



## Diploma Thesis

Höhere Technische Bundeslehranstalt Leonding  
Abteilung für Informatik

# Visulation of the NoBeard Virtual Machine

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Date: **April 4, 2018**

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## **Declaration of Academic Honesty**

Hereby, I declare that I have composed the presented paper independently on my own and without any other resources than the ones indicated. All thoughts taken directly or indirectly from external sources are properly denoted as such.

This paper has neither been previously submitted to another authority nor has it been published yet.

Leonding, April 4, 2018

Egon Manya

## **Eidesstattliche Erklärung**

Hiermit erkläre ich an Eides statt, dass ich die vorgelegte Diplomarbeit selbstständig und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Gedanken, die aus fremden Quellen direkt oder indirekt übernommen wurden, sind als solche gekennzeichnet.

Die Arbeit wurde bisher in gleicher oder ähnlicher Weise keiner anderen Prüfungsbehörde vorgelegt und auch noch nicht veröffentlicht.

Leonding, am 4. April 2018

Egon Manya

## Abstract

Here it is described what the thesis is all about. The abstract shall be brief and concise and its size shall not go beyond one page. Furthermore it has no chapters, sections etc. Paragraphs can be used to structure the abstract. If necessary one can also use bullet point lists but care must be taken that also in this part of the text full sentences and a clearly readable structure are required.

Concerning the content the following points shall be covered.

- *Definition of the project:* What do we currently know about the topic or on which results can the work be based? What is the goal of the project? Who can use the results of the project?
- *Implementation:* What are the tools and methods used to implement the project?
- *Results:* What is the final result of the project?

This list does not mean that the abstract must strictly follow this structure. Rather it should be understood in that way that these points shall be described such that the reader is animated to dig further into the thesis.

Finally it is required to add a representative image which describes your project best. The image here shows Leslie Lamport the inventor of  $\text{\LaTeX}$ .



## Zusammenfassung

An dieser Stelle wird beschrieben, worum es in der Diplomarbeit geht. Die Zusammenfassung soll kurz und prägnant sein und den Umfang einer Seite nicht übersteigen. Weiters ist zu beachten, dass hier keine Kapitel oder Abschnitte zur Strukturierung verwendet werden. Die Verwendung von Absätzen ist zulässig. Wenn notwendig, können auch Aufzählungslisten verwendet werden. Dabei ist aber zu beachten, dass auch in der Zusammenfassung vollständige Sätze gefordert sind.

Bezüglich des Inhalts sollen folgende Punkte in der Zusammenfassung vorkommen:

- *Aufgabenstellung*: Von welchem Wissenstand kann man im Umfeld der Aufgabenstellung ausgehen? Was ist das Ziel des Projekts? Wer kann die Ergebnisse der Arbeit benutzen?
- *Umsetzung*: Welche fachtheoretischen oder -praktischen Methoden wurden bei der Umsetzung verwendet?
- *Ergebnisse*: Was ist das endgültige Ergebnis der Arbeit?

Diese Liste soll als Sammlung von inhaltlichen Punkten für die Zusammenfassung verstanden werden. Die konkrete Gliederung und Reihung der Punkte ist den Autoren überlassen. Zu beachten ist, dass der/die LeserIn beim Lesen dieses Teils Lust bekommt, diese Arbeit weiter zu lesen.

Abschließend soll die Zusammenfassung noch ein Foto zeigen, das das beschriebene Projekt am besten repräsentiert. Das folgende Bild zeigt Leslie Lamport, den Erfinder von  $\text{\LaTeX}$ .



## **Acknowledgments**

If you feel like saying thanks to your grandma and/or other relatives.

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# Chapter 1

## Introduction

### 1.1 Initial Situation

Common word processors do not prepare print-like documents in so far as these programs do not reflect the rules of professional printing which have been grown over centuries. These rules contain clear requirements for balancing page layouts, the amount of white space on pages, font-handling, etc. Donald Knuth's TeX package (see [?]) is a word processor which conforms to these printing rules. This package was enhanced by Leslie Lamport by providing more text structuring commands. He called his package LaTeX [?].

When preparing a thesis, we want not only to have our content on a top level, we also want to commit to a high level of formal criteria. Therefore, we request our students to use one of these professional printing production environments like TeX or LaTeX.

Furthermore students should train their scientific writing skills. This includes a clear and structured break-down of their ideas, a high-level and clear wording, and the training of transparent citations of ideas from other sources than from theirs. A good source for more information concerning technical and scientific writing can be found in [?].

### 1.2 Goals

The general goals and objectives of the project are described here. Care must be taken that the goals documented here are purely project goals and have nothing to do with individual goals of the team members. If individual goals should be part of the thesis they are listed in appendix B.

