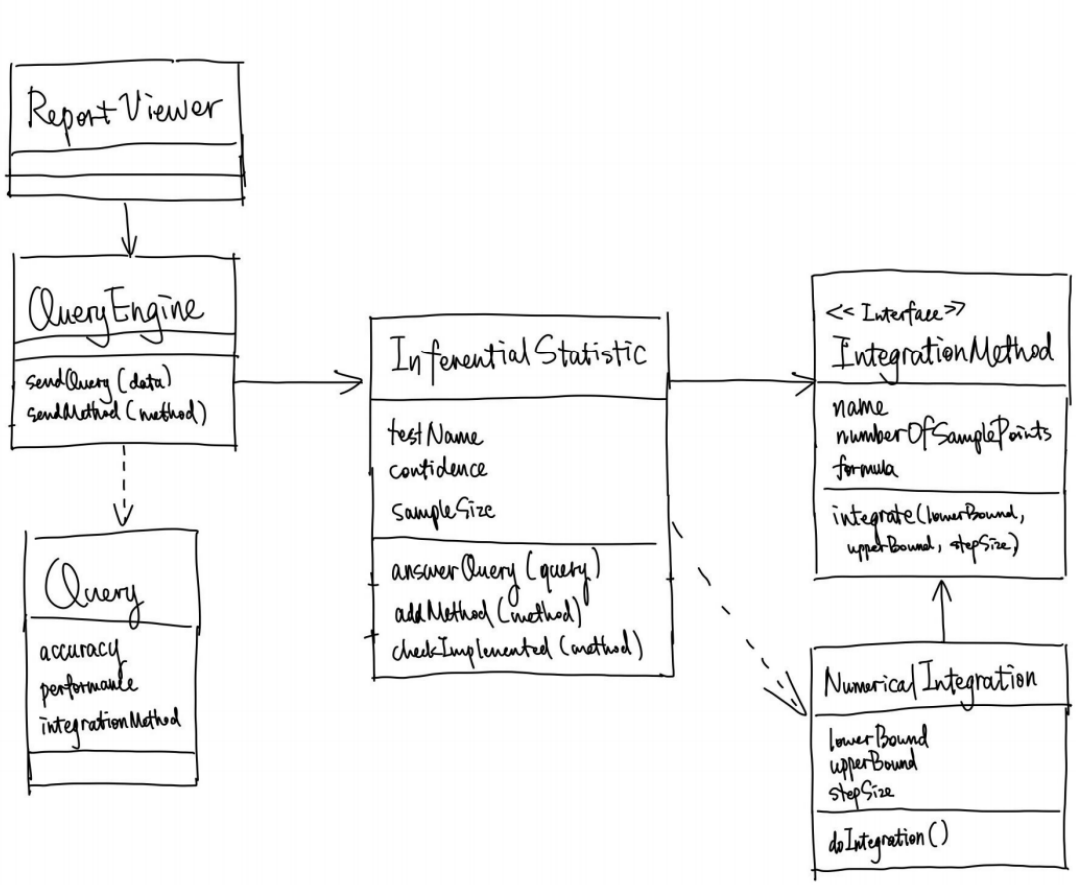
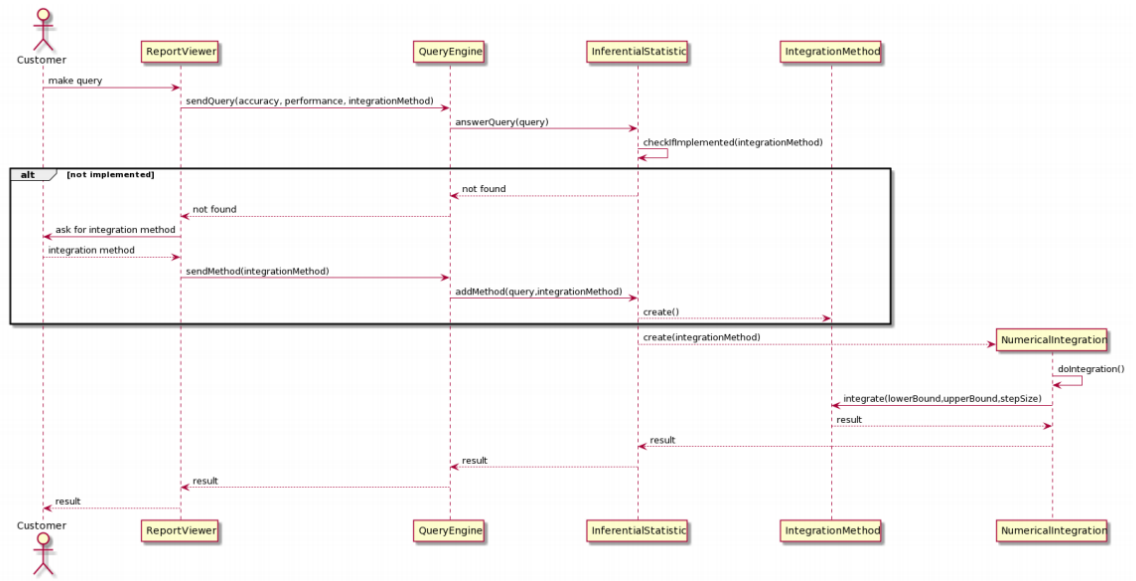
Part 1 Peer Review

Date -- 4/29/2020

Final Class Diagram



Final Sequence Diagram



Discussion

To what extent did the peer's design function?

