1 SOLUTION

This chapter describes the details how the project is implemented. Note that algorithms and codes listed here are written in Ruby programming language, which is the main language of the project.

1.1 NAME MATCHING ALGORITHMS

We will start off by detailing bundled matching algorithms here. Each matching algorithm calculates the *similarity score* between two strings. The score is ranging between 0.0 to 1.0, where 0.0 means completely different and 1.0 means extact matched.

1.1.1 *Levenshtein distance*

This algorithm measures the difference between two strings. It tells the minimum number of opearations needed to change string to another. These opeations are insertions, deletions, or substitutions. Consider these following examples.

- Sm**i**th → Sm**y**th
  the minimum operation to change is 1, which is to substitute *i* to *y*, therefore Levenshtein distance for these two strings is 1.
- Gowan → **Mc**Gowan
  2 insertions of *M* and *c* is required.
- Sm**i**th**e** → Sm**y**th
  1 deletion of *e* and 1 substitution of *i* to *y* are required.

The implementation used in the project is done by Battley [1][1]. Once the distance is calculated, it will be compared to the length of the longer string between the two (or if they are the same length, use that length).

For example, Levenshtein distance between *Smyth* and *Smithe* is 2, compare 2 to length of the longer string, *Smithe*, which is 6. So the *similarity score* of these two strings are $6 - (2/6) = 0.667$.

The code of this algorithm is as in listing 1, note that `name` and `@base_name.name` are two strings to be matched.

1 levenshtein.rb

GROUP	LETTERS
1	B, F, P, V
2	C, G, J, K, Q, S, X, Z
3	D, T
4	L
5	M, N
6	R
-	A, E, I, O, U, H, W, Y

Table 1: Soundex letter group.

```
def cal_score
  @value = Text::Levenshtein.distance(@name, @base_name.name)
  size = [@name.size, @base_name.name.size].max
  @score = ((size - @value).to_f / size)
end
```

Listing 1: Levenshtein distance implementation.

1.1.2 *Soundex*

Soundex encodes a string into a 4 character code representing an essence of its sound as pronounced in English. It operates in the following steps.

1. Take the first letter of a string.
2. Encode each remaining letters into a group following table 1. Discards A, E, I, O, U, H, W, and Y
3. Remove two adjacent same characters.
4. If a group of a first letter is the same as the second letter, remove the second letter.
5. Trim or pad with zeros as necessary, making the result 4 characters long.

Let us follow these steps by step, consider we are going to encode the string *PFISTTER*.

1. Take first letter of *PFISTTER*.
   PFISTTER → P
2. Encode remaining letter *FISTTER*.
   PFISTTER → P1-233-6 → P12336

3. Remove two adjacent same characters.
   PFISTTER → P12336 → P1236
4. P is also in group 1, so remove the second 1 letter.
   PFISTTER → P1236 → P236
5. P236 is 4 characters long, so no need to be trimmed or padded.
   PFISTTER → P1236 → P236

Therefore, soundex of *PFISTTER* is `P236`.

The implementation of soundex (listing 2) in this project is adapted from Winstanley's *Irish soundex* implementated in Visual Basic[2]. The code is commented following the same aforementioned steps.

```
def self.soundex(name)
  # Take the first letter of a string.
  result = name.first

  # Encode remaining letters
  name[1..name.length].split('').each do |n|
    result = result + category(n).to_s
  end

  # Remove two adjacent same characters
  result.gsub!(/([0-9])\1+/, '\1')

  # If category of 1st letter equals 2nd character, remove 2nd
      character
  if result.size >= 2 && category(result[0]).to_s == result[1]
    result.slice!(1)
  end

  # Trim or pad with zeros as necessary
  result = if result.size == 4
           result
         elsif result.size > 4
           result[0..3]
         else
           result.ljust(4, '0')
         end
end
```

Listing 2: Soundex implementation.

The `category` function implements soundex grouping table (table 1) as in listing 3.

2 [2] Appendix 3.

```
def self.category(c)
  if c.match(/[AEIOUHWY]/).present?
    ""
  elsif c.match(/[BPFV]/).present?
    1
  elsif c.match(/[CSKGJQXZ]/).present?
    2
  elsif c.match(/[DT]/).present?
    3
  elsif c.match(/[L]/).present?
    4
  elsif c.match(/[MN]/).present?
    5
  elsif c.match(/[R]/).present?
    6
  else
    ""
  end
end
```

Listing 3: Soundex grouping table implementation.

