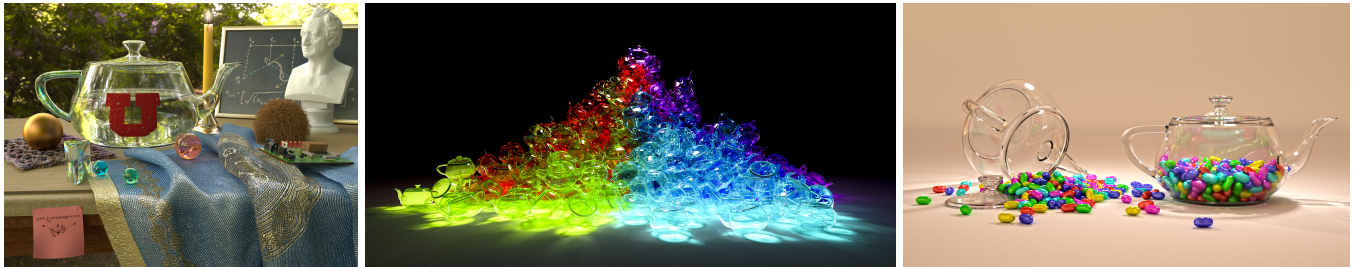# Teapot Rendering Competition

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Ian Mallett (TRC 2017 winner)   Laura Marie Lediaev (TRC 2015 winner)   Laura Marie Lediaev (TRC 2014 winner)

Figure 1: *Winners of a few Teapot Rendering Competition events at the University of Utah.*

CCS CONCEPTS

• **Computing methodologies** → **Ray tracing**;

KEYWORDS

Ray tracing, course assignment, competition, Utah teapot.

1 INTRODUCTION

Teapot Rendering Competition (TRC) is the final assignment of the graduate-level "Ray Tracing for Graphics" course at the University of Utah. In this course, students develop their own renderers using ray tracing, following a series of assignments throughout a semester. This final assignment gives students a chance to explore the kind of visually-appealing images they can produce using the renderers they develop and share them with their classmates and the local community. Examples of award-winning images from Teapot Rendering Competition events are shown in Figures 1 and 2.

2 COURSE DETAILS

"Ray Tracing for Graphics" is a semester-long course that covers the fundamentals of rendering in the context of ray tracing. It is a project-heavy course, in which students implement their own renderers starting from scratch. The course meets twice a week for lectures and almost every week includes a new project deadline. Each one of the 13 assignments in this course is designed to assist students to implement new features into their renderers. Starting

Table 1: *Metadata in tabular format.*

Summary	Rendering competition of scenes designed and rendered by students using their own renderers
Learning Outcomes	Students learn to present their images and the rendering features they implemented
Classification	Rendering
Audience	Both graduate and undergraduate students
Dependencies	Renderer programming knowledge
Prerequisites	Builds on all prior assignments in the class
Strengths	Students enjoy presenting their work
Weaknesses	There is limited time for preparation
Variants	Unlimited design options for the scenes
Assessment	Technical capabilities and esthetics

with simple ray-sphere intersection, the project assignments cover a range of fundamental topics, from the basics all the way to global illumination methods.

Students complete all of these projects within the span of 15 weeks, including a week-long semester break in the middle. Students are highly encouraged (but not required) to use C++ for their implementations. A substantial amount of C++ source code is given with each project assignment, including basic classes for vector and matrix algebra, storage classes for rays, hit information, camera parameters, and scene data, and base classes that define interfaces between various components, such as scene objects, lights, and materials. However, students are *not* given a full renderer code with missing pieces that they are asked to fill in. The source code included with each project assignment is designed to make it easier for students to implement the project by concentrating on the core rendering components of the assignment and to ensure that students use a proper code structure, such that they can continue to build on their implementations by adding new features throughout the semester. Students must develop the core structure of their renderers, thus learning the basics of renderer design, in addition to implementing all core rendering features. Therefore, students can rightfully claim ownership of the renderers they develop, even

Justin Alain Jensen (TRC 2017)   Nathan Vollmer Morrical (TRC 2017)   Ian Mallett (TRC 2014)   Venkata Kushal Ponnam &Victor Castro (TRC 2015)

Figure 2: *Example award winners from Teapot Rendering Competition events.*

though their implementations typically contain substantial amount of code that is given to them.

Lectures also include detailed discussions of previous project assignments, which help students discover and fix any problems with their implementations. Nonetheless, even with the help of the source code provided with each assignment and the discussions during lectures, completing a full renderer within 15 weeks is not a simple task. Therefore, during the semester, students typically do not spend much time exploring the kind of images they can produce with their renderers. One of the fundamental goals of the final project is to give students a chance to produce something new and interesting with their renderers and truly enjoy what they have accomplished.

3   REQUIREMENTS

Teapot Rendering Competition is the final project of this course. Unlike other projects in the course that require specific features to be implemented, the final project does not include any software development requirements, thought students are free to improve their renderers. What is required is that they design an original scene and render it with their own software. In particular, the final project has the following three simple requirements:

1. The scene must be original.
2. It must contain at least one visible Utah teapot model.
3. The images/videos must be generated using the renderer developed by the student.

Students are instructed to design a scene that demonstrates the technical capabilities of their renderers, but there are no requirements regarding the specific features they should present. External assets are permitted, as long as there are no copyright violations.

Since students must use their own renderers, TRC can be considered a programming competition. However, during the competition students present the original images they design and render, not their code. Therefore, TRC can also be considered an art competition. Nonetheless, the main goal of the competition is to enjoy the process of rendering visually-appealing images and sharing them with others.

4   PARTICIPATION

Because this competition inherently contains a substantial art component and most students taking the course do not have a strong art background, collaboration with others is permitted and highly

encouraged. There are no restrictions about the collaborators students can choose, as long as the images and videos presented in the competition are original and rendered using the software developed by the student.

The competition is also open to students who have taken the course in past years. After students have taken the course and developed their renderers, they can participate in the future competitions. Students presently taking the course, however, are required to participate.

Allowing students from previous years to participate in this competition may give them an unfair advantage. After all, students presently taking the course have a very limited time to prepare for the competition, as it takes place a little over a week after the previous project assignment deadline. Students from previous years, however, have much more time to prepare for the competition. Yet, students presently taking the course can also enjoy the same unfair advantage, if they decide to participate in the following years. This brings students, who have taken the course over multiple years, together, and gives them a chance to enjoy each other's efforts. It also allows students who wish to have more time to prepare for the competition to get this chance in the upcoming years.

5   COMPETITION

During the competition students are given a limited time to present their images and videos to an audience of students, faculty, and local graphics professionals and enthusiasts. They tell the stories behind the scenes they have designed and highlight various features of their renderers that are needed for generating the visuals they present.

The competing pieces are judged separately by a jury of professors and computer graphics professionals, students presently taking the course, and all members of the audience, resulting in three categories of awards: *Juror Choice Awards*, a *Student Choice Award*, and an *Audience Choice Award*. The *winner* of the competition is chosen by the jury. If the winner is not a student who is presently taking the course, a *Best in Class Award* is given as well.

6   CONCLUSION

Teapot Rendering Competition is a festive event that brings together people of all ages who enjoy computer graphics, commemorating the famous Utah Teapot with dazzling visuals. It is certainly the highlight of the course and one of the important events of the year for people who attend it regularly. Therefore, the competition is held even when the course is not offered.