Alexandre Zaghetto

Intel Galileo: Laboratórios

Aulas Práticas Envolvendo o Intel Galileo

27 de Outubro de 2015

Universidade de BrasÃ■lia
BrasÃ■lia Distrito Federal Brasil

Use the template dedic.tex *together with the Springer document class SVMono for monograph-type books or SVMult for contributed volumes to style a quotation or a dedication at the very beginning of your book in the Springer layout*

Foreword

Use the template *foreword.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style your foreword in the Springer layout.

The foreword covers introductory remarks preceding the text of a book that are written by a *person other than the author or editor* of the book. If applicable, the foreword precedes the preface which is written by the author or editor of the book.

Place, month year *Firstname Surname*

Prefácio

Use the template *preface.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style your preface in the Springer layout.

A preface is a book's preliminary statement, usually written by the *author or editor* of a work, which states its origin, scope, purpose, plan, and intended audience, and which sometimes includes afterthoughts and acknowledgments of assistance.

When written by a person other than the author, it is called a foreword. The preface or foreword is distinct from the introduction, which deals with the subject of the work.

Customarily *acknowledgments* are included as last part of the preface.

Place(s), *Firstname Surname*
month year *Firstname Surname*

Acknowledgements

Use the template *acknow.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) if you prefer to set your acknowledgement section as a separate chapter instead of including it as last part of your preface.

Conteúdo

Acronyms

Use the template *acronym.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style your list(s) of abbreviations or symbols in the Springer layout.

Lists of abbreviations, symbols and the like are easily formatted with the help of the Springer-enhanced `description` environment.

ABC	Spelled-out abbreviation and definition
BABI	Spelled-out abbreviation and definition
CABR	Spelled-out abbreviation and definition

Parte I
Part Title

Use the template *part.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style your part title page and, if desired, a short introductory text (maximum one page) on its verso page in the Springer layout.

Capítulo 1
Chapter Heading

Resumo Each chapter should be preceded by an abstract (10–15 lines long) that summarizes the content. The abstract will appear *online* at www.SpringerLink.com and be available with unrestricted access. This allows unregistered users to read the abstract as a teaser for the complete chapter. As a general rule the abstracts will not appear in the printed version of your book unless it is the style of your particular book or that of the series to which your book belongs.

Please use the 'starred' version of the new Springer `abstract` command for typesetting the text of the online abstracts (cf. source file of this chapter template `abstract`) and include them with the source files of your manuscript. Use the plain `abstract` command if the abstract is also to appear in the printed version of the book.

1.1 Section Heading

Use the template *chapter.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style the various elements of your chapter content in the Springer layout.

1.2 Section Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

Use the standard `equation` environment to typeset your equations, e.g.

$$a \times b = c \,, \tag{1.1}$$

```
void zigzag (byte *matriz, boolean acender, boolean luz){
  /*  Inicializacao das variaveis de controle */
  linha = coluna = 0;
  direcao = LOW;
  if (acender == HIGH)
    zera (matriz);

  /*  Varredura de toda a matriz */
  for (indice = 0; indice < pow(tamanho, 2); indice++){
    /*  Caso esteja acendendo os LEDS */
    if (acender == HIGH){
      bitSet (matriz[linha], coluna);
      envia (matriz);
      if (luz == LOW)
        bitClear (matriz[linha], coluna);

    /*  Caso contrario */
    }else{
      bitClear (matriz[linha], coluna);
      envia (matriz);
    }

    /*  Vindo pela direita */
    if (direcao == LOW){
      if (linha == 0){
        coluna++;
        direcao = HIGH;
      }else if (coluna == (tamanho - 1)){
        linha++;
        direcao = HIGH;
      }else{
        coluna++;
        linha--;
      }
    /*  Vindo pela esquerda */
    }else{
      if (coluna == 0){
        linha++;
        if (linha == tamanho){
            linha = tamanho - 1;
          coluna++;
        }
        direcao = LOW;
      }else if (linha == (tamanho - 1)){
        coluna++;
        direcao = LOW;
      }else{
        linha++;
        coluna--;
      }
    }
  }
}
```

zigzagscan.ino

however, for multiline equations we recommend to use the `eqnarray` environment[1].

