

Science Research Writing

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1. Objetivo do Minicurso

Things should be made as simple as possible, but not any simpler.

– *Albert Einstein*

1. Objetivo do Minicurso

Por que eu preciso disso?

O objetivo da pesquisa científica é **publicar**, mas bom cientistas nem sempre são bons escritores.

Objetivos

- Contribuir para pessoas, para as quais o Inglês não é a língua nativa, escreverem textos científicos em Inglês.
- Escrever sua própria pesquisa em Inglês **é a única forma** de fazer parte da comunidade científica internacional.
- Escrever e publicar um artigo científico é o melhor modo de desenvolver sua carreira.

1. Objetivo do Minicurso

O que será discutido?

- A maioria da pesquisa científica segue uma estrutura bastante convencional: **título, resumo, introdução, metodologia, resultados, discussão e/ou conclusão.**

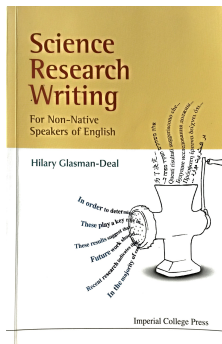


Figura 1: Livro de referência.

- A maioria do vocabulário não-especializado encontra-se neste livro.
- Um modelo de texto familiar ajuda a minimizar o efeito de erros gramaticais e ortográficos.
- Use o material que você está lendo (especialmente de nativos) para desenvolver suas habilidades de escrita.

1. Objetivo do Minicurso

- Este minicurso também pretende discutir o que é ciência e como ela pode ser feita de modo efetivo.
- A estrutura de um artigo científico, de certo modo, revela como que é o dia-a-dia da Ciência.
- O dia-a-dia da Ciência constitui-se em como proceder de modo metodológico para avançar o conhecimento científico e tecnológico.

1. Introdução

- O melhor momento para escrever a introdução é quando as seções de metodologia e resultados estiverem prontas, ou pelo menos rascunhadas.
- A introdução pode ser pensada na apresentação de uma obra de arte em um museu ou de uma grande construção. As Figuras 2 e 3 retratam esses dois momentos.

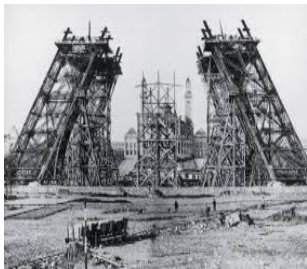


Figura 2: Obra inacabada.

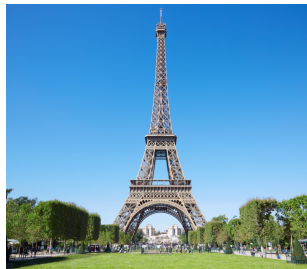


Figura 3: Obra pronta.

1. Introdução

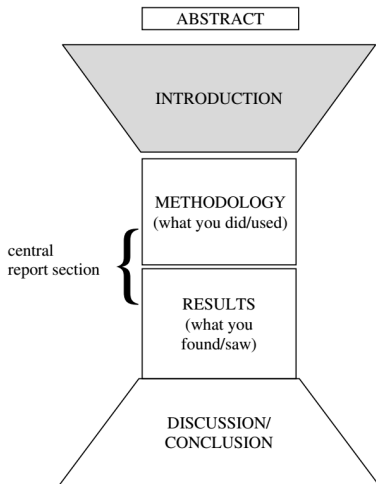


Figura 4: Estrutura geral de um artigo científico ou dissertação/tese. Fonte: (Glasman-Deal, 2010)

1.1 Estrutura

- Na Introdução, inicia-se de modo geral e conduz o leitor gradualmente ao foco do trabalho.
- Em trabalhos recentes do GCOM, adotamos dividir a metodologia em duas partes.
 - ① A primeira destinada a apresentar um *background* mínimo a respeito do método. Os seguintes títulos são adotados: **Background** ou **Preliminary Concepts**.
 - ② A segunda apresenta o método proposto no artigo. Neste caso, pode-se nomear como **Methodology** ou pela própria técnica proposta.
- Na Conclusão, o procedimento é o contrário, o foco do trabalho é a primeira informação e termina-se o texto, em geral, apresentando perspectivas de trabalhos futuros.