Now that we encode two strings to be matched in soundexes. We then calculate the *similarity score* of these two soundexes using these steps.

- Compare first characters of each soundex, if they are different, *similarity score* is 0, otherwise move to next step.
- Compare the rest 3 digits by using Levenshtein distance (section 1.1.1) to calculate the distance between them.

For example, *similarity score* between *Smith* and *Speed*, which soundexes are `S530` and `S130` respectively, is 0.75 (1 substitution from *5* to *1*, so 1 difference of length 4).

The code of this soundex *similarity score* is as in listing 4.

```
def soundex_distance_score(s1, s2)
  if s1.first != s2.first
    0 # Different category, so they suppose to be completely
        different
  else
    (s1.size - Text::Levenshtein.distance(s1, s2).to_f ) / s1.size
  end
end
```

Listing 4: Soundex similarity score implementation.

1.1.3 *Irish soundex*

Irish soundex is another variant of traditional soundex. It determines characteristics of Irish names and normalised them to modern names. This algorithm also follows Winstanley's *Irish soundex*[3].

Irish names might contain some prefix, e.g. *Mc* or *O*, which are obstructive to soundex result. These prefixes are to be discarded. Moreover, there is no initial soft *C* in Irish names, instead *K* is used. So the first letter *C* is changed to *K*. It is implemented as in listing 5.

3 [2] Appendix 3.

```
def self.soundex(name)
  # Change initial ST. to SAINT
  name = name.match(/^ST\./).present? ? "SAINT
      #{name[3..name.length]}" : name

  # Discard Irish prefixes
  name = if name.match(/^O /).present?
         name[1..name.length].gsub(' ', '')
       elsif name.match(/^O'/).present?
         name[2..name.length].gsub(' ', '')
       elsif name.match(/^MC/).present?
         name[2..name.length].gsub(' ', '')
       elsif name.match(/^M'/).present?
         name[2..name.length].gsub(' ', '')
       elsif name.match(/^MAC/).present? && name != 'MAC'
         name[3..name.length].gsub(' ', '')
       else
         name
       end

  # Change initial C to K
  name = name.strip.gsub(/^C/, 'K')

  # Call to traditional soundex.
  return {
    :label => name,
    :soundex => Soundex.soundex(name)
  }
end
```

Listing 5: Irish soundex implementation.

Irish soundex algorithm in this project calls traditional soundex described in section 1.1.2 to minimise repeated code. It also calculates *similarity score* the same way soundex does, as in listing 4.

2

RELATED WORK

From research questions on section **??**, there are three aforementioned terms that will be core research fields of this project. These fields are *name matching*, *web service*, and *extensible platform*.

2.1 NAME MATCHING

There are many methods for matching names. This project encodes various of them at the starting state.

2.1.1 *Edit distance*

> Edit distance is a way of quantifying how dissimilar two strings (e.g., words) are to one another by counting the minimum number of operations required to transform one string into the other. – Edit distance, **?**]

An direct string operation way of comparing two string could work with name matching too. One of the edit distance variant, *Levenshtein distance* [**?**] is chosen to be implemented in this project.

2.1.2 *Soundex*

Soundex [**?**] encodes a name (or any string) into a 4 character code which represents an essence of its sound as pronounced in English. The idea is to encode letters with similar sound into the same group, and ignore vowels (unless it is the first letter). For example, *Smith* is translated to `S530`, and *Simon* is translated to `S550`.

Irish Soundex[1] is a modified version of Soundex, aims to improve capability of a traditional one upon Irish surnames. By applying rules accroding to the langauage characteristics and make some adjustment to distinguish names properly.

Both Soundex variants are also implemented in the project.

1 [2] Appendix 3.

2.1.3 *Lookup Table*

In 1901, Robert Edwin Matheson, the assistant registrar-general in Dublin, developed a name classification system [**?**] for an aid of register indexing and searching. He used a report on surnames in Ireland extracted from civil registers [**?**] in 1894 as a base of his system[2].