$$a \times b = c$$

[1] In physics texts please activate the class option `vecphys` to depict your vectors in ***boldface-italic*** type - as is customary for a wide range of physical subjects.

$$\mathbf{a} \cdot \mathbf{b} = \mathbf{c} \tag{1.2}$$

1.2.1 Subsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

> Please do not use quotation marks when quoting texts! Simply use the `quotation` environment – it will automatically render Springer's preferred layout.

1.2.1.1 Subsubsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.1, see also Fig. 1.1[2]

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

Paragraph Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

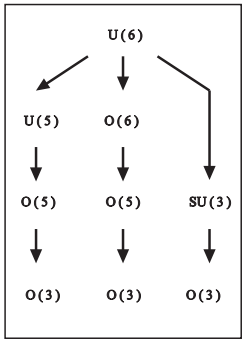

Figura 1.1 If the width of the figure is less than 7.8 cm use the `sidecapion` command to flush the caption on the left side of the page. If the figure is positioned at the top of the page, align the sidecaption with the top of the figure – to achieve this you simply need to use the optional argument `[t]` with the `sidecaption` command

[2] If you copy text passages, figures, or tables from other works, you must obtain *permission* from the copyright holder (usually the original publisher). Please enclose the signed permission with the manucript. The sources must be acknowledged either in the captions, as footnotes or in a separate section of the book.

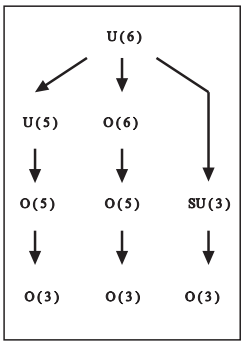

Figura 1.2 Please write your figure caption here

For typesetting numbered lists we recommend to use the `enumerate` environment – it will automatically render Springer's preferred layout.

1. Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.
   a. Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.
   b. Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.
2. Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.

Subparagraph Heading

In order to avoid simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2, see also Fig. 1.2.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

For unnumbered list we recommend to use the `itemize` environment – it will automatically render Springer's preferred layout.

- Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development, cf. Table 1.1.
  – Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.
  – Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.
- Livelihood and survival mobility are oftentimes coutcomes of uneven socioeconomic development.

Run-in Heading Boldface Version Use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Run-in Heading Italic Version Use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Tabela 1.1 Please write your table caption here

Classes	Subclass	Length	Action Mechanism
Translation	mRNA[a]	22 (19–25)	Translation repression, mRNA cleavage
Translation	mRNA cleavage	21	mRNA cleavage
Translation	mRNA	21–22	mRNA cleavage
Translation	mRNA	24–26	Histone and DNA Modification

[a] Table foot note (with superscript)

1.3 Section Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

If you want to list definitions or the like we recommend to use the Springer-enhanced `description` environment – it will automatically render Springer's preferred layout.

Type 1 That addresses central themes pertainng to migration, health, and disease. In Sect. 1.1, Wilson discusses the role of human migration in infectious disease distributions and patterns.

Type 2 That addresses central themes pertainng to migration, health, and disease. In Sect. 1.2.1, Wilson discusses the role of human migration in infectious disease distributions and patterns.

1.3.1 Subsection Heading

In order to avoid simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Use the LaTeX automatism for all your cross-references and citations citations as has already been described in Sect. 1.2.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

If you want to emphasize complete paragraphs of texts we recommend to use the newly defined Springer class option `graybox` and the newly defined environment `svgraybox`. This will produce a 15 percent screened box 'behind' your text.

If you want to emphasize complete paragraphs of texts we recommend to use the newly defined Springer class option and environment `svgraybox`. This will produce a 15 percent screened box 'behind' your text.