1.2 Gramática e Redação

1 Tempos verbais

- Em geral: **Present Simple**, **Past Simple** e **Present Perfect**.
- Menos frequente: **Future/Present Continuous/Imperative**.

Exemplos:

- 1 Os autores pretendem continuar a pesquisa no futuro: *We will integrate/we are integrating this technique with the FEM implementations.*
- 2 Os autores convidam a comunidade científica a realizarem esta pesquisa no futuro: *This technique should be integrated with the FEM implementations.*
- 3 *Consider an iterative algorithm and a dynamical system with state vector x_k and dynamics $x_{k+1} = f(x_k)$.*¹

2 Conexão do texto

3 Voz passiva e ativa

4 Parágrafo

¹A. Hasan et al., IEEE Trans. Automat. Contr. 58, 1524 (2013).

1.2.1 Tempos verbais

- **Present Simple:** Usado na ciência para realizar afirmações sobre fatos aceitos e verdades.
- O que é definido como “fato aceito ou verdade” é frequentemente, de modo surpreendente, **uma decisão do autor**, e geralmente é seguida por uma referência.
- Exemplos:
 - *System identification focuses on finding models from data and use them to understand or analyze the properties or behaviors of the underlying systems [1].²*
 - *Currently the chaotic systems are a great deal of research for applications that are commonly used by engineers controlling the chaos³*

²J. R. A. Solares, H.-L. Wei, and S. A. Billings, Neural Comput. Appl. 1 (2017)

³A. Melendez-Cano, et al., in 2017 Int. Conf. Mechatronics, Electron. Automot. Eng. (IEEE, 2017), pp. 49–54.

1.1 Tempos verbais

- **Past Simple**: Algo que aconteceu em um momento no passado e que tem pouca relevância para o presente.
- Exemplos:
 - *Tsubone and Saito [11] proposed a 4-D manifold piecewise linear system and gave a sufficient condition for hyperchaos.*⁴
 - *Some of the most elegant examples of such circuits [4]–[14] were motivated by the discovery of simple third-order ordinary differential(...)*⁵
 - *The idea of synchronization between two identical chaotic systems with differential initial condition was introduced by Pecora and Carrol [1]. This process is commonly known as auto-synchronization which has master-slave architecture.*⁶

⁴C. Li, J. C. Sprott, W. Thio, and H. Zhu, IEEE Trans. Circuits Syst. II Express Briefs 61, 977 (2014).

⁵J. C. Sprott, IEEE Trans. Circuits Syst. II Express Briefs 58, 240 (2011).

⁶A. Melendez-Cano, et al. in 2017 Int. Conf. Mechatronics, Electron. Automot. Eng. (IEEE, 2017), pp. 49–54.

1.1 Tempos verbais

- **Present Perfect:** Algo que aconteceu no passado com relevância para o presente.
- Exemplos:
 - *Currently the chaotic systems are a great deal of research for applications that **are** commonly used by engineers controlling the chaos; these systems **have received** attention since 1990.*⁷
 - *The identification of systems with hysteresis **has been discussed** in Leva and Piroddi (2002).*⁸
- Veja a diferença entre:
 - little attention **has been paid** to the selection of an appropriate rubber component
 - little attention **was paid** to the selection of an appropriate rubber component

⁷A. Melendez-Cano, et al., in 2017 Int. Conf. Mechatronics, Electron. Automot. Eng. (IEEE, 2017), pp. 49–54.

⁸L. A. Aguirre, Automatica 50, 1160 (2014).

1.2.2 Conexão do texto

- **Sobreposição**: repetição de algum elemento da sentença anterior.
- Exemplos:
 - *The pattern of inflammation during an asthma attack is different from that seen in **stable asthma**. In **stable asthma** the total number of inflammatory cells does not increase.*
 - *Equation (2) can be electronically implemented in a **circuit**, as shown in Fig. 1. The **circuit** consists of three successive active integrators.⁹*

⁹J. C. Sprott, IEEE Trans. Circuits Syst. II Express Briefs 58, 240 (2011).