He gathered information from registry offices, focusing on people or members of close families. When these people made official register records with the office, they might use different variant of their surnames. For example, Mr. Green can be registered as dead by his son using the name Huneen.

With these information, Matheson classified the surnames in Ireland into 2091 groups. For example, group 753 consists of these names.

> Green, Greenan, greenaway, greene, grene, Guerin, Houneen, Huneen, MacAlasher, MacAlesher, MacGlashan, MacGlashin, MacIllesher, M'Alasher, M'Alesher, McAlasher, McAlesher, McGlashan, McGlashin, McIllesher, M'Glashan, M'Glashin, M'Illesher, Oonin.

This classification also includes multiple mapping between names. One name can belong to one or more group. For example, *Green* belongs to groups 753, 754, 768, and 1350.

By using this classification information, we can construct a lookup table for Irish names by having names in the same group hold the same reference number.

2.2 WEB SERVICE

One convenient way to bring this service to public is to create a *web service*. A web service is a tool or function that can be accessed by other programs over the web (via http) [**?**]. A result from web service is designed to be used by computer programs rather than humans.

There are many ways to implement web services. Two famous ones are *Simple Object Access Protocol (SOAP)* and *Representational State Transfer (REST)*. Both has their own advantages [**?**]. We decided to implement our service using REST due to its simplicity and scalability [**?**][**?**].

At this initial state, data resulting from our web service is in `JSON` [**?**] format. Since it is widely used in web development and becoming more and more popular [**?**]. However, our service can be extended into any other format easily as well, such as traditional `XML`.

2 [2] section 2.3.

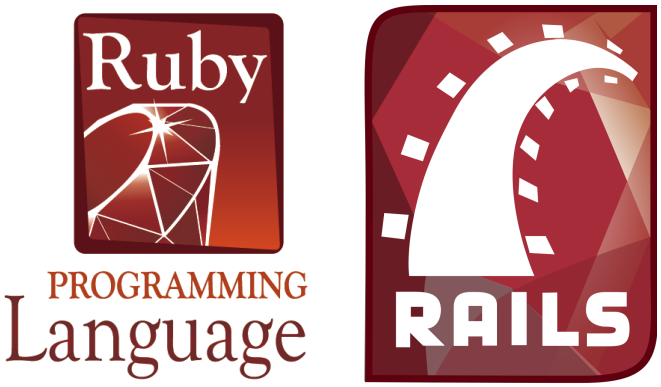

Figure 1: Ruby programming language (left) and Ruby on Rails framework (right).

2.3 EXTENSIBLE FRAMEWORK

"Ruby is designed to make programmers happy."
– ?]

Our system is implemented in *Ruby* [**?**] programming language. Ruby is a well-balanced language, it can be used as an traditional object-oriented language [**?**] and also capable of performing functional programming [**?**], thus making it very flexible and versatile.

The system sits on top of *Ruby on Rails* (or *Rails*, in short) [**?**] framework. Rails is a mature and stable framework that has been in web development for decades [**?**]. So it has a great support and a large community bebind. A great choice for building a sustainable system.

Rails is capable of both web service and web interface. By sharing the same algorithm we could provide a service for both programs (targeted by web service) and humans (targeted by web interface).

Part I

THE SHOWCASE

You can put some informational part preamble text here. Illo principalmente su nos. Non message *occidental* anglo-romanic da. Debitas effortio simplificate sia se, auxiliar summarios da que, se avantiate publicationes via. Pan in terra summarios, capital interlingua se que. Al via multo esser specimen, campo responder que da. Le usate medical addresses pro, europa origine sanctificate nos se.

3

INTRODUCTION

This template for LaTeX has two goals:

1. Provide students with an easy-to-use template for their Master's or PhD thesis (though it might also be used by other types of authors for reports, books, etc.).
2. Provide a classic, high-quality typographic style that is inspired by "*The Elements of Typographic Style*".

Web service for 19th century Irish personal name matchingversion 0.2

The bundle is configured to run with a *full* MiKTeX or TeXLive installation right away and, therefore, it uses only freely available fonts.

People interested only in the nice style and not the whole bundle can now use the style stand-alone via the file `classicthesis.sty`. This works now also with "plain" LaTeX.

As of version 3.0, `classicthesis` can also be easily used with LyX[1] thanks to Nicholas Mariette and Ivo Pletikosić. The LyX version of this manual will contain more information on the details.

