independent and gets things done, but does not hesitate to ask for help or clarification, when this is needed.

I first met Philip in a Computer Graphics class that I teach. Through his coursework, he demonstrated proficiency in computer graphics software implementations, including ray tracing, graphics debugging, and relevant math/physics principles of computer graphics, such as simplectic (energy preserving) integration of differential equations for physical simulations. He then went on to take a GPU (Graphics Processing Unit) Programming course with me, where he demonstrated proficiency with CUDA programming concepts, GPU algorithms, and implementations in CUDA, including a GPU project of his own undertaking. He then took a Computer Graphics Project course with me, where he developed substantive CPU and GPU implementations for triangle mesh scene ray tracing, as well as an implementation of cel shading for triangle mesh scenes.

He then went on to undertake several additional independent projects, with me as supervisor, with weekly meetings to discuss progress. In the first, he chose and developed an implementation of the illustrative rendering process used in Team Fortress 2, based on a paper that appeared in The 5th International Symposium on Non-Photorealistic Animation in 2007 (detailed in Mitchell et al 2007). This work utilized a combination of cel shading, texture-mapped diffuse lighting, and rim lighting to produce a stylized scenes for triangle mesh scenes. In a subsequent project, he developed a 2-dimensional heightmap project (triangle mesh sheet oriented along the xy-plane) with given time-dependent height functions of spatial variables (e.g. $h = f(t, x, y)$).

Finally, he took a reading course with me, where he read and in weekly meetings we discussed a wide variety of computer graphics research papers. He explored the history of the Computer Graphics field starting around 1973, where we discussed several of the key developments such as distributed ray tracing in 1984, the rendering equation in 1986, etc., as well as more recent and

cutting-edge developments in computer graphics such as progressive photon mapping in 2008 and incrementally backed global illumination in 2019, etc.

For these projects, the two of us had weekly meetings and discussions, so I have had a good deal of direct interaction with him, with productive and informative meetings. As a result, I am very comfortable with writing a strong reference letter for him.

Philip's thoughtful nature, along with his communication skills, his energy, creativity and proactive diligence, made these meetings productive and useful. I saw weekly live demos of his computer graphics algorithm programming work and his weekly progress for the projects, as he made additions and alterations to the code he was writing. These attributes, along with his habits of being independent and getting things done but without hesitating to ask for clarifications as needed, will serve him very well in the future.

Based on this set of experiences, I recommend him most highly.

Sincerely,

Alan H. Barr
– Fellow of the ACM
– ACM SIGGRAPH Achievement Award
– Elected as Member of ACM SIGGRAPH Academy
Professor of Computer Science, Computation & Neural Systems, Caltech