1.2.2 Conexão do texto

- **Pronome**: uso de pronomes como *this*, *it*, *they*.
- Exemplo:
 - *Data processing is an important part given that data preparation plays a key role when training a model. Generally, this consists of dealing with missing values and outliers, data normalization and transformation, dimensionality reduction, and performing feature engineering.*¹⁰
 - *Tsubone and Saito [11] proposed a 4-D manifold piecewise linear system and gave a sufficient condition for hyperchaos. A 2-D return map provided the theoretical evidence for hyperchaos. They also enumerated several problems(...)*¹¹

¹⁰J. R. Ayala Solares, H.-L. Wei, and S. A. Billings, Neural Comput. Appl. 1 (2017).

¹¹C. Li, J. C. Sprott, W. Thio, and H. Zhu, IEEE Trans. Circuits Syst. II Express Briefs 61, 977 (2014).

1.2.2 Conexão do texto

- **Relative clause:** continua a sentença com um ponto e vírgula ou *which*.
- Exemplos:
 - *Each PC is treated to be a new input variable; lagged PC variables were then used to built a logistic-NARX model.*¹²
 - *In general purpose processors this is usually fixed to IEEE double precision, which is a 64 bit floating point number representation.*¹³
 - *In this paper, we consider a stochastic population model which is inspired by both engineering and biological considerations.*¹⁴

¹²J. R. Ayala Solares, H.-L. Wei, and S. A. Billings, Neural Comput. Appl. 1 (2017).

¹³A. Hasan et al., IEEE Trans. Automat. Contr. 58, 1524 (2013).

¹⁴E. Gelenbe, Inf. Secur. Tech. Rep. 12, 242 (2007).

1.2.2 Conexão do texto

- **Relação entre sentenças:** termo ou expressão para indicar relações de 1) **causa**, 2) **resultado**, 3) **contraste**, 4) **surpresa** e 5) **adição**.
- Exemplos:¹⁵
 - ① *This method often fails **due to** the necessity of computing B_{k+1}^{-1} .*
 - ② *This is an example of a smooth dynamical system, and **hence** general integration methods can be used to compute trajectories.*
 - ③ *It follows that for certain systems computer generated trajectories may serve as good approximations of true trajectories. **However**, the statement is valid only for trajectories near to an invariant hyperbolic set(...)*
 - ④ ***In spite of** these developments, there are still many open problems in the area of rigorous numerical analysis of nonlinear systems.*
 - ⑤ ***Apart from** rounding, there are other sources of computation errors when analyzing nonlinear systems.*

¹⁵Z. Galias, IEEE Circuits Syst. Mag. 13, 35 (2013).

1.2.3 Voz ativa e passiva

- É comum o uso do *we* em textos em Inglês para se referir ao grupo de autores. Veja o exemplo:
 - *In this work, we focus on systems with binary responses that depend on continuous time predictors.*¹⁶
- Não é comum o uso do *I* em textos em Inglês ou do *Eu/Nós* em textos em Português.
- Em artigos com apenas um autor ou em dissertações/teses será preferido o uso da voz passiva ou uso de *dummy subjects* (sujeitos artificiais). Veja exemplos:
 - *The circuit was constructed in breadboard style using Tektronix AM501 operational amplifier modules, as shown in Fig. 2.*¹⁷
 - *This work presents a gray-box procedure for the identification of single-block NARX polynomial models(...)*¹⁸

¹⁶J. R. Ayala Solares, H.-L. Wei, and S. A. Billings, *Neural Comput. Appl.* 1 (2017).

¹⁷J. C. Sprott, *IEEE Trans. Circuits Syst. II Express Briefs* 58, 240 (2011).

¹⁸L. A. Aguirre, *Automatica* 50, 1160 (2014).