### 1.3 Overview

Details of the diploma thesis have to be aligned between student and supervisor. This should be a basic structure to facilitate the first steps when students start to write their theses.



Figure 1.1: Don Knuth, the inventor of  $\text{\TeX}$

Never forget to add some illustrative images. Images must not be messed up with your normal text. They are encapsulated in floating bodies and referenced in your text. An example can be seen in figure 1.1. As you can see, figures are placed by default on top of the page nearby the place where they are referenced the first time. Furthermore you can see that a list of figures is maintained automatically which can be included easily by typing the command `\listoffigures` into your document.

## 1.4 Basic Terminology

As usual the very basic terminology is briefly explained here. Most probably the explanations here only scratch a surface level. More detailed explanations of terminology goes into chapter ??.

## 1.5 Related Work and Projects

Here a survey of other work in and around the area of the thesis is given. The reader shall see that the authors of the thesis know their field well and understand the developments there. Furthermore here is a good place to show what relevance the thesis in its field has.

## 1.6 Structure of the Thesis

Finally the reader is given a brief description what (s)he can expect in the thesis. Each chapter is introduced with a paragraph roughly describing its content.



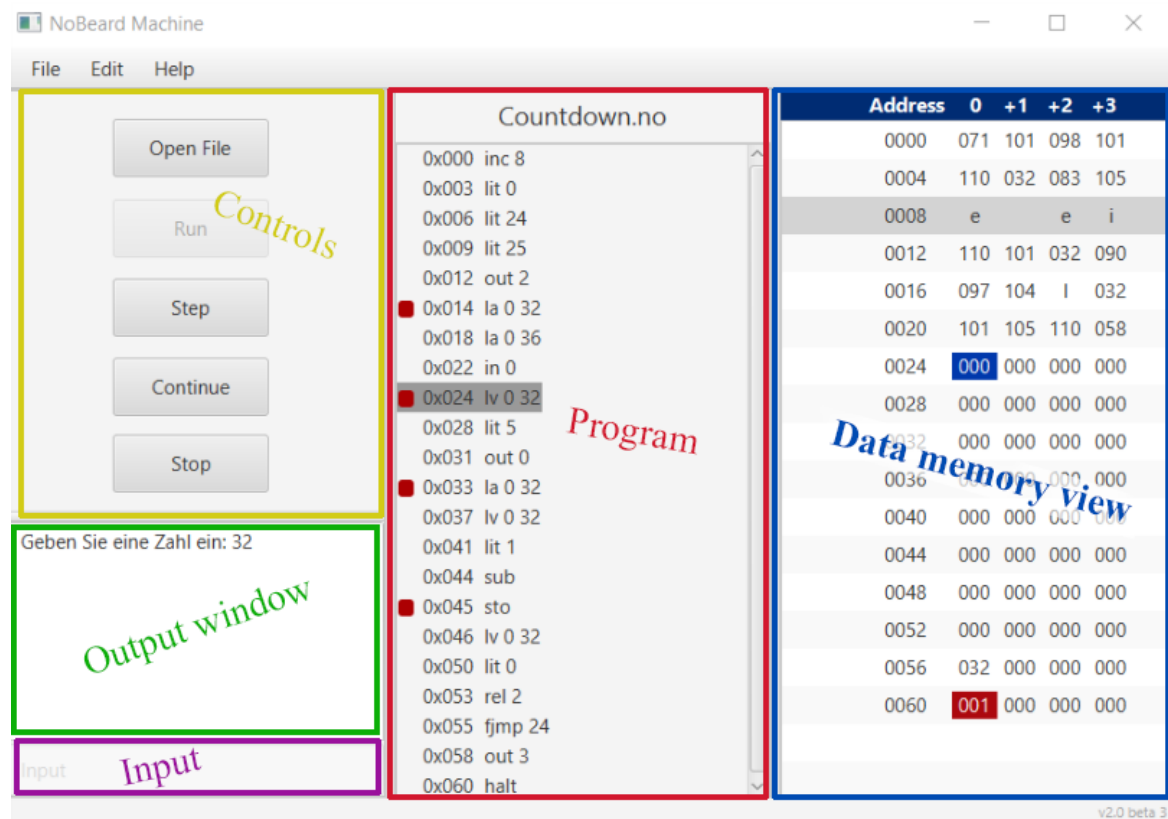
## Chapter 2

# Formal languages & Compiler construction

## Chapter 3

# Description of the GUI

This chapter describes how to use the graphical user interface of the NoBeard virtual machine and serves at the same time as a user manual. The application is developed as simple as possible to use. With the three main tools the user can load and run NoBeard object files, debugging running programs and get a whole view of the data memory.



### 3.1 Loading & Running a program

By starting the user interface, a NoBeard object file has to be loaded by a click on the “open file” button. Than the user can choose the desired file. Afterward, the window shows the content and the title of the opened program which is now executable.

