「モデリングとシミュレーション特論」課題（解答例)

2019/6/25

1　最適速度交通流モデル

課題 1　Consider the Optimal Velocity traffic flow model. Two examples are given as `Step` class with a step OV function and `Tanh` class with a realistic `tanh` OV function. With reference to those examples, construct a model with a piece-wise linear OV function and perform simulations for obtaining a fundamental diagram. Use the following parameters: $x_0 = 44$, $x_1 = 56$, $v_{\max} = 30$, $\alpha = 2$. The length of the circuit is $L = 1,000$, and the number of cars varies from 5 to 30.
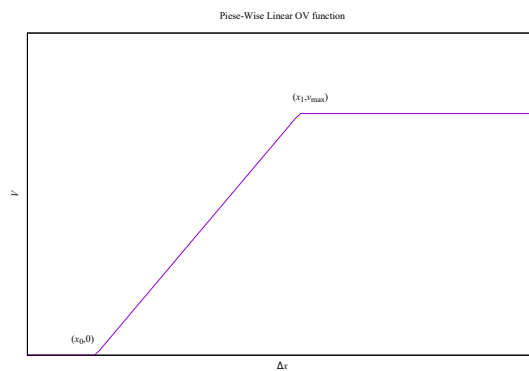

図 1　A piece-wise linear OV function.

解答例

Source Code 1　PWLinear.java

```
1  package models;
2
3  import java.io.IOException;
```

```java
import java.util.function.DoubleFunction;

/**
 *
 * @author tadaki
 */
public class PWLinear extends Simulation {

    public PWLinear(DoubleFunction ovfunction,
            int length, int numCar, double alpha) {
        super(ovfunction, length, numCar, alpha);
    }

    /**
     * @param args the command line arguments
     * @throws java.io.IOException
     */
    public static void main(String args[]) throws IOException {
        int length = 1000;
        int tmax = 1000;

        double vmax = 30;
        final double x0 = 44.;
        final double x1 = 56.;
        final double alpha = 2.;
        int numCar = 20;
        DoubleFunction<Double> ovfunction
                = x -> {
                    if (x < x0) {
                        return 0.;
                    }
                    if (x < x1) {
                        return vmax *
                                (x - x0) / (x1 - x0);
                    }
                    return vmax;
                };
        PWLinear sys = new PWLinear(ovfunction, length, numCar, alpha);
        sys.tmax = tmax;
        sys.hv(PWLinear.class.getSimpleName()+"-hv.txt");
        sys.fundamental(PWLinear.class.getSimpleName() + "-fundamental.txt",
                5, 30, 1, 10);
    }

}
```

Source Code 1 performs a simulation with a piece-wise linear OV function. The

fundamental diagram is shown below.