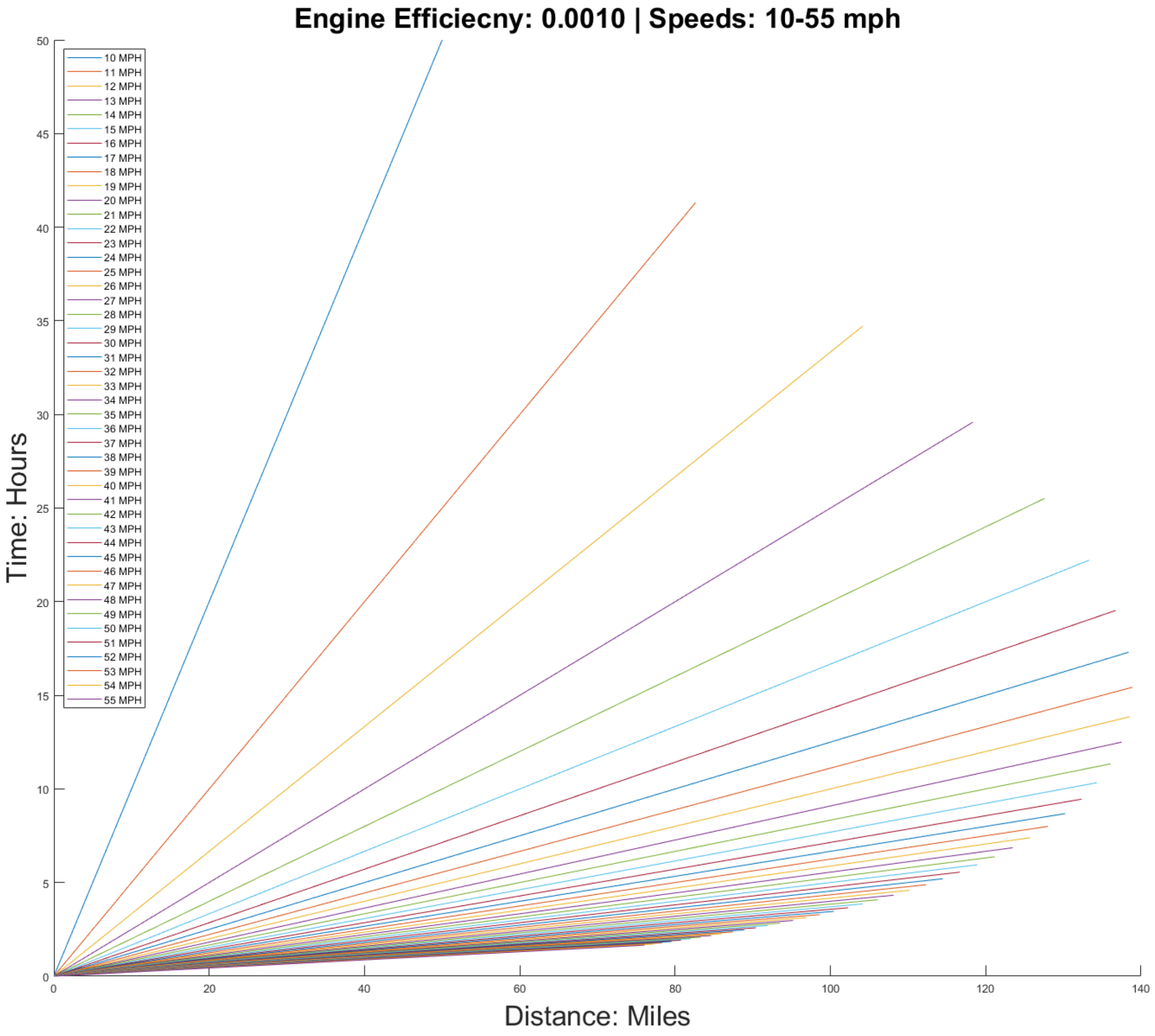
Wentworth Institute of Technology
COMP2000 – Data Structures
Summer 2022, Prof. Jones Yu

Lab 2 - Assignment 1
Due: Thursday, May 26
By: Reilly LeBlanc

Abstract.

This report sets out to satisfy the requirements laid out in the provided assignment document.



Graph showing maximum possible distances at different fixed speeds for a fixed engine efficiency. Generated in MATLAB

Contents

1 Problem 1 | Motorboats

This section contains information and analysis for the first assigned problem.