This should enable anyone with a basic knowledge of LaTeX 2ε or LyX to produce beautiful documents without too much effort. In the end, this is my overall goal: more beautiful documents, especially theses, as I am tired of seeing so many ugly ones.

The whole template and the used style is released under the GNU General Public License.

If you like the style then I would appreciate a postcard:

Andre Miede
Detmolder Strasse 32
31737 Rinteln
Germany

The postcards I received so far are available at:

http://postcards.miede.de

A well-balanced line width improves the legibility of the text. That's what typography is all about, right?

So far, many theses, some books, and several other publications have been typeset successfully with it. If you are interested in some typographic details behind it, enjoy Robert Bringhurst's wonderful book.

1 http://www.lyx.org

IMPORTANT NOTE: Some things of this style might look unusual at first glance, many people feel so in the beginning. However, all things are intentionally designed to be as they are, especially these:

- No bold fonts are used. Italics or spaced small caps do the job quite well.
- The size of the text body is intentionally shaped like it is. It supports both legibility and allows a reasonable amount of information to be on a page. And, no: the lines are not too short.
- The tables intentionally do not use vertical or double rules. See the documentation for the `booktabs` package for a nice discussion of this topic.[2]
- And last but not least, to provide the reader with a way easier access to page numbers in the table of contents, the page numbers are right behind the titles. Yes, they are *not* neatly aligned at the right side and they are *not* connected with dots that help the eye to bridge a distance that is not necessary. If you are still not convinced: is your reader interested in the page number or does she want to sum the numbers up?

Therefore, please do not break the beauty of the style by changing these things unless you really know what you are doing! Please.

3.1 ORGANIZATION

You can use these margins for summaries of the text body...

A very important factor for successful thesis writing is the organization of the material. This template suggests a structure as the following:

- `Chapters/` is where all the "real" content goes in separate files such as `Chapter01.tex` etc.
- `FrontBackMatter/` is where all the stuff goes that surrounds the "real" content, such as the acknowledgments, dedication, etc.
- `gfx/` is where you put all the graphics you use in the thesis. Maybe they should be organized into subfolders depending on the chapter they are used in, if you have a lot of graphics.
- `Bibliography.bib`: the BibTeX database to organize all the references you might want to cite.
- `classicthesis.sty`: the style definition to get this awesome look and feel. Bonus: works with both LaTeX and pdfLaTeX... and LyX.
- `ClassicThesis.tcp` a TeXnicCenter project file. Great tool and it's free!

2 To be found online at http://www.ctan.org/tex-archive/macros/latex/contrib/booktabs/.

- `ClassicThesis.tex`: the main file of your thesis where all the content gets bundled together.
- `classicthesis-config.tex`: a central place to load all nifty packages that are used. In there, you can also activate backrefs in order to have information in the bibliography about where a source was cited in the text (i. e., the page number).

  Make your changes and adjustments here. This means that you specify here the options you want to load `classicthesis.sty` with. You also adjust the title of your thesis, your name, and all similar information here. Refer to Section 3.3 for more information.

  This had to change as of version 3.0 in order to enable an easy transition from the "basic" style to LyX.

In total, this should get you started in no time.

3.2 STYLE OPTIONS

There are a couple of options for `classicthesis.sty` that allow for a bit of freedom concerning the layout:

. . . or your supervisor might use the margins for some comments of her own while reading.

- General:
  - `drafting`: prints the date and time at the bottom of each page, so you always know which version you are dealing with. Might come in handy not to give your Prof. that old draft.
- Parts and Chapters:
  - `parts`: if you use Part divisions for your document, you should choose this option. (Cannot be used together with `nochapters`.)
  - `nochapters`: allows to use the look-and-feel with classes that do not use chapters, e. g., for articles. Automatically turns off a couple of other options: `eulerchapternumbers`, `linedheaders`, `listsseparated`, and `parts`.
  - `linedheaders`: changes the look of the chapter headings a bit by adding a horizontal line above the chapter title. The chapter number will also be moved to the top of the page, above the chapter title.
- Typography:
  - `eulerchapternumbers`: use figures from Hermann Zapf's Euler math font for the chapter numbers. By default, old style figures from the Palatino font are used.
  - `beramono`: loads Bera Mono as typewriter font. (Default setting is using the standard CM typewriter font.)

