

Criterion A- Planning

Defining the Problem

The client is a group of IB Further Math students trying to understand the Chinese remainder theorem. The students and I are studying discrete math, and struggle to understand the Chinese remainder theorem and its applications on a deeper level. Because it has many layers of abstraction, a visualization would help us understand it. We could not, however, find a visualization of the algorithm on the web or in textbooks.

Upon consulting with other students, I suggested that I create the visualization myself to help all of us understand the underlying principles of the theorem better. The Chinese remainder theorem deals with congruences in modular arithmetic, so representing modular numbers will be key. The problem is to effectively demonstrate the workings of the theorem using an example problem.

Rational for Solution

Through visualization, I have been able to understand other concepts, such as vectors, much better. I created a small 3d environment in Racket in order to do this. By writing a lecture and creating the visualization presentation, I hope to help many students taking discrete math to understand the Chinese remainder theorem. Visualization accompanied by verbal lecture is very effective. For this reason, many professors are adopting flipped classrooms, in which lectures are watched independently by students, and workshops are done in class.

The application is to be coded in Java because Java deploys to many platforms easily due to the prevalence of the JVM. In addition, Java is a strongly typed language and this may help prevent bugs. The highly structured nature of Java code will be beneficial to this kind of presentation.

Success Criteria

1. Functioning presentation and completion of Chinese remainder theorem applied to an example problem.
2. Successful representation of modular numbers in
 - a. Mathematical form
 - b. Visual form
3. Representation of solutions in different moduli to check solutions.
4. Inclusion of notes that help the audience understand steps to solving the example problem.