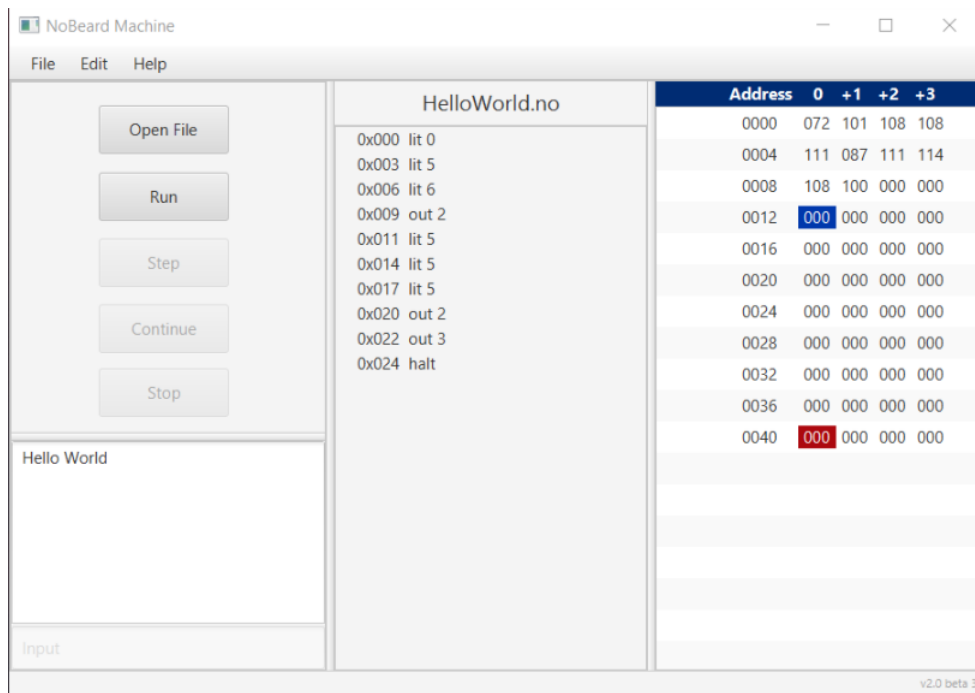


Figure 3.1: Executed "Hello World" program

The content lists instructions with the belonging addresses and operators. By hitting the “Run” button, the machine executes the loaded program. Under the control buttons there is a window which simulates a terminal where the user can see the outputs of the running program. If the program runs against an input instruction, the machine stops and requests the user for an input which can be done under the output window. To submit an input, the Enter key has to be pressed.

### 3.2 Debugging

To debug a program the user has to set breakpoints. These breakpoints can be placed by clicking on the studied address. If a breakpoint has been placed and the program is about to start, it runs only until the line where the breakpoint has been set.

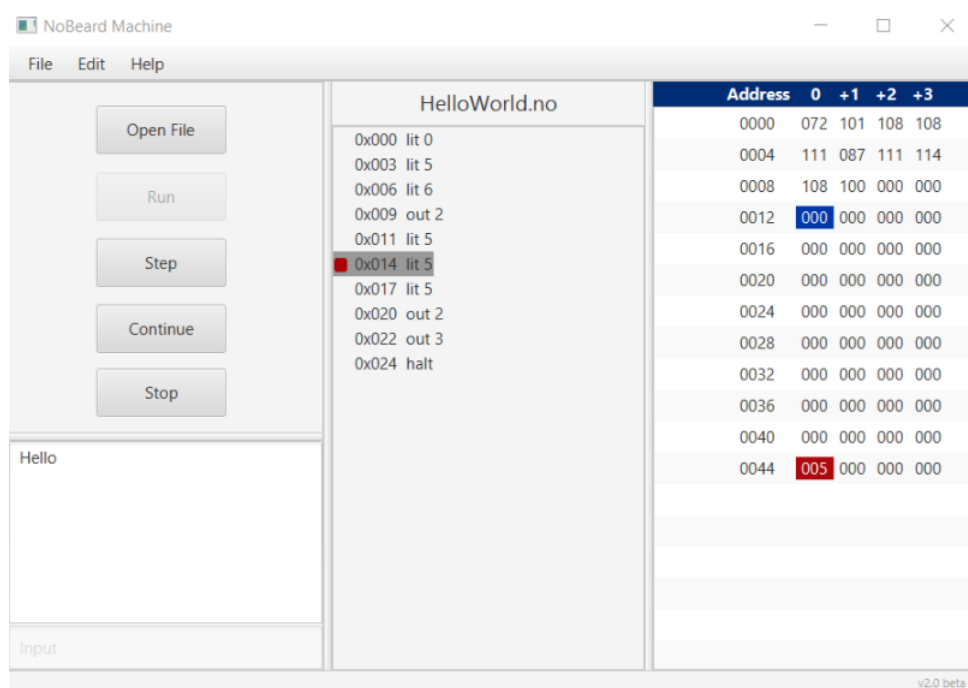


Figure 3.2: Debugging the "Hello World" program

Then the user is able to step one line further or jump to the next breakpoint. Stepping is handled by the "Step" button as shown in the following picture. By clicking on the "Continue" button, the program runs from the current line until the next breakpoint. If there is not any breakpoint left from the current line, it runs until the end of file. Optionally, the user is able to stop the program during the execution. This could be achieved by the "Stop" button.