  - `eulermath`: loads the awesome Euler fonts for math. (Palatino is used as default font.)
  - `pdfspacing`: makes use of pdftex' letter spacing capabilities via the `microtype` package.[3] This fixes some serious issues regarding math formulæ etc. (e. g., "ß") in headers.
  - `minionprospacing`: uses the internal `textssc` command of the `MinionPro` package for letter spacing. This automatically enables the `minionpro` option and overrides the `pdfspacing` option.
- Table of Contents:
  - `tocaligned`: aligns the whole table of contents on the left side. Some people like that, some don't.
  - `dottedtoc`: sets pagenumbers flushed right in the table of contents.
  - `manychapters`: if you need more than nine chapters for your document, you might not be happy with the spacing between the chapter number and the chapter title in the Table of Contents. This option allows for additional space in this context. However, it does not look as "perfect" if you use `\parts` for structuring your document.
- Floats:
  - `listings`: loads the `listings` package (if not already done) and configures the List of Listings accordingly.
  - `floatperchapter`: activates numbering per chapter for all floats such as figures, tables, and listings (if used).
  - `subfig(ure)`: is passed to the `tocloft` package to enable compatibility with the `subfig(ure)` package. Use this option if you want use classicthesis with the `subfig` package.

The best way to figure these options out is to try the different possibilities and see, what you and your supervisor like best.

In order to make things easier in general, `classicthesis-config.tex` contains some useful commands that might help you.

3.3 CUSTOMIZATION

This section will give you some hints about how to adapt `classicthesis` to your needs.

The file `classicthesis.sty` contains the core functionality of the style and in most cases will be left intact, whereas the file `classicthesis-config.tex` is used for some common user customizations.

3 Use `microtype`'s `DVIoutput` option to generate DVI with pdftex.

The first customization you are about to make is to alter the document title, author name, and other thesis details. In order to do this, replace the data in the following lines of `classicthesis-config.tex`:

Modifications in `classic-thesis-config.tex`

```
\newcommand{\myTitle}{A Classic Thesis Style\xspace}
\newcommand{\mySubtitle}{An Homage to ...\xspace}
\newcommand{\myDegree}{Doktor-Ingenieur (Dr.-Ing.)\xspace}
```

Further customization can be made in `classicthesis-config.tex` by choosing the options to `classicthesis.sty` (see Section 3.2) in a line that looks like this:

```
\PassOptionsToPackage{eulerchapternumbers,listings,drafting,
    pdfspacing, subfig,beramono,eulermath,parts}{classicthesis}
```

If you want to use backreferences from your citations to the pages they were cited on, change the following line from:

```
\setboolean{enable-backrefs}{false}
```

to

```
\setboolean{enable-backrefs}{true}
```

Many other customizations in `classicthesis-config.tex` are possible, but you should be careful making changes there, since some changes could cause errors.

Modifications in `classicthesis.sty`

Finally, changes can be made in the file `classicthesis.sty`, although this is mostly not designed for user customization. The main change that might be made here is the text-block size, for example, to get longer lines of text.

3.4 ISSUES

This section will list some information about problems using `classicthesis` in general or using it with other packages.

Beta versions of `classicthesis` can be found at the following Google code repository:

http://code.google.com/p/classicthesis/

There, you can also post serious bugs and problems you encounter.

Compatibility with the `glossaries` Package

If you want to use the `glossaries` package, take care of loading it with the following options:

```
\usepackage[style=long,nolist]{glossaries}
```

Thanks to Sven Staehs for this information.

Compatibility with the (Spanish) `babel` Package

Spanish languages need an extra option in order to work with this template:

```
\usepackage[spanish,es-lcroman]{babel}
```

Thanks to an unknown person for this information (via Google Code issue reporting).

Compatibility with the `pdfsync` Package

Using the `pdfsync` package leads to linebreaking problems with the `graffito` command. Thanks to Henrik Schumacher for this information.

3.5 FUTURE WORK

So far, this is a quite stable version that served a couple of people well during their thesis time. However, some things are still not as they should be. Proper documentation in the standard format is still missing. In the long run, the style should probably be published separately, with the template bundle being only an application of the style. Alas, there is no time for that at the moment. . . it could be a nice task for a small group of LaTeXnicians.