It functioned, but required a decent amount of change on my end to get it to work. There were a couple issues that would have caused compile errors; the interface had fields in it and there needed to be parameters passed into the integrationMethod(). Additionally, there was no main method, so I was confused on where the program would actually start. Lastly, there were no actual implementations of the IntegrationMethod interface. These were all minor issues that I was able to fix, but it did require a fair amount of code to be changed from the initial class diagram. Once fixed, the deisgn functioned well.

To what extent did the design favor composition over inheritance?

The initial design didn't favor composition over inheritance for a simple reason; there were no actual implementations of the IntegrationMethod class. If there were implementations of IntegrationMethod, then it would have favored composition over inheritance. If you considered the implementations that I put in to get the design to function, then it id a good job favoring composition over inheritance. It only used the IntegrationMethod interface implementation to do the individual integrations.

To what extent did the design program to interfaces?

The design did a good job programming to interfaces. It used the IntegrationMethod interface to hold the integrate() method, and the NumericalIntegration class had a reference to that interface. One small issue was that the design gave the interface some fields, which is wrong, so I removed them.

To what extent was the design loosely coupled? Were there any trainwrecks?

Yes, this design is loosely coupled. There are a few dependencies between NumericalIntegrtaion and the actual implementations of the IntegrationMethod interface, but this is expected. There are certainly not any unnecessary dependencies or associations between any class or interfaces, and there were no trainwrecks.

To what extent was the design cohesive? Did it violate Single Responsibility Principle anywhere?

The design was very cohesive. Both the NumericIntegration class and the IntegrationMethod class have **only one reason to change.** They both carry out one responsibility and demonstrated high cohesion. Additionally, each IntegrationMethod implementation had one integrate() method to properly perform it's respective integration method, and a getName() method to simply return the actual name of the integration type.

Was there anything that your peer’s design/notebook lacked that would have made life easier for you?

Yes. I don't think it was necessary to include the classes that were not related to the actual Numeric Integration layer of the architecture. Additionally, there should not have been fields inside of the interface. Finally, it would have been easier to understand if there was at least one concrete implementation of the IntegrationMethod, as it took me a few tries to really wrap my head around what the design intended.

In retrospect: was there anything that your notebook was lacking that would have made life easier for someone else?

Yes. I probably should have noted that my ConcreteImplentations of the IntegrationMethod were not actually going to be the real concrete implementations, they were just there to be placeholders.

Time Spent - 3 hours (includes implementing the actual design)

Part 2 Decorator

Date -- 4/30/2020

Candidate Design 1

For my first candidate design, I propose that we give the IntegrationMethod interface an abstract decorator called **IntegrationDecorator**. That abstrct decorator will have one concrete Decorator implementation, called AreaUnderTheCurveDecorator. In the AreaUnderTheCurverDecorator's integrate method, it will call Math.abs(integrate()), so that the integrals are properly calculated to consider negative regions.

Pros

This approach will do a very good job of **adding additional responsibilities to an object dynamcially.** Additionally, this design will allows us to add on additional functionality to our integration methods in the future. Also, we don't have to change **any existing code** to add on this decorator. Overall, it gets the job done with out touching the existing code.

Cons

We will have to add additional an additional dependency between the NumericanIntegration class and the actual AreaUnderTheCurveDecorator. Also if this ends up being our only additional functionality added to the IntegrationMethod, than this would be an overall design decision, and you could simply override the integrate method in another class to do the job with less code. However, it is likely that the design will in fact change in the future, and so I believe the pros outweight the cons.

Candidate Design 2

For the second candidate design, I propose we could give the NumericalIntegration class a decorator. This would allows us to modify the fields within the class if we wanted to change the step sizes or the bounds of integration. Additionally, we could modify our NumericIntegration class and allow if to have an option for absolute values, and then we could in that functionality with our decorator.

Pros

The pros to this approach are almost identical to the pros for the Candidate Design 1. The only different pro is that this approach will be able to add is the fact that we are going to decorate the doIntegrate() method instead of the integrate() method inside of the IntegrationMethod interface. This approach also does a good job of **adding additional responsibilities to an object dynamcially.** We also have access to change more variables; namely the step size and bounds of integration.

