Traffic 3.0, Extracting Software Examples for Pedagogical Effectiveness

Semester Thesis

By: Susanne Kasper
Supervised by: Michela Pedroni
Prof. Bertrand Meyer

Student Number: 00-907-295
# Table of Contents

1 Introduction.................................................................................................5
   1.1 Motivation ..................................................................................5
   1.2 Scope of the work ........................................................................5
   1.3 Initial Situation ...........................................................................6

2 One Application for Each Example ..........................................................8

3 The Preview Example .............................................................................9
   3.1 Highlighting a Line .....................................................................9
   3.2 Spotlighting Louvre ....................................................................10
   3.3 Animating Route1 ........................................................................10

4 The Final Code for Preview ....................................................................10

5 TOUCH Documentation ...........................................................................11

6 TRAFFIC Documentation .......................................................................27
1 Introduction

This report is a short description of our work. The motivation for this semester thesis and the description of the initial situation are given in the first chapter. Then, the scope of the thesis is specified. In the second and third chapter our work is described and illustrated. Chapter four shows the resulting example. The documentations of the new TOUCH library and the actual TRAFFIC library are given in the following chapters.

1.1 Motivation

A new book about Eiffel named “A Touch of Class, Learning to Program Well” is currently being written by Prof. Dr. B. Meyer. The target reader of this book is the programming novice. The book is a result of the reorganization of the course “Introduction to Programming” for first term students at the Department of Computer Science at ETH Zurich, Switzerland. It supports the student while learning and gives supplementary information to the lecture. Furthermore, it provides a good introduction to readers who are not attending the course. The aim of this book is not just to teach the readers how to program but to instruct them how to program well.

The book is based on an object-oriented Eiffel software framework. The underlying library is the TRAFFIC library.

1.2 Scope of the work

The core subject of this semester thesis is to implement the presented examples from the book. Because the writing of the book started before one line of code existed, the examples in the book differ from the implementation in the library.

At the beginning of this semester thesis, there existed two applications that were relevant for this work: ‘city_3d’ and ‘touch’. Touch was one large application with the intention to contain all the traffic examples from the book. The goal of this thesis was to create small separated applications for the examples in the book. Therefore, we had to find a way to easily generate a reduced application that looks like the city_3d application and to reimplement the code of the touch example.

Another task was to implement a TOUCH library, which adds an additional layer of abstraction on top of the traffic library and contains the specific implementation needed for the touch examples and of course, the classes needed to get the single example applications.
1.3 Initial Situation

The initial situation consisted of two different big applications. One of them was the 'city_3d' application. The running application can be seen in figure 1.

For the first example we wanted just a map and as few buttons as possible to prevent any confusion of the readers. The desired application should therefore just provide the buttons to zoom in and out and one additional button to start the example.

![Figure 1: The original city_3d window.](image)
The second original application was the touch application. The first scene provided a choice of the examples.

Figure 2 shows the running preview example with the line 8 highlighted. These examples are based upon a 2d-visualization unlike the city_3d application, which requires a 3d-visualization. The resulting simple application should look like a simplified city_3d application; therefore, the examples had to be reimplemented to make them 3 dimensional. An additional layer of abstraction, the TOUCH library, had to be added as well.

*Figure 2: The original touch_preview window.*
2 One Application for Each Example

At first, we built a framework for the examples. We reduced the city_3d main window drastically. The only buttons which remained were the zoom in and the zoom out button. To start the example, we added an additional button.

The console at the lower right corner is intended to display results of queries. Station names, line lengths etc. can be displayed there.

![Figure 3: The empty window for all the examples.](image)
The first example presented in the second chapter of the book consists of only 4 lines of code:

```python
Paris.display
Louvre.spotlight
Line8.highlight
Routel.animate
```

This example is the very first one and shows simple invocations of features. All the animations are visible one after the other to demonstrate the sequential processing of the code.

We started with looking at the highlighting of one line.

### 3.1 Highlighting a Line

Because all line segments have been stored together and could not be accessed individually, we changed the storage of the lines into a hash table with the individual traffic line as key. Now, every line, respectively its `EM_3D_OBJECTS`, can be accessed separately. This is used for the highlighting of a particular line.

Then the features for highlighting and un-highlighting a single line were added. The creation of the normal and the highlighted lines had to be adapted as well.

To clarify, that there is a difference between the highlighting which remains and the temporary highlighting for some seconds (which we need in the touch examples), we renamed the feature call `Line8.highlight` to `Line8.highlight_for_5_seconds` in the first example.

![Figure 4: The line 8 is highlighted.](image)
3.2 Spotlighting Louvre

Because special building information is not stored until now, the Louvre is represented as a big building at the location of Louvre. We implemented a new class TOUCH_BUILDING which forwards calls to the TRAFFIC_BUILDING and has an additional feature where a building can be created at a specified place.

The spotlighting is then also made for 5 seconds. Afterwards, the building has to be removed from the building list and the EM_3D_OBJECT list. Of course, the other buildings should remain in these lists. Therefore a feature delete_one_building had to be added in the TRAFFIC_3D_MAP_WIDGET.

3.3 Animating Route1

The animation of one route, respectively the traveling of a traveler along a specified route, requires a TOUCH_ROUTE which has its own traveler.

The call of the feature animate triggers the traveler to start his journey. After reaching the destination, the traveler is removed again.

4 The Final Code for Preview

Paris.display
Louvre_Building.spotlight_for_5_seconds
Line8.highlight_for_5_seconds
Route1.animate