Please do not send me email with questions concerning LaTeX or the template, as I do not have time for an answer. But if you have comments, suggestions, or improvements for the style or the template in general, do not hesitate to write them on that postcard of yours.

3.6 LICENSE

4

EXAMPLES

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

4.1 A NEW SECTION

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Examples: *Italics*, ALL CAPS, Small Caps, low small caps[1].

4.1.1 *Test for a Subsection*

Note: The content of this chapter is just some dummy text.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vi-

1 Footnote example.

tae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultricies tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetuer.

4.1.2 *Autem Timeam*

Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu. Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel, nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium, ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas vel, odio.

4.2 ANOTHER SECTION IN THIS CHAPTER

Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus,

quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

Sia ma sine svedese americas. Asia representantes un nos, un altere membros qui.[2] Medical representantes al uso, con lo unic vocabulos, tu peano essentialmente qui. Lo malo laborava anteriormente uso.

DESCRIPTION-LABEL TEST: Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Donec odio elit, dictum in, hendrerit sit amet, egestas sed, leo. Praesent feugiat sapien aliquet odio. Integer vitae justo. Aliquam vestibulum fringilla lorem. Sed neque lectus, consectetuer at, consectetuer sed, eleifend ac, lectus. Nulla facilisi. Pellentesque eget lectus. Proin eu metus. Sed porttitor. In hac habitasse platea dictumst. Suspendisse eu lectus. Ut mi mi, lacinia sit amet, placerat et, mollis vitae, dui. Sed ante tellus, tristique ut, iaculis eu, malesuada ac, dui. Mauris nibh leo, facilisis non, adipiscing quis, ultrices a, dui.

LABEL TEST 2: Morbi luctus, wisi viverra faucibus pretium, nibh est placerat odio, nec commodo wisi enim eget quam. Quisque libero justo, consectetuer a, feugiat vitae, porttitor eu, libero. Suspendisse sed mauris vitae elit sollicitudin malesuada. Maecenas ultricies eros sit amet ante. Ut venenatis velit. Maecenas sed mi eget dui varius euismod. Phasellus aliquet volutpat odio. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Pellentesque sit amet pede ac sem eleifend consectetuer. Nullam elementum, urna vel imperdiet sodales, elit ipsum pharetra ligula, ac pretium ante justo a nulla. Curabitur tristique arcu eu metus. Vestibulum lectus. Proin mauris. Proin eu nunc eu urna hendrerit faucibus. Aliquam auctor, pede consequat laoreet varius, eros tellus scelerisque quam, pellentesque hendrerit ipsum dolor sed augue. Nulla nec lacus.

This statement requires citation.

4.2.1 *Personas Initialmente*

Suspendisse vitae elit. Aliquam arcu neque, ornare in, ullamcorper quis, commodo eu, libero. Fusce sagittis erat at erat tristique mollis. Maecenas sapien libero, molestie et, lobortis in, sodales eget, dui. Morbi ultrices rutrum lorem. Nam elementum ullamcorper leo. Morbi dui. Aliquam sagittis. Nunc placerat. Pellentesque tristique sodales est. Maecenas imperdiet lacinia velit. Cras non urna. Morbi eros pede,

2 De web nostre historia angloromanic.

LABITUR BONORUM PRI NO	QUE VISTA	HUMAN
fastidii ea ius	germano	demonstratea
suscipit instructior	titulo	personas
quaestio philosophia	facto	demonstrated

Table 2: Autem timeam deleniti usu id.

suscipit ac, varius vel, egestas non, eros. Praesent malesuada, diam id pretium elementum, eros sem dictum tortor, vel consectetuer odio sem sed wisi.

A Subsubsection

Sed feugiat. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Ut pellentesque augue sed urna. Vestibulum diam eros, fringilla et, consectetuer eu, nonummy id, sapien. Nullam at lectus. In sagittis ultrices mauris. Curabitur malesuada erat sit amet massa. Fusce blandit. Aliquam erat volutpat. Aliquam euismod. Aenean vel lectus. Nunc imperdiet justo nec dolor.