1.3.1.1 Subsubsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

Theorem 1.1. *Theorem text goes here.*

Definition 1.1. Definition text goes here.

Demonstração. Proof text goes here. □

Paragraph Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. 1.2.

Note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

Theorem 1.2. *Theorem text goes here.*

Definition 1.2. Definition text goes here.

Demonstração. Proof text goes here. □

Acknowledgements If you want to include acknowledgments of assistance and the like at the end of an individual chapter please use the `acknowledgement` environment – it will automatically render Springer's preferred layout.

Appendix

When placed at the end of a chapter or contribution (as opposed to at the end of the book), the numbering of tables, figures, and equations in the appendix section continues on from that in the main text. Hence please *do not* use the `appendix` command when writing an appendix at the end of your chapter or contribution. If there is only one the appendix is designated "Appendix", or "Appendix 1", or "Appendix 2", etc. if there is more than one.

$$a \times b = c \tag{1.3}$$

Problems

1.1. A given problem or Excercise is described here. The problem is described here. The problem is described here.

1.2. Problem Heading
(a) The first part of the problem is described here.
(b) The second part of the problem is described here.

Referências

In view of the parallel print and (chapter-wise) online publication of your book at www.springerlink.com it has been decided that – as a genreral rule – references should be sorted chapter-wise and placed at the end of the individual chapters. However, upon agreement with your contact at Springer you may list your references in a single seperate chapter at the end of your book. Deactivate the class option `sectrefs` and the `thebibliography` environment will be put out as a chapter of its own.

References may be *cited* in the text either by number (preferred) or by author/year.[3] The reference list should ideally be *sorted* in alphabetical order – even if reference numbers are used for the their citation in the text. If there are several works by the same author, the following order should be used:

1. all works by the author alone, ordered chronologically by year of publication
2. all works by the author with a coauthor, ordered alphabetically by coauthor
3. all works by the author with several coauthors, ordered chronologically by year of publication.

The *styling* of references[4] depends on the subject of your book:

- The *two* recommended styles for references in books on *mathematical, physical, statistical and computer sciences* are depicted in [1, 2, 3, 4, 5] and [6, 7, 8, 9, 10].
- Examples of the most commonly used reference style in books on *Psychology, Social Sciences* are [11, 12, 13, 14, 15].
- Examples for references in books on *Humanities, Linguistics, Philosophy* are [16, 17, 18, 19, **?**].
- Examples of the basic Springer style used in publications on a wide range of subjects such as *Computer Science, Economics, Engineering, Geosciences, Life Sciences, Medicine, Biomedicine* are [20, 21, 23, 22, 24].

1. Broy, M.: Software engineering — from auxiliary to key technologies. In: Broy, M., Dener, E. (eds.) Software Pioneers, pp. 10-13. Springer, Heidelberg (2002)
2. Dod, J.: Effective substances. In: The Dictionary of Substances and Their Effects. Royal Society of Chemistry (1999) Available via DIALOG.
http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999
3. Geddes, K.O., Czapor, S.R., Labahn, G.: Algorithms for Computer Algebra. Kluwer, Boston (1992)

[3] Make sure that all references from the list are cited in the text. Those not cited should be moved to a separate *Further Reading* section or chapter.

[4] Always use the standard abbreviation of a journal's name according to the ISSN *List of Title Word Abbreviations*, see http://www.issn.org/en/node/344

4. Hamburger, C.: Quasimonotonicity, regularity and duality for nonlinear systems of partial differential equations. Ann. Mat. Pura. Appl. **169**, 321–354 (1995)
5. Slifka, M.K., Whitton, J.L.: Clinical implications of dysregulated cytokine production. J. Mol. Med. (2000) doi: 10.1007/s001090000086