1.2.4 Parágrafo

- Parágrafos são recursos visuais para leitura e escrita.
- Dois erros comuns:
 - 1 única frase ou grupo de pequenas frases soltas;
 - 2 parágrafos muito longos.
- Pelo menos duas frases com 8 a 12 linhas (duas colunas).¹⁹
- Frequentemente começam uma frase central (*topic sentence*).
 - *Equation (2) can be electronically implemented in a circuit, as shown in Fig. 1. The circuit consists of three successive active integrators in a feedback loop plus a second nonlinear feedback loop involving only two of the integrators and an inverter with a diode. It can be viewed as a chaotic phase- shift oscillator with gain control or as an analog computer solving (2).*¹⁸
- *Skimming* é leitura rápida de um artigo na sequência: Título, resumo, primeira frase de cada parágrafo.
- Planese seu [artigo em tópicos](#). Uma vez organizados, [cada tópico será um parágrafo](#).

¹⁹J. C. Sprott, IEEE Trans. Circuits Syst. II Express Briefs 58, 240 (2011).

1.3 Um Modelo de Introdução

- Será examinado uma introdução de um artigo. A introdução encontra-se na folha de exercícios.
- Apaguem mentalmente cada uma das sentenças numeradas na folha de exercícios e veja e veja qual a diferença no texto.
- Outro aspecto é observar aspectos gramaticais, tais como tempos verbais, conjunções, etc.

1.3 Um Modelo de Introdução I

Texto I

- In Sentence 1 'Polylactide (PLA) has received much attention in recent years due to its biodegradable properties, which offer important economic benefits.' the writer establishes the importance of this research topic.
- In Sentence 2 'PLA is a polymer obtained from corn and is produced by the polymerisation of lactide.' the writer provides general background information for the reader.
- In Sentence 3 'It has many possible uses in the biomedical field¹ and has also been investigated as a potential engineering material.^{2,3}' the writer does the same as in Sentences 1 and 2, but in a more specific/detailed way, using research references to support both the background facts and the claim for significance.

1.3 Um Modelo de Introdução II

- In Sentence 4 ‘However, it has been found to be too weak under impact to be used commercially.⁴’ the writer describes the general problem area or the current research focus of the field.
- In Sentence 5 ‘One way to toughen polymers is to incorporate a layer of rubber particles⁵’ the writer provides a transition between the general problem area and the literature review.
- In Sentence 6 ‘For example, Penney et al. showed that PLA composites could be prepared using blending techniques⁶ and more recently, Hillier established the toughness of such composites.⁷’ the writer provides a brief overview of key research projects in this area.
- In Sentence 7 ‘However, although the effect of the rubber particles on the mechanical properties of copolymer systems was demonstrated over two years ago,⁸ little attention has been paid to the selection of an appropriate rubber component.’ the writer describes a gap in the research.

1.3 Um Modelo de Introdução III

- **In Sentence 8** 'The present paper presents a set of criteria for selecting such a component.' **the writer describes the paper itself.**
- **In Sentence 9** 'On the basis of these criteria it then describes the preparation of a set of polymer blends using PLA and a hydrocarbon rubber(PI).' **the writer gives details about the methodology reported in the paper.**
- **In Sentence 10** 'This combination of two mechanistically distinct polymerisations formed a novel copolymer in which the incorporation of PI significantly increased flexibility.' **the writer announces the findings.**

1.3 Um Modelo de Introdução IV

Componentes básicos de uma Introdução

- 1 Componente 1: **Relevância e Definições**
 - Estabelecer a importância do campo.
 - Apresentar fatos e informações básicas.
 - Definir a terminologia do título e das palavras-chave.
 - Apresentar o problema ou área de pesquisa em foco.
- 2 Componente 2: **Revisão de Literatura**
 - Contribuições de pesquisas anteriores ou atuais
- 3 Componente 3: **Determinação do Problema**
 - Identificar o **gap** na pesquisa.
 - Descrever o problema a ser investigado.
- 4 Componente 4: **Sumário do Artigo**
 - Descrição do próprio artigo.