1.1 *Introduction*

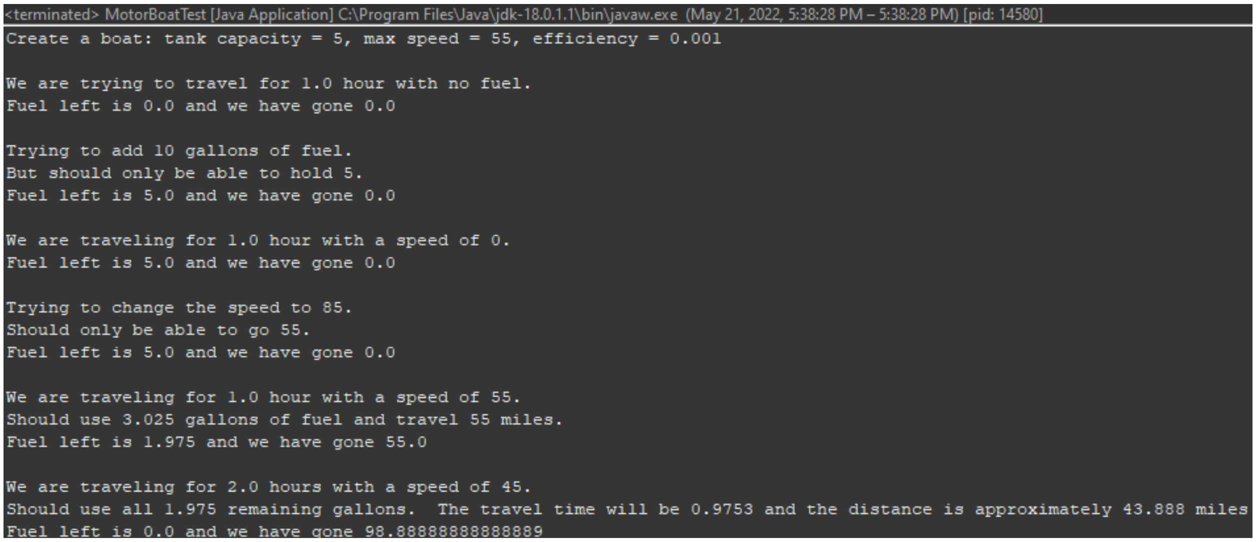
The first problem asked the student to create a class, MotarBoat, with various attributes that could represent an actual motorboat. It was also outlined that the class should contain methods to change some of the attributes, as well as calculate certain actions taken by the boat. Students were provided with two functions: $F = e \times s^2 \times t$ and $D = s \times t$, where $F =$ fuel used, $D =$ distance, $e =$ efficiency, $s =$ speed, and $t =$ time.

1.2 *Analysis*

The only difficulty was re-familiarizing myself with Java and Eclipse. I had been removed from the ecosystem for some time, focusing primarily on ML and data analysis projects in Python and R.No method used was particularly notable, condition checking is rudimentary and could be improved in terms of producing error messages for the user.

1.3 *Results*

Result 1: Console output from the provided MotorBoatTest.java



```
<terminated> MotorBoatTest [Java Application] C:\Program Files\Java\jdk-18.0.1.1\bin\javaw.exe  (May 21, 2022, 5:38:28 PM – 5:38:28 PM) [pid: 14580]
Create a boat: tank capacity = 5, max speed = 55, efficiency = 0.001

We are trying to travel for 1.0 hour with no fuel.
Fuel left is 0.0 and we have gone 0.0

Trying to add 10 gallons of fuel.
But should only be able to hold 5.
Fuel left is 5.0 and we have gone 0.0

We are traveling for 1.0 hour with a speed of 0.
Fuel left is 5.0 and we have gone 0.0

Trying to change the speed to 85.
Should only be able to go 55.
Fuel left is 5.0 and we have gone 0.0

We are traveling for 1.0 hour with a speed of 55.
Should use 3.025 gallons of fuel and travel 55 miles.
Fuel left is 1.975 and we have gone 55.0

We are traveling for 2.0 hours with a speed of 45.
Should use all 1.975 remaining gallons.  The travel time will be 0.9753 and the distance is approximately 43.888 miles
Fuel left is 0.0 and we have gone 98.88888888888889
```