6. J. Dod, in *The Dictionary of Substances and Their Effects*, Royal Society of Chemistry. (Available via DIALOG, 1999), http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999
7. H. Ibach, H. Lüth, *Solid-State Physics*, 2nd edn. (Springer, New York, 1996), pp. 45-56
8. S. Preuss, A. Demchuk Jr., M. Stuke, Appl. Phys. A **61**
9. M.K. Slifka, J.L. Whitton, J. Mol. Med., doi: 10.1007/s001090000086
10. S.E. Smith, in *Neuromuscular Junction*, ed. by E. Zaimis. Handbook of Experimental Pharmacology, vol 42 (Springer, Heidelberg, 1976), p. 593

11. Calfee, R. C., & Valencia, R. R. (1991). *APA guide to preparing manuscripts for journal publication.* Washington, DC: American Psychological Association.
12. Dod, J. (1999). Effective substances. In: The dictionary of substances and their effects. Royal Society of Chemistry. Available via DIALOG.
http://www.rsc.org/dose/Effective substances. Cited 15 Jan 1999.
13. Harris, M., Karper, E., Stacks, G., Hoffman, D., DeNiro, R., Cruz, P., et al. (2001). Writing labs and the Hollywood connection. *J Film* Writing, 44(3), 213–245.
14. O'Neil, J. M., & Egan, J. (1992). Men's and women's gender role journeys: Metaphor for healing, transition, and transformation. In B. R. Wainrig (Ed.), *Gender issues across the life cycle* (pp. 107–123). New York: Springer.
15. Kreger, M., Brindis, C.D., Manuel, D.M., Sassoubre, L. (2007). Lessons learned in systems change initiatives: benchmarks and indicators. *American Journal of Community Psychology*, doi: 10.1007/s10464-007-9108-14.

16. Alber John, Daniel C. O'Connell, and Sabine Kowal. 2002. Personal perspective in TV interviews. *Pragmatics* 12:257–271
17. Cameron, Deborah. 1997. Theoretical debates in feminist linguistics: Questions of sex and gender. In *Gender and discourse*, ed. Ruth Wodak, 99–119. London: Sage Publications.
18. Cameron, Deborah. 1985. *Feminism and linguistic theory.* New York: St. Martin's Press.
19. Dod, Jake. 1999. Effective substances. In: The dictionary of substances and their effects. Royal Society of Chemistry. Available via DIALOG.
http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999

20. Brown B, Aaron M (2001) The politics of nature. In: Smith J (ed) The rise of modern genomics, 3rd edn. Wiley, New York
21. Dod J (1999) Effective Substances. In: The dictionary of substances and their effects. Royal Society of Chemistry. Available via DIALOG.
http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999
22. Slifka MK, Whitton JL (2000) Clinical implications of dysregulated cytokine production. J Mol Med, doi: 10.1007/s001090000086
23. Smith J, Jones M Jr, Houghton L et al (1999) Future of health insurance. N Engl J Med 965:325–329
24. South J, Blass B (2001) The future of modern genomics. Blackwell, London

Capítulo 2
Laboratório 2

2.1 Sobre o problema

O objetivo desse sistema é mensurar o nível de iluminação de um local utilizando o sensor LDR. Quanto maior o nível de luz incidida, mais led's deverão ser acesos.

2.2 Fundamentos teóricos

2.2.1 Sensor LDR

O LDR (*Light Dependent Resistor*) é um componente eletrônico passivo – sem polaridade –, cuja resistência varia conforme a intensidade da luz que incide sobre ele. A medida que a intensidade da luz incidida aumenta, a sua resistência diminui. [**?**]

2.2.2 Conversor analógico-digital (ADC)

Em resumo, o ADC é uma funcionalidade que converte uma tensão analógica em um determinado número. O Intel Galileo/Arduino possui 10 bits de precisão, portanto, pode detectar (2^{10} = 1024) níveis discretos analógicos. Isso significa que qualquer tensão (0 – 5 V) que entre no pino ADC do Intel Galileo, será convertido em um número de 0 a 1023. [**?**]

Fórmula:

$$\frac{\text{Resolução do sistema}}{\text{Tensão do sistema}} = \frac{\text{Leitura ADC}}{\text{Tensão analógica medida}} \tag{2.1}$$

Portanto, para o Intel Galileo, tem-se:

$$\frac{1023}{5} = \frac{\text{Leitura ADC}}{\text{Tensão analógica medida}} \tag{2.2}$$

2.3 Pré-requisitos

- Conversor digital-analógico;
- Operadores lógicos;
- Instrução condicional simples (se/então);
- Saída digital.

