



Florida International University

Spring 2024 Senior Design Project

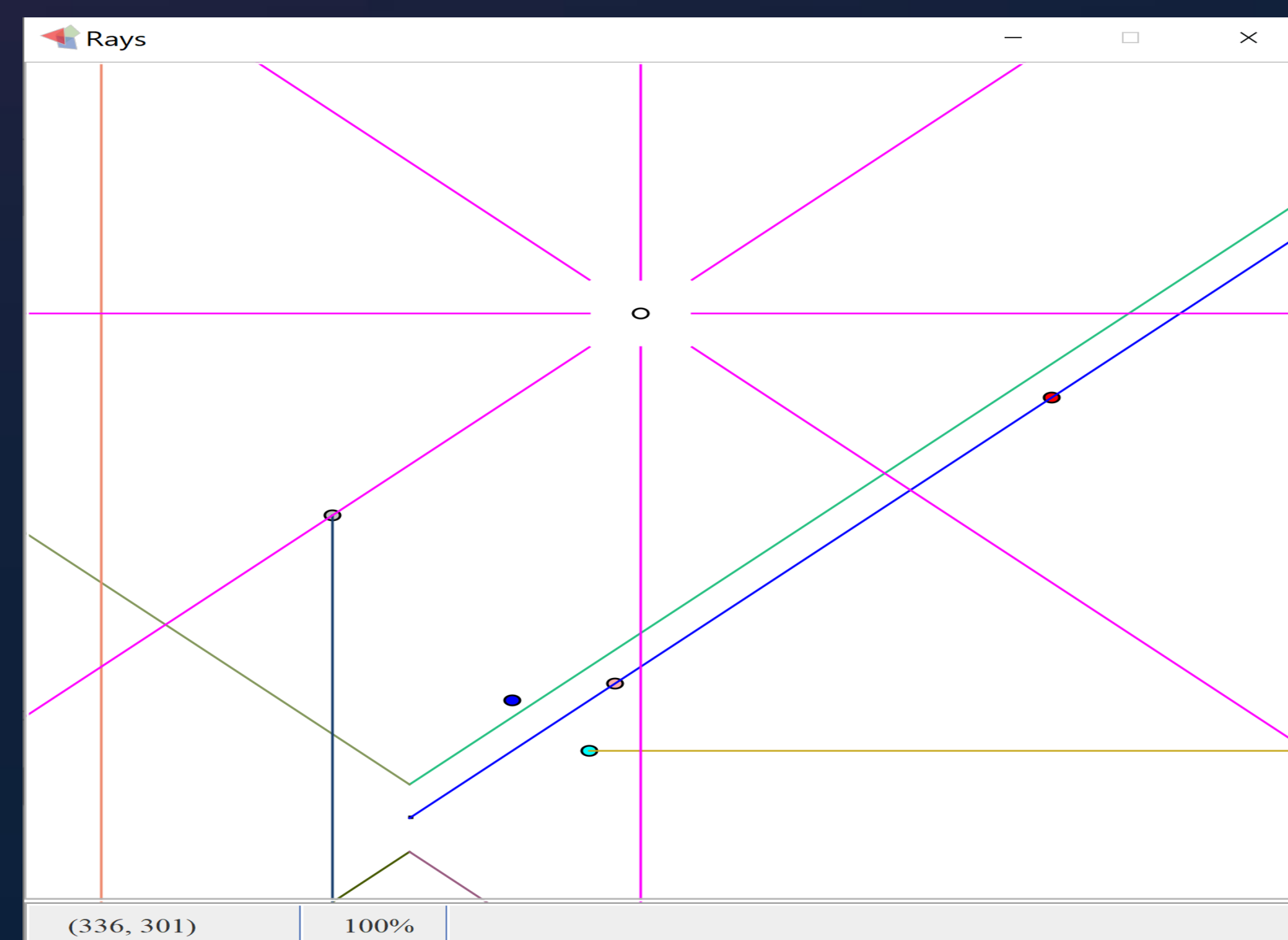
Geometric Visualization Tool

**Knight Foundation
School of Computing
and Information Sciences**

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PROBLEM

This tool addresses the critical need for efficient visualization development and the availability of geometric data structures and algorithms (DS&A) in Java. It is designed to streamline the design, implementation, and testing of geometric DS&A in both individual and group settings. By leveraging the CGAL library's capabilities, it also simplifies processes by allowing the bypass of C++ data through text files, thus requiring only one group member's involvement. Moreover, it enhances CGAL's robust algorithms by providing essential visual information for further processing.