1.4 Source Code

MotorBoat.java

```java
package p1.lab2.comp2000;

public class MotorBoat {
   private double fuelCapcity, fuelRemaining, speedMax, speed, boatEfficiency , distance;

   public MotorBoat(double givenCapacity, double givenMaxSpeed, double givenEfficiency) {
      this.fuelCapcity    = givenCapacity;
      this.fuelRemaining  = 0;
      this.speedMax       = givenMaxSpeed;
      this.speed          = 0;
      this.boatEfficiency = givenEfficiency;
      this.distance       = 0;
   }

   public double distance(){
      return(this.distance);
   }

   public double fuelRemaining() {
      return(this.fuelRemaining);
   }


   public void refuelBoat(double fuleAmount) {
      if(fuleAmount > (this.fuelCapcity-this.fuelRemaining)) {
         this.fuelRemaining += (this.fuelCapcity-this.fuelRemaining);
      } else {
         this.fuelRemaining += fuleAmount;
      }
   }

   public void operateForTime(double time) {
      if(this.speed > 0 ) {
         double maxTime = (this.fuelRemaining)/(this.boatEfficiency*this.speed*this.speed);

         if(maxTime < time) {
            time = maxTime;
         }

         this.distance += this.speed*time;
         this.fuelRemaining -= this.boatEfficiency*this.speed*this.speed*time;
      }

   }

   public void changeSpeed(double newSpeed) {
      if( newSpeed > this.speedMax) {
         this.speed = this.speedMax;
      } else if (newSpeed < 0) {
         this.speed = 0;
      } else {
         this.speed = newSpeed;
      }
   }
}
```

2 Problem 2 | School Kids

This section contains information and analysis for the second assigned problem.

2.1 Introduciton

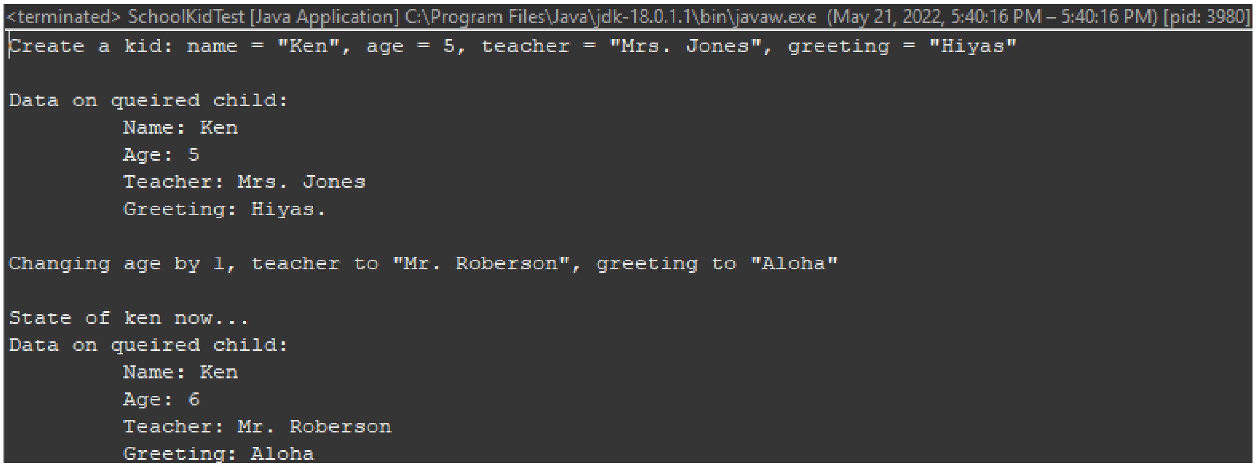
The second problem asked the student to create a class, SchoolKid, and a derived class, ExaggeratingKid, that contained various attributes of a given child. The parent class was responsible for holding the child's: name, age, teacher's name, and greeting. It was also expected that it could change all of these attributes as the child aged and progressed through school. The derived class was nearly identical in function, but the kids created under this class would exaggerate certain attributes, specifically their age and greeting. They would always exaggerate their true age by two years and append ”I am the best.” to their greeting.

2.2 Analysis

Similar to problem one, there were no direct difficulties with the problem in and of itself. The solution takes advantage of Java's parent/child class structure and operations.