2.4 Material necessário

- Intel Galileo;
- Protoboard;
- Jumpers ou fios;
- 1x resistor de 10 kΩ e 4x resistores de 220 Ω;
- 4x led's (preferencialmente de cores diferentes);
- 1 sensor LDR.

2.5 Circuito montado

Os led's devem ser mantidos o mais longe possível do sensor LDR, evitando assim, que a luz emitida por eles interfira na medida feita pelo sensor.

2.6 Código

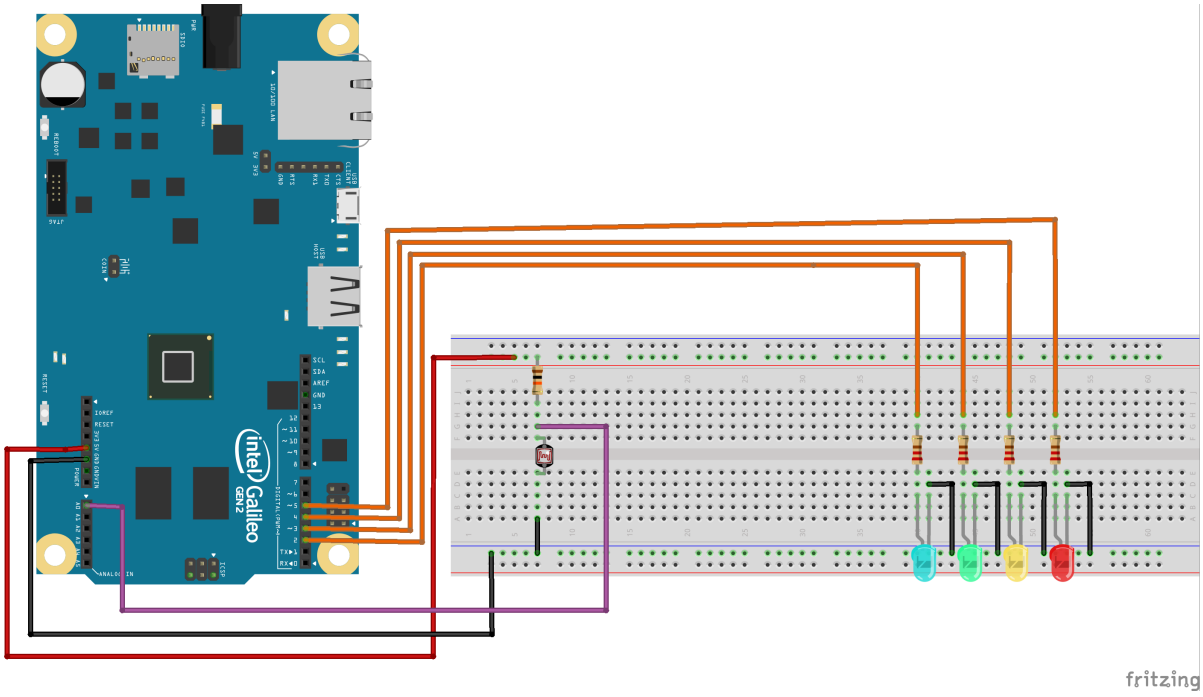

Figura 2.1 Montagem do circuito utilizando o software Fritzing

```
/*
* Título: Medida do nível de iluminação utilizando o sensor LDR
* Autor: Charles Cardoso de Oliveira
* Descrição: A medida que o nível de iluminação aumenta, diminui o valor lido na entrada analógica A0.
* Os valores lidos são mostrados no monitor via interface serial e devem ser utilizados para calibrar os valores LIMIARX de acordo com o local.
* A quantidade de led's ligados é controlada pelos condicionais.
*/

#define LIMIAR1 1020
#define LIMIAR2 1010
#define LIMIAR3 1000

#define LED1 2
#define LED2 3
#define LED3 4
#define LED4 5

int valorAnalogico;

void setup(){
    Serial.begin(9600); /* Inicia o modo serial para debug */

    pinMode(LED1, OUTPUT);
    pinMode(LED2, OUTPUT);
    pinMode(LED3, OUTPUT);
    pinMode(LED4, OUTPUT);
}

void loop(){
  valorAnalogico = analogRead(A0);
  Serial.println(valorAnalogico); /* Imprime no monitor o valor lido em A0 (deve ser utilizado para calibrar os valores LIMIAR) */

  if(valorAnalogico > LIMIAR1){
    digitalWrite(LED1, HIGH);
    digitalWrite(LED2, LOW);
    digitalWrite(LED3, LOW);
    digitalWrite(LED4, LOW);
  }

  if(valorAnalogico > LIMIAR2 && valorAnalogico <= LIMIAR1){
    digitalWrite(LED1, HIGH);
    digitalWrite(LED2, HIGH);
    digitalWrite(LED3, LOW);
    digitalWrite(LED4, LOW);
  }

  if(valorAnalogico > LIMIAR3 && valorAnalogico <= LIMIAR2){
    digitalWrite(LED1, HIGH);
    digitalWrite(LED2, HIGH);
    digitalWrite(LED3, HIGH);
    digitalWrite(LED4, LOW);
  }

  if(valorAnalogico <= LIMIAR3){
    digitalWrite(LED1, HIGH);
    digitalWrite(LED2, HIGH);
    digitalWrite(LED3, HIGH);
    digitalWrite(LED4, HIGH);
  }
}
```

lab2_charles/lab2_galileo.ino

Apêndice A
Chapter Heading

All's well that ends well