Cons

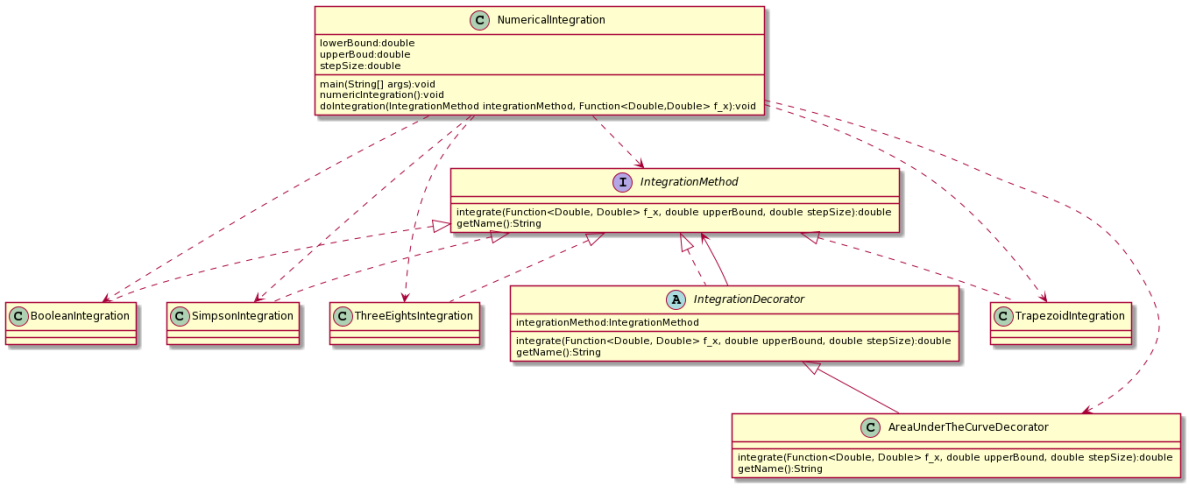
Again, this adds additional dependencies into our system. However a larger con is that this does not end up changing the functionality of the integrate() method. Instead, it more focuses on **changing the bounds of integration**. This would make it much more difficult for the client to properly set the bounds and step size to accurately get the area under the curve. Additionally, this will require us to **change the existing code,** which is very undesirable.

Preference

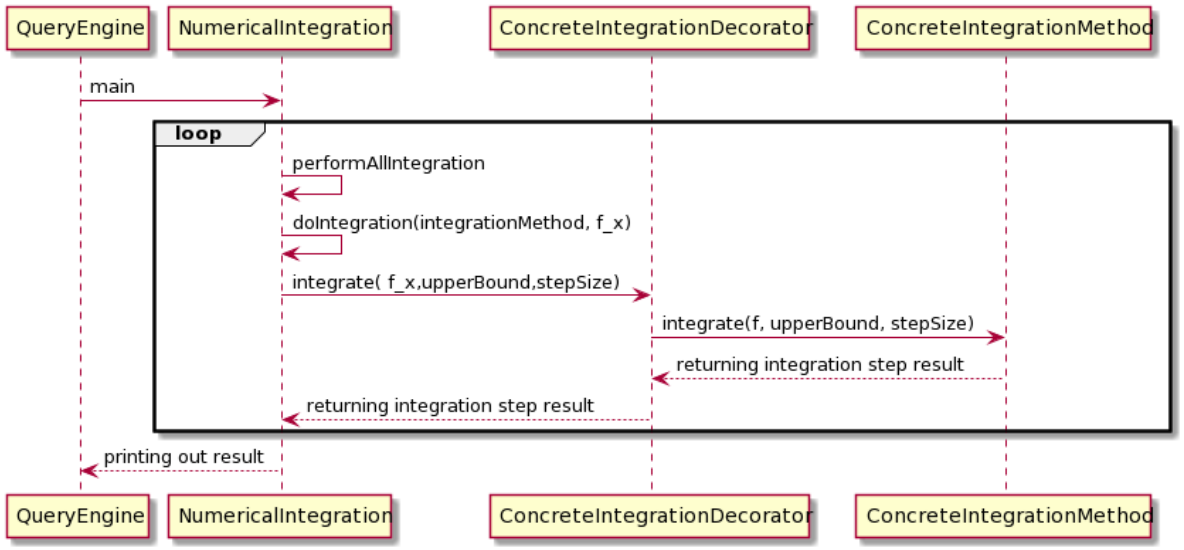
I prefer the first design because it is better geared towards actually changing the value returned by the intergration method. We will have a greater flexibility on the ability the change what values will be returned by the integrate() method. This also does a better job of adding additional behavior without changing underlying code. Also, this better prepares the system for more integration method changes that will come in the future.

Sketch of Class & Sequence Diagrams

Class Diagram



Sequence Diagram



Citations

https://ramj2ee.blogspot.com/2013/12/decorator-design-pattern-sequence.html

https://www.softwareideas.net/a/391/Decorator-Design-Pattern--UML-Diagrams-

https://www.visual-paradigm.com/tutorials/decoratordesignpattern.jsp

Time Spent -- 2 hours