2.3 Results

Result 1: Console output from the provided SchoolKidTest.java



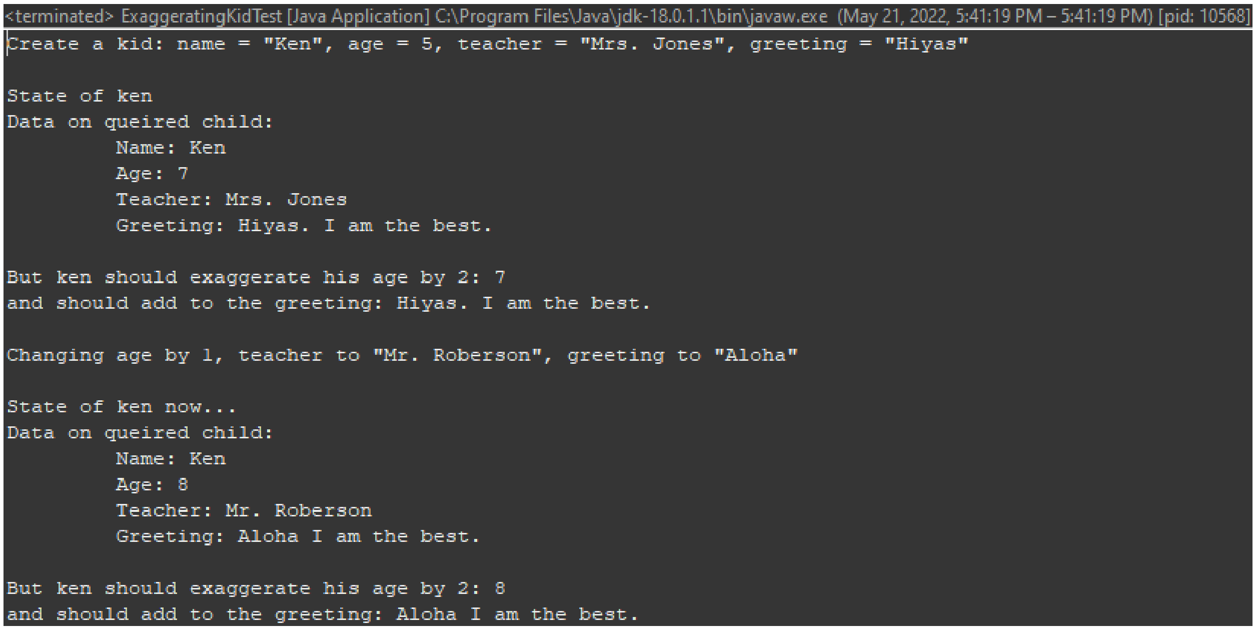
```
<terminated> SchoolKidTest [Java Application] C:\Program Files\Java\jdk-18.0.1.1\bin\javaw.exe  (May 21, 2022, 5:40:16 PM – 5:40:16 PM) [pid: 3980]
Create a kid: name = "Ken", age = 5, teacher = "Mrs. Jones", greeting = "Hiyas"

Data on queired child:
         Name: Ken
         Age: 5
         Teacher: Mrs. Jones
         Greeting: Hiyas.

Changing age by 1, teacher to "Mr. Roberson", greeting to "Aloha"

State of ken now...
Data on queired child:
         Name: Ken
         Age: 6
         Teacher: Mr. Roberson
         Greeting: Aloha
```

Result 2: Console output from the provided ExaggeratingKidTest.java



```
<terminated> ExaggeratingKidTest [Java Application] C:\Program Files\Java\jdk-18.0.1.1\bin\javaw.exe  (May 21, 2022, 5:41:19 PM – 5:41:19 PM) [pid: 10568]
Create a kid: name = "Ken", age = 5, teacher = "Mrs. Jones", greeting = "Hiyas"

State of ken
Data on queired child:
         Name: Ken
         Age: 7
         Teacher: Mrs. Jones
         Greeting: Hiyas. I am the best.

But ken should exaggerate his age by 2: 7
and should add to the greeting: Hiyas. I am the best.

Changing age by 1, teacher to "Mr. Roberson", greeting to "Aloha"

State of ken now...
Data on queired child:
         Name: Ken
         Age: 8
         Teacher: Mr. Roberson
         Greeting: Aloha I am the best.

But ken should exaggerate his age by 2: 8
and should add to the greeting: Aloha I am the best.
```

2.4 Source Code

SchoolKid.java

```java
package p2.lab2.comp2000;

public class SchoolKid {

   private String name, teacher, greeting;
   private int age;

   public SchoolKid(String givenName, int givenAge, String givenTeacher, String givenGreeting) {
      this.name     = givenName;
      this.age      = givenAge;
      this.teacher  = givenTeacher;
      this.greeting = givenGreeting;
   }

   public void haveBirthday() {
      this.age += 1;
   }

   public void changeTeacher(String newTeacher) {
      this.teacher = newTeacher;
   }

   public void changeGreeting(String newGreeting) {
      this.greeting = newGreeting;
   }

   public String getAge() {
      return (Integer.toString(this.age));
   }

   public String getGreeting() {
      return (this.greeting);
   }

   public String toString() {
      return String.format(”Data on queired child: \n\t Name: %s \n\t Age: %d \n\t Teacher: %s \n\t Greeting: %s”, this.name, this.age, this.teacher, this.greeting);
   }
}

class ExaggeratingKid extends SchoolKid {

   public ExaggeratingKid(String givenName, int givenAge, String givenTeacher, String givenGreeting) {
      super(givenName, givenAge+2, givenTeacher, givenGreeting + ” I am the best.”);
   }

   public void changeGreeting(String newGreeting) {
      this.greeting = newGreeting + ” I am the best.”;
   }
}
```

For the code used to generate the graph at the top of the page, please see the GIT for this course.