Use the template *appendix.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style appendix of your book in the Springer layout.

A.1 Section Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations.

A.1.1 Subsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. A.1.

For multiline equations we recommend to use the `eqnarray` environment.

$$\begin{aligned} \mathbf{a} \times \mathbf{b} &= \mathbf{c} \\ \mathbf{a} \times \mathbf{b} &= \mathbf{c} \end{aligned} \tag{A.1}$$

A.1.1.1 Subsubsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. A.1.1.

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

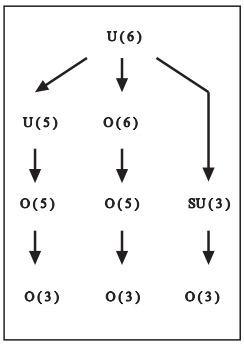

Figura A.1 Please write your figure caption here

Tabela A.1 Please write your table caption here

Classes	Subclass	Length	Action Mechanism
Translation	mRNA[a]	22 (19–25)	Translation repression, mRNA cleavage
Translation	mRNA cleavage	21	mRNA cleavage
Translation	mRNA	21–22	mRNA cleavage
Translation	mRNA	24–26	Histone and DNA Modification

[a] Table foot note (with superscript)

Glossary

Use the template *glossary.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style your glossary in the Springer layout.

glossary term Write here the description of the glossary term. Write here the description of the glossary term. Write here the description of the glossary term.

glossary term Write here the description of the glossary term. Write here the description of the glossary term. Write here the description of the glossary term.

glossary term Write here the description of the glossary term. Write here the description of the glossary term. Write here the description of the glossary term.

glossary term Write here the description of the glossary term. Write here the description of the glossary term. Write here the description of the glossary term.

glossary term Write here the description of the glossary term. Write here the description of the glossary term. Write here the description of the glossary term.

Solutions

Problems of Chapter 1

1.1 The solution is revealed here.

1.2 Problem Heading
(a) The solution of first part is revealed here.
(b) The solution of second part is revealed here.

Índice