1 Project Description

1.1 Overview

For two years now, the department of Computer Science has been applying a new teaching approach called “Inverted Curriculum” [1, 2] to the Introduction to Programming course. This technique is also referred to as a “outside-in” strategy of teaching. The students work from the start with a big software which they gradually get to know better. At first, the exercises consist of merely calling a few library functions. Later on, Design by Contract, control structures, genericity and other advanced topics are introduced, some of which also using the framework. The framework consists of a game-like application called FLAI_HUNT and several libraries the game relies on, namely TRAFFIC, EiffelBase and EiffelVision2. During the winter semester 2004/05 Sibylle Aregger redesigned the TRAFFIC library [3] and Rolf Bruderer extended ESDL [4, 5], a multimedia library for Eiffel, with features needed for it to be used as visualization library for FLAI_HUNT. The goal of my semester project is to redesign FLAI_HUNT to use ESDL instead of EiffelVision2. This involves the actual redesign of the application as well as correcting existing weaknesses in the code for an enhancement of readability and ease of use. Possibly missing features in ESDL will be implemented in the process.

The implementation of a teaching application like FLAI_HUNT requires a special focus on clean design and code quality. FLAI_HUNT and its underlying libraries should serve as an exemplary piece of code for the students. During the semester they will encounter a great deal of this system, allowing them to discover and criticize bad design and ugly code, which they undoubtedly will if existent. Furthermore, the Introduction to Programming course should be pointed towards programming novices and therefore the corresponding software needs to be easy to read, very well understandable and nicely documented. This requires great care for its quality by the developer.

The final application should include options for extension by the students as programming assignments. In order to provide this, possible extensions and/or modifications need to be specified and incorporated into the design. Assignment construction is a very demanding task, in that all resources need to be very strictly adapted to the knowledge that students have at a certain point in time.

A minor task, but nonetheless worth mentioning, is also the redesign from a graphical point of view. Meaning, not only the application code will be redesigned but also the “look and feel” of the game.

1.2 Motivation

Initially I wanted to do a semester thesis on ESDL, but due to several circumstances I ended up doing it on FLAT_HUNT with a side of ESDL. A fact that I am now quiet happy about - not that it would not have been fun to do it on only ESDL, but now I am really excited to do something that will be extensively used by several dozens if not hundreds of people. I hope I can design the application such that the students will enjoy to learn programming with as little frustration as possible. Hence, I aspire to write the cleanest code I have ever written, which will be a very good exercise for me and my discipline.

Another very appealing factor for me to take the project was the diversity: I will not only be hacking away like there was no tomorrow, but there are also “softer” tasks at hand. Among them, the complete redesign of the FLAI_HUNT application which requires careful consideration, and the designing of new graphics which is a favorite spare time activity of mine.

To cut a long story short, I am really looking forward to actually beginning with the work and I will endeavor to produce good results.

1.3 Scope of the work

My semester thesis consists of the following parts:

- **Redesign of FLAT_HUNT**: I will redesign FLAT_HUNT to use ESDL as visualization library and give it a new (more exciting) "look and feel".
• **Assignment construction:** I will write down possible extensions for exercises and incorporate them into the design.

• **ESDL Extensions:** Whenever I find insufficient support by ESDL for something I need for the FLAT_HUNT redesign, I will implement the missing feature(s).

• **Documentation:** As a guidance for the students I will document the newly designed application properly.

• **Report:** Throughout the entire project period I will put important ideas, design decisions, etc. on record along with a description - and, as result, produce the final report.

### 1.4 Intended Results

I intend to produce the following results during my semester thesis:

• **Redesign of FLAT_HUNT:** Cleanly designed, understandable and easy to use game-like application, hopefully with a certain fun-factor

• **Assignment construction:** Suggestions for new exercises, which will also be incorporated into the code if accepted.

• **ESDL Extensions:** Additions to ESDL if deficiency encountered

• **Documentation:** Good and comprehensive documentation, namely a user guide and a developer guide.

• **Report:** A documentation of all the work I have done during my thesis

### 2 Background Material

#### 2.1 Reading List


3 Project Management

3.1 Objectives and Priorities

Ordered by priorities, the main objectives of this work are as follows:

1. Study and get to know ESDL, TRAFFIC and the current status of FLAT_HUNT
2. Redesign FLAT_HUNT, with special attention to ease of use, readability and quality of code.
3. Writing a good documentation for the students.
4. ESDL extensions and assignment construction.
5. New graphics for FLAT_HUNT.

Priority 1 has to be fulfilled in order to move further down the list. The main objective of this project is the redesign of FLAT_HUNT, and thus has priority 2. I will attempt to do priorities 2 and 3 partly in parallel, so as not to postpone the whole documentation till the end of the project period and in the process forgetting important details “I programmed way back and don’t exactly remember”

The two points of priority 4 are both side-products of the actual project, but I am confident those can be addressed too. Last but not least there are the new graphics for FLAT_HUNT, which I would really enjoy doing, so you can pretty much count on having also this priority completed towards the end of the project.

I did not explicitly list the report in the priority list, because I intend to write it in parallel during the whole project period.

3.2 Criteria for Success

3.2.1 Design of the Application

For the design of an application the target group has to be taken into account which, in our case, is assumed to be consisting of programming novices. Therefore the application has to meet the following requirements:

- easy to understand
- easy to use
- easy to remember
- sound
- object-oriented design (reusable, extendible, generic, ..)
- reasonable use of design patterns

3.2.2 Quality of Code

Since the application is also meant to be an exemplary piece of software for students, the following points are essential:

- style guidelines
- contracts (preconditions, postconditions, invariants)
- documentation of implementation and interface
- query-command separation
- option-operand principle
3.2.3 Documentation

Good documentation is crucial for the students in order to avoid frustration about tenacious little details and also to provide a good starting point for someone who has never used the software before. Thus it has to be:

- easy to understand
- complete
- useful

3.3 Method of Work

I will work mostly by myself. At least once per milestone, I will have a meeting with my supervisor Michela Pedroni. Furthermore, I will keep a log of the work I do. That way I can arrange my time quietly but efficiently but Michela also has a rough overview of what I have done up to certain point in time. Important decisions will be made at meetings in order to keep the project in reasonable bounds.

Questions that cannot be answered by Google, manuals or similar means will be directed towards Michela, who will also give me feedback about the code from time to time to ensure good code quality.

For the implementation I will either use Eclipse with the Eiffel-plugin or ISE EiffelStudio 3.5. The documentation will be written with LyX.

4 Plan with Milestones

4.1 Project Steps

- Project start: April 8, 2005.
- Project plan, reading, studying existing application and libraries, ideas: April 22, 2005
- Report and documentation: continuous
- Design: May 13, 2005
- Minimal implementation: June 10, 2005
- Extensions to the game: July 1, 2005
- Project end, wrap-up: July 14, 2005
### 4.2 Tentative Schedule

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References


   http://se.inf.ethz.ch/projects/michela_pedroni

   http://se.inf.ethz.ch/projects/sibylle_aregger

   http://se.inf.ethz.ch/projects/rolf_bruderer

   http://se.inf.ethz.ch/projects/till_bay