### 3.3 Data Visualization

On the right side of the window is the visualisation of the data memory view in a list form. This view lists data byte wise from the data memory of the machine. Each line of the list view has a content of an address given in decimal notation following by four bytes raw data. The memory is separated in two parts. The list starts on the top with the string constants followed by stack frames of the currently running functions. While the frame pointer is highlighted with a blue background, the stack pointer is signed with a red background. The user has also the possibility to convert confused raw data to characters or integers.

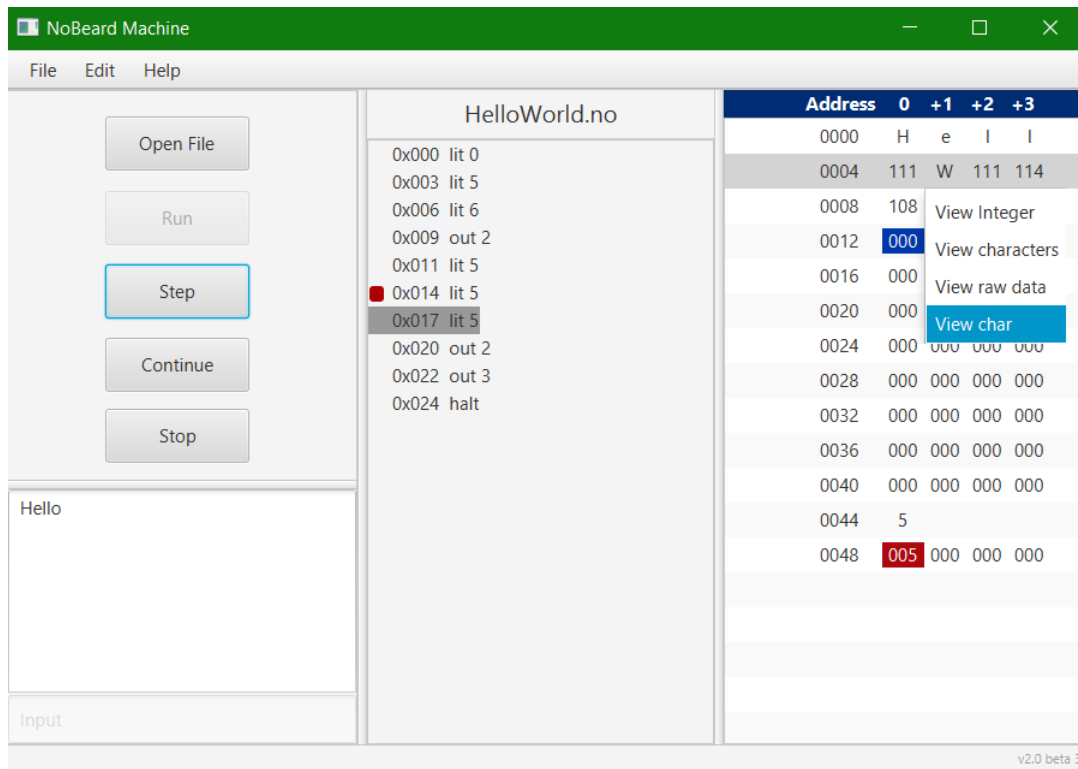


Figure 3.3: Converting data to characters

With a right click on the selected line of the list, a context menu could be opened. This menu includes following functions: showing integer, characters of the whole line, a single character or converting back the line to raw data. To make the conversion from raw data to alphanumeric characters or integers more easy and fast, a multi selection function is developed for the list of the data memory.

## Chapter 4

# Implementation

## Chapter 5

### Summary

Here you give a summary of your results and experiences. You can add also some design alternatives you considered, but kicked out later. Furthermore you might have some ideas how to drive the work you accomplished in further directions.

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# List of Tables

# Project Log Book

Date	Participants	Todos	Due
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# Appendix A

## Additional Information

If needed the appendix is the place where additional information concerning your thesis goes. Examples could be:

- Source Code
- Test Protocols
- Project Proposal
- Project Plan
- Individual Goals
- ...

Again this has to be aligned with the supervisor.

## Appendix B

# Individual Goals

This is just another example to show what content could go into the appendix.