2. Metodologia

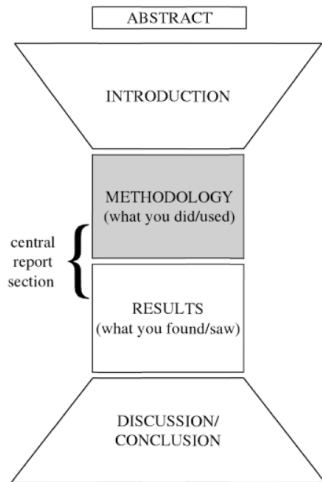


Figura 5: Estrutura geral de um artigo científico ou dissertação/tese. Fonte: (Glasman-Deal, 2010)

2.1 Estrutura

- Diferentes nomes: **Materials and Methods**, **Procedure**, **Experiments**, **Methodology**.
- Primeira parte do núcleo do artigo (**central report**).
- Frase típica no *Guide for Authors*:
 - *The Methodology should contain sufficient detail for readers to replicate the work done and obtain similar results.*

2.2 Gramática e Redação

Aspectos importantes de gramática e redação para a metodologia

- Voz passiva e ativa.
- Uso do [a](#) e [the](#).
- Advérbios.

2.2.1 Voz passiva e Ativa

- ① Na maioria dos casos, a voz passiva é utilizada. Exemplos:²⁰
 - *In this case, since the nonlinear equations are integrated by means of a characteristic (...).*
 - *In such case, the regular dynamics continues several iterations after the control routine was stopped.*
- ② **Present Simple**: descreve procedimentos normais na literatura.
- ③ **Past Simple**: descreve o que foi feito pelos autores.
- ④ Exemplos:
 - ① *We collected the samples.*
 - ② *The samples were collected.*
 - ③ *Two dye jets are placed in the laser cavity. A gain jet is then excited by an argon ion laser and the pulses are spatially filtered in order to obtain a Gaussian beam. Polarisation is confirmed using a polarising cube. The pulses were split into reference pulses and probe pulses and the reference pulses were carefully aligned into the detector to minimise noise levels.*

²⁰R. V Solé, et al. Math. Biol. 61, 1187 (1999).

2.2.2 Uso do *a* e *the*

Use o *the*

- Se os autores e os leitores conhecem o *objeto* ou a pessoa descrita.
- Se há apenas uma única opção (*Cairo is the capital of Egypt.*)

Use o *a*

- Se não importa ou os autores e/ou leitores não conhecem.

Exemplos

- 1 This effect may hide *a* connection between the two.
- 2 This effect may hide *the* connection between the two.

2.2.3 Advérbios

Duplo sentido:

- *Look at that dog with one eye.*
 - 1 Using one eye?
 - 2 Having one eye?
- *He gave a lecture about liver cancer at the hospital last January.*
 - 1 Was the *lecture* in hospital?
 - 2 Was the *cancer* in hospital?

Soluções:

- **With one eye** look at that dog.
- **Last January** he gave a lecture **about liver cancer at the hospital.**
- **Last January** he gave a lecture **at the hospital**; his subject was **liver cancer.**

2.3 Um Modelo de Metodologia I

Texto III

- In Sentence 1 'The current investigation involved sampling and analysing six sites to measure changes in groundwater chemistry.' the writer offers a general overview of the entire subsection, including the purpose of the investigation.
- In Sentence 2 'The sites were selected from the London Basin area, which is located in the south-east of England and has been frequently used to interpret groundwater evolution.'²⁻⁴ the writer provides background information and justifies the choice of location by referring to previous research.
- In Sentence 3 'A total of 18 samples was collected and then analysed for the isotopes mentioned earlier' the writer provides an overview of the procedure/method itself.

2.3 Um Modelo de Metodologia II

- **In Sentence 4** ‘Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.’ **the writer provides details about what was done and used and also shows that care was taken.**
- **In Sentence 5** ‘The filled bottles were shipped directly to two separate laboratories at Reading University, where they were analysed using standard methods suitably miniaturised to handle small quantities of water.’⁵ **the writer continues to describe what was done in detail, using language which communicates that care was taken.**
- **In Sentence 6** ‘Samples 10–18 were prepared in our laboratory using a revised version of the precipitation method established by the ISF Institute in Germany.’⁶ **the writer describes what was done by referring to existing methods in the literature.**

