

A Python Graphics Package for the First Day and Beyond

Michael H. Goldwasser
Dept. Mathematics and Computer Science
Saint Louis University
220 North Grand Blvd
St. Louis, Missouri 63103-2007
goldwamh@slu.edu

David Letscher
Dept. Mathematics and Computer Science
Saint Louis University
220 North Grand Blvd
St. Louis, Missouri 63103-2007
letscher@slu.edu

ABSTRACT

We demonstrate the use of a new Python graphics package named `cs1graphics`, while discussing its impact on pedagogy and showcasing the recent work of our students. Our package was originally developed with two goals in mind. First, we insisted that it be intuitive enough that students can sit down and make use of it from the very first day of an introductory class. Second, we wanted to provide seamless support for intermediate and advanced lessons as students progress. The resulting package is freely available at www.cs1graphics.org. We find its combination of simplicity and functionality unmatched by existing packages.

Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education—*computer science education*;
I.3.4 [Computer Graphics]: Graphics Utilities—*graphics packages*; D.1.5 [Programming Techniques]: Object-oriented Programming

General Terms

Design, Human Factors

Keywords

CS1, Python

1. INTRODUCTION

In 2005, we redesigned our CS1 course using Python as the instructional language. We wished to include an object-oriented graphics unit and were faced with selecting a package. The standard industrial package for Python is Tkinter, which is a wrapper for the Tcl/Tk widget set; we did not consider this suitable for direct use in our course. Guzdial's library [1] is not object oriented, and Zelle's module [2] lacks valuable functionality common to more established pedagogical libraries (typically in Java).

Faced with creating a package from scratch, we took the opportunity to develop a design that graciously borrows our favorite features of existing systems while supporting new functionality that we desired. Our fundamental goal was to achieve a design that is simple enough to use from the very first day, yet rich enough to provide a scaffold for more

advanced lessons. Our criteria for simplicity is that a student can sit down and create interesting images with only the most modest preliminary coaching. Among the intermediate and advanced lessons that the graphics enable are object-oriented principles, flow of control, container classes, inheritance, recursion, and event-driven programming. Yet we insist that the support for these lessons be provided in a way that does not adversely impact the simple interface used on the first day.

With this presentation, we wish to announce the availability of the package and to describe its support of pedagogy. The package is an object-oriented Python module named `cs1graphics`, available at www.cs1graphics.org. We believe its simplicity makes it a valuable tool for students in a CS0 or CS1 course, for high school students, and even for an enthusiastic ten-year old.

2. OUTLINE OF DEMONSTRATION

- The First Day (ease of use)
 - Basics of object orientation
- Showcase of animations created by our students
- Composition with the Layer Class
 - Modeling and design
 - Frames of reference
- Computer Graphics Principles
 - General Transformations
 - Double Buffering
 - Painter's Algorithm
- Extensibility Through Inheritance
 - Showcase of our students' later work
- Events and User Interaction
 - Event-driven programming

3. REFERENCES

- [1] M. Guzdial. *Introduction to Computing and Programming in Python: A Multimedia Approach*. Prentice Hall, 2005.
- [2] J. M. Zelle. *Python Programming: An Introduction to Computer Science*. Franklin, Beedle & Associates, 2003.