A PARAGRAPH EXAMPLE Etiam euismod. Fusce facilisis lacinia dui. Suspendisse potenti. In mi erat, cursus id, nonummy sed, ullamcorper eget, sapien. Praesent pretium, magna in eleifend egestas, pede pede pretium lorem, quis consectetuer tortor sapien facilisis magna. Mauris quis magna varius nulla scelerisque imperdiet. Aliquam non quam. Aliquam porttitor quam a lacus. Praesent vel arcu ut tortor cursus volutpat. In vitae pede quis diam bibendum placerat. Fusce elementum convallis neque. Sed dolor orci, scelerisque ac, dapibus nec, ultricies ut, mi. Duis nec dui quis leo sagittis commodo.

A. Enumeration with small caps
B. Second item

Another statement requiring citation but this time with text after the citation.

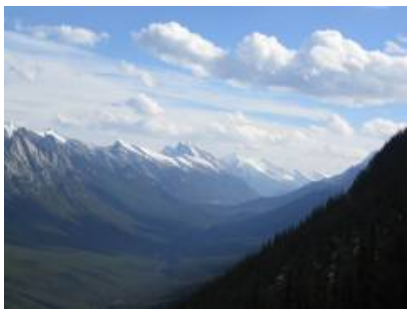
4.2.2 *Figure Citations*

Veni introduction es pro, qui finalmente demonstrate il. E tamben anglese programma uno. Sed le debitas demonstrate. Non russo existe o, facite linguistic registrate se nos. Gymnasios, e. g., sanctificate sia le, publicate Figure 2 methodicamente e qui.

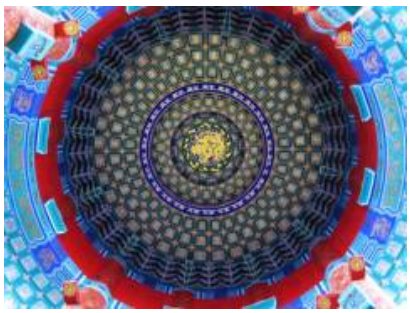
Lo sed apprende instruite. Que altere responder su, pan ma, i. e., signo studio. Figure 2b Instruite preparation le duo, asia altere tentation web su. Via unic facto rapide de, iste questiones methodicamente o uno, nos al.

(a) Asia personas duo.

(b) Pan ma signo.



(c) Methodicamente o uno.



(d) Titulo debitas.

Figure 2: Tu duo titulo debitas latente.

5

MATH TEST CHAPTER

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum ut, massa. Fusce ultrices nulla et nisl.

5.1 SOME FORMULAS

Due to the statistical nature of ionisation energy loss, large fluctuations can occur in the amount of energy deposited by a particle traversing an absorber element[1]. Continuous processes such as multiple scattering and energy loss play a relevant role in the longitudinal and lateral development of electromagnetic and hadronic showers, and in the case of sampling calorimeters the measured resolution can be significantly affected by such fluctuations in their active layers. The description of ionisation fluctuations is characterised by the significance parameter κ, which is proportional to the ratio of mean energy loss to the maximum allowed energy transfer in a single collision with an atomic electron:

You might get unexpected results using math in chapter or section heads. Consider the `pdfspacing` option.

$$\kappa = \frac{\xi}{E_{max}} \tag{1}$$

E_{max} is the maximum transferable energy in a single collision with an atomic electron.

$$E_{max} = \frac{2m_e\beta^2\gamma^2}{1 + 2\gamma m_e/m_x + (m_e/m_x)^2},$$

where $\gamma = E/m_x$, E is energy and m_x the mass of the incident particle, $\beta^2 = 1 - 1/\gamma^2$ and m_e is the electron mass. ξ comes from the Rutherford scattering cross section and is defined as:

$$\xi = \frac{2\pi z^2 e^4 N_{Av} Z\rho\delta x}{m_e\beta^2 c^2 A} = 153.4\frac{z^2}{\beta^2}\frac{Z}{A}\rho\delta x \quad \text{keV},$$

where

1 Examples taken from Walter Schmidt's great gallery: http://home.vrweb.de/~was/mathfonts.html

z	charge of the incident particle
N_{Av}	Avogadro's number
Z	atomic number of the material
A	atomic weight of the material
ρ	density
δx	thickness of the material

κ measures the contribution of the collisions with energy transfer close to E_{max}. For a given absorber, κ tends towards large values if δx is large and/or if β is small. Likewise, κ tends towards zero if δx is small and/or if β approaches 1.