2.3 Um Modelo de Metodologia III

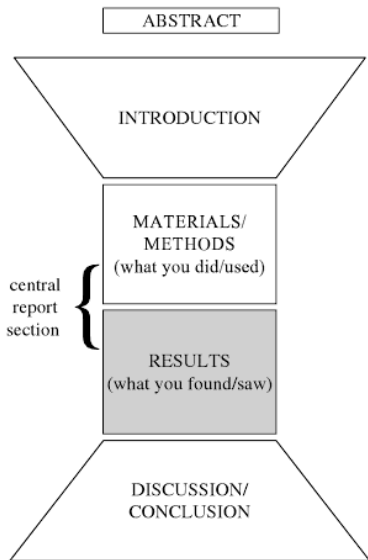
- In Sentence 7 'This method obtains a precipitate through the addition of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$; the resulting precipitate can be washed and stored easily.' the writer provides more detailed information about the method and shows it to have been a good choice.
- In Sentence 8 'The samples were subsequently shipped to ISF for analysis by accelerator mass spectrometry (AMS).' the writer provides more details of the method.
- In Sentence 9 'All tubing used was stainless steel, and although two samples were at risk of CFC contamination as a result of brief contact with plastic, variation among samples was negligible.' the writer mentions a possible difficulty in the methodology.

2.3 Um Modelo de Metodologia IV

Componentes básicos de uma Metodologia

- 1 Componente 1: **Background**
 - Introdução a Metodologia.
 - Retomar o objetivo do trabalho.
 - Descrição dos equipamentos/materiais utilizados.
 - Descrever informação básica.
- 2 Componente 2: **Método usado**
 - Detalhes específicos do método.
 - Justificar escolhas feitas.
 - Sugerir cuidado em certos procedimentos.
- 3 Componente 3: **Comparação**
 - Comparação com outros estudos.
- 4 Componente 4: **Problemas ocorridos**
 - Apresentar dificuldades ou problemas ocorridos.

3. Resultados



3.1 Estrutura

Há em geral quatro opções

- Option 1
 - Results or Data Analysis
 - Discussion
 - Conclusion(s)
- Option 2
 - Results *or* Data Analysis
 - Discussion
 - \emptyset
- Option 3
 - Results and Discussion
 - \emptyset
 - Conclusion(s)
- Option 4
 - Results or Data Analysis
 - Discussion and Conclusion(s)
 - \emptyset

3.2 Gramática e Redação

- 1 **Sequência:** *The temperature increased to 49° C and later dropped to 30° C.*
- 2 **Frequência:** *If a particular result occurred on every occasion a test was carried out, then it is a very reliable result.*
- 3 **Quantidade:** *A considerable amount of residue remained in the pipe.*
- 4 **Causalidade:** *This suggests that there is a trade-off in the decision of number representation.²¹*

²¹A. Hasan, et al., IEEE Trans. Automat. Contr. 58, 1524 (2013).

3.3 Um Modelo de Resultados I

Texto VI

- In Sentences 1 and 2 'Data obtained in previous studies^{1,2} using a fixed on-site monitor indicated that travel by car resulted in lower CO exposure than travel on foot. According to Figo et al. (1999), the median exposure of car passengers was 11% lower than for those walking.'² the writer refers to the findings and conclusions obtained by other researchers.
- In Sentences 3 and 4 'In our study, model led emission rates were obtained using the Traffic Emission Model (TEM), a CO-exposure modelling framework developed by Ka.³ Modelled results were compared with actual roadside CO concentrations measured hourly at a fixed monitor.' the writer refers back to his/her own methodology and adds more information about it.
- In Sentence 5 'Figure 1 shows the results obtained using TEM.' the writer invites the reader to look at a graph/figure/table etc.

3.3 Um Modelo de Resultados II

- In Sentence 6 ‘As can be seen, during morning peak-time journeys the CO concentrations for car passengers were significantly lower than for pedestrians, which is consistent with results obtained in previous studies.²’ the writer refers to specific results and compares them with those obtained in another study, using subjective, evaluative language (consistent with).
- In Sentence 7 ‘However, the modelled data were not consistent with parallel FOM measurements for afternoon journeys.’ the writer offers a general statement about his/her results to begin a new paragraph.