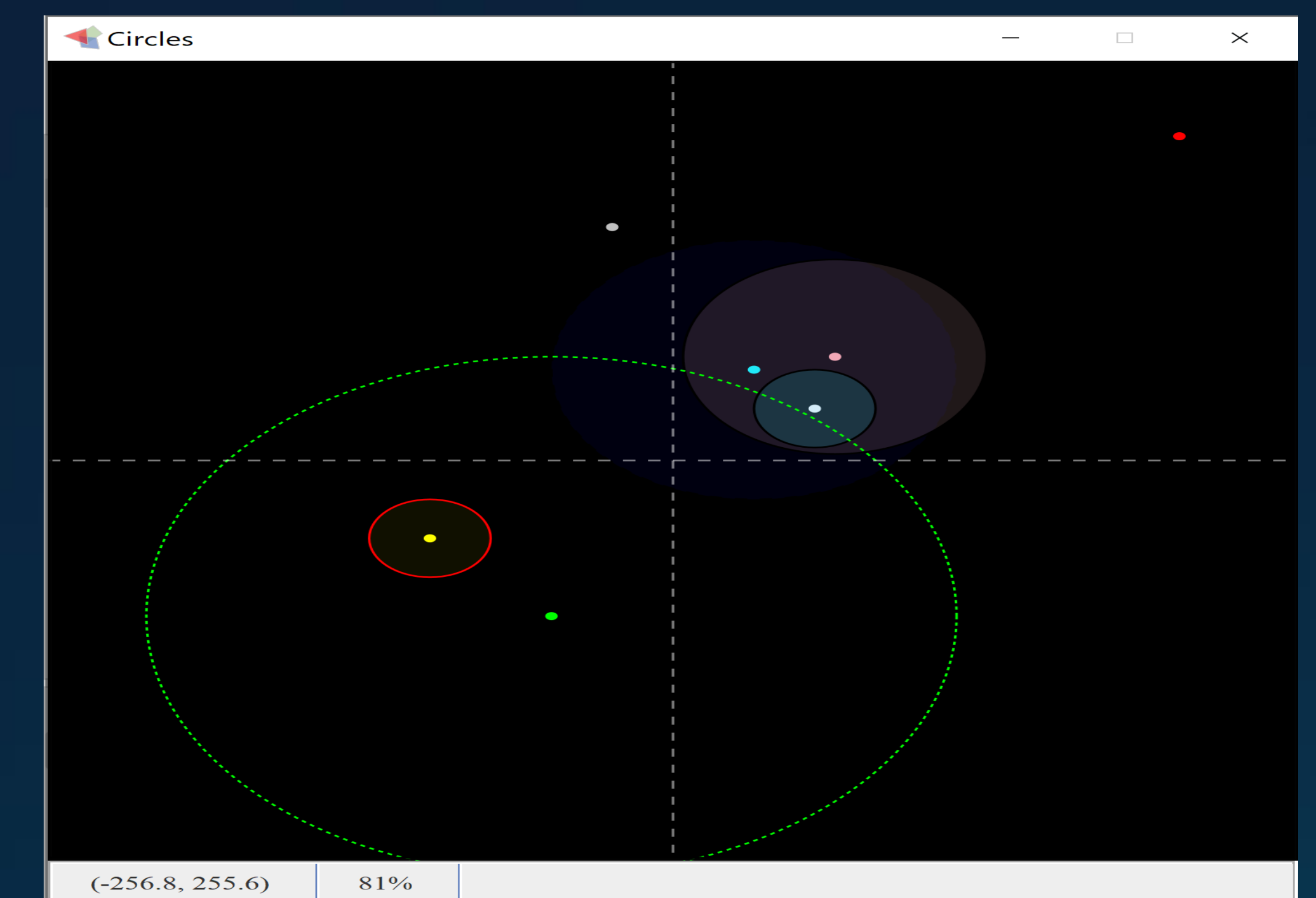
CURRENT SYSTEM

The system framework integrates the CGAL library and Java JAR library for visualization, equipped with classes and interfaces that standardize viewing windows and outputs, but it requires correct Cmake configuration and arithmetic libraries to function on the C++ side. The Geo2Util utility enhances this setup by offering export and import functions for eight types of 2D geometric objects—points, segments, circles, triangles, rectangles, polygons, lines, and rays—and provides methods to convert these into string representations with customizable visual properties such as boundary color and type. This capability allows C++ users to design objects with preferred aesthetics, while Java users can use the data for further enhanced visualization, maintaining consistency with the system's standards.



IMPLEMENTATION

The Geo2Util utility library facilitates the implementation of export functionality on the Java codebase side of the program. The system design revolves around a loop structure that necessitates robust export/import capabilities for operational integrity. This is achieved through the `exportGeomObject` method, applicable to all geometric object types via overloading. Objects are converted into strings, incorporating visual properties like boundary color, type, and interior color, and stored for subsequent processing. Exported data is handled in a text-based format, ensuring that the subsequent import process selectively discards visual information to retrieve pure geometric data. This entire process is rigorously tested in a final class setup to ensure effective data handling and manipulation across all phases.



REQUIREMENTS

C++, CGAL Library, and Java



CGAL

SUMMARY

In this project, my primary role was to develop the C++ utility library, Geo2Util, using CGAL algorithms to create and manage geometric data with visual details for Java visualization. This tool supports exporting and importing visual data, enhancing Java's ease of use while optimizing geometric computations. I initially had issues installing and utilizing CGAL on my personal device and so I focused on learning about Java development for file and data handling aspects, focusing on abstract string export methods and their overloading for diverse objects and refactoring the code my teammates produced.

REFERENCES

<https://www.cgal.org/>
<https://docs.oracle.com/javase/8/docs/api/java/awt/Graphics.html>



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ACKNOWLEDGEMENT

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