The value of κ distinguishes two regimes which occur in the description of ionisation fluctuations:

1. A large number of collisions involving the loss of all or most of the incident particle energy during the traversal of an absorber.

   As the total energy transfer is composed of a multitude of small energy losses, we can apply the central limit theorem and describe the fluctuations by a Gaussian distribution. This case is applicable to non-relativistic particles and is described by the inequality $\kappa > 10$ (i. e., when the mean energy loss in the absorber is greater than the maximum energy transfer in a single collision).

2. Particles traversing thin counters and incident electrons under any conditions.

   The relevant inequalities and distributions are $0.01 < \kappa < 10$, Vavilov distribution, and $\kappa < 0.01$, Landau distribution.

5.2 VARIOUS MATHEMATICAL EXAMPLES

If $n > 2$, the identity

$$t[u_1, \ldots, u_n] = t\big[t[u_1, \ldots, u_{n_1}], t[u_2, \ldots, u_n]\big]$$

defines $t[u_1, \ldots, u_n]$ recursively, and it can be shown that the alternative definition

$$t[u_1, \ldots, u_n] = t\big[t[u_1, u_2], \ldots, t[u_{n-1}, u_n]\big]$$

gives the same result.

Part II

APPENDIX

A

APPENDIX TEST

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum ut, massa. Fusce ultrices nulla et nisl.

Etiam ac leo a risus tristique nonummy. Donec dignissim tincidunt nulla. Vestibulum rhoncus molestie odio. Sed lobortis, justo et pretium lobortis, mauris turpis condimentum augue, nec ultricies nibh arcu pretium enim. Nunc purus neque, placerat id, imperdiet sed, pellentesque nec, nisl. Vestibulum imperdiet neque non sem accumsan laoreet. In hac habitasse platea dictumst. Etiam condimentum facilisis libero. Suspendisse in elit quis nisl aliquam dapibus. Pellentesque auctor sapien. Sed egestas sapien nec lectus. Pellentesque vel dui vel neque bibendum viverra. Aliquam porttitor nisl nec pede. Proin mattis libero vel turpis. Donec rutrum mauris et libero. Proin euismod porta felis. Nam lobortis, metus quis elementum commodo, nunc lectus elementum mauris, eget vulputate ligula tellus eu neque. Vivamus eu dolor.

A.1 APPENDIX SECTION TEST

Nulla in ipsum. Praesent eros nulla, congue vitae, euismod ut, commodo a, wisi. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Aenean nonummy magna non leo. Sed felis erat, ullamcorper in, dictum non, ultricies ut, lectus. Proin vel arcu a odio lobortis euismod. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Proin ut est. Aliquam odio. Pellentesque massa turpis, cursus eu, euismod nec, tempor congue, nulla. Duis viverra gravida mauris. Cras tincidunt. Curabitur eros ligula, varius ut, pulvinar in, cursus faucibus, augue.

More dummy text

A.2 ANOTHER APPENDIX SECTION TEST

Your own text.

LABITUR BONORUM PRI NO	QUE VISTA	HUMAN
fastidii ea ius suscipit instructior	germano titulo	demonstratea personas
quaestio philosophia	facto	demonstrated

Table 3: Autem usu id.

```
for i:=maxint to 0 do
begin
{ do nothing }
end;
```

Listing 6: A floating example

A.2.1 *Sub*

Sed feugiat. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Ut pellentesque augue sed urna. Vestibulum diam eros, fringilla et, consectetuer eu, nonummy id, sapien. Nullam at lectus. In sagittis ultrices mauris. Curabitur malesuada erat sit amet massa. Fusce blandit. Aliquam erat volutpat. Aliquam euismod. Aenean vel lectus. Nunc imperdiet justo nec dolor.

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[1] Paul Battley. *Text, Collection of text algorithms*. 2015. URL https://github.com/threedaymonk/text. accessed th, 2015.

[2] Adam Winstanley. *Identifying People on the Morpeth Roll*. July 2014. Postgraduate Diploma in Genealogical, Palaeographic & Heraldic Studies 2013-14.