3.3 Um Modelo de Resultados III

- **In Sentence 8** ‘Although the mean CO concentrations modelled by TEM for afternoon journeys on foot were in line with those of Figo et al., a striking difference was noted when each of the three peak hours was considered individually (Fig. 2).’ **the writer refers to specific results and compares them to those obtained in another study, using language that comments on the result(s) (a striking difference).**
- **In Sentences 9 and 10** ‘It can be observed that during the first hour (*H1*) of the peak period, journeys on foot resulted in a considerably lower level of CO exposure. Although levels generally exceeded those modelled for car journeys during *H2*, during the last hour (*H3*) the levels for journeys on foot were again frequently far lower than for car journeys.’ **the writer selects specific results to describe in more detail, using language that comments on the results (considerably lower, generally, frequently far lower).**

3.3 Um Modelo de Resultados IV

- **In Sentence 11** 'A quantitative analysis to determine modelling uncertainties was applied, based on the maximum deviation of the measured and calculated levels within the considered period.' **the writer refers to the method used to analyse the results.**
- **In Sentence 12** 'Based on this approach, the average uncertainty of the model prediction for this study slightly exceeds the 50% acceptability limit defined by Jiang.⁷' **the writer mentions a problem in the results and uses quantity language (slightly) to minimise its significance.**
- **In Sentence 13** 'Nevertheless, these results suggest that data obtained using TEM to simulate *CO* exposures may provide more sensitive information for assessing the impact of traffic management strategies than traditional on-site measurement.' **the writer makes a reference to the implications and applications of the work s/he has done.**

3.3 Um Modelo de Resultados V

Componentes básicos para Resultados

- 1 Componente 1: **Introdução**
 - Revisitar o objetivo da pesquisa.
 - Retomar aspectos da metodologia
 - Visão geral dos resultados
- 2 Componente 2: **Resultados Principais**
 - Convite para observar os resultados
 - Resultados principais
 - Comparação com outros resultados
 - Comparação com resultados esperados
- 3 Componente 3: **Problemas**
 - Limitações ou falhas nos resultados.
- 4 Componente 4: **Implicações**
 - Consequências dos resultados.

4. Conclusão

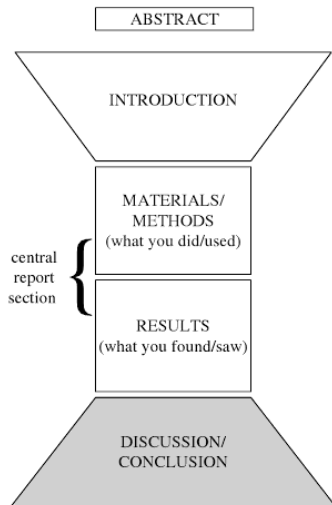


Figura 7: Estrutura geral de um artigo científico ou dissertação/tese. Fonte: (Glasman-Deal, 2010)

4.1 Estrutura

- Em geral, apresentamos uma discussão junto com os resultados. (Option 3)
- Quando há uma seção *Conclusions*, em geral é uma seção curta, de cerca de 2 parágrafos com enfoque em aspectos específicos da seção *Results*.
- Na *Introduction* foi criado um mapa a respeito das pesquisas existentes.
- Na *Conclusions* você localiza sua pesquisa neste mapa.
- Na *Introdução* você apresentou o **gap** ou problema em aberto.
- Na *Conclusions* você apresenta até que ponto o **gap** foi resolvido.
- Na *Introduction* você apresenta o que foi feito no artigo.
- Na *Conclusions* você indica potenciais trabalhos futuros.

4.3 Modelo para a Conclusão I

Texto VIII

- **In Sentence 1** ‘Prior work has documented the effectiveness of psychosocial intervention in improving quality of life (QoL) and reducing stress in patients suffering from various disorders; Epstein,¹⁸ for example, reports that orthopedic patients participating in a two week multimedia intervention programme improved across several QoL indices, including interpersonal conflict and mental health.’ **the writer revisits previous research.**
- **In Sentence 2** ‘However, these studies have either been short-term studies or have not focused on patients whose disorder was stress related.’ **the writer revisits the Introduction to recall specific weakness in the methodology used in previous studies.**

4.3 Modelo para a Conclusão II

- **In Sentence 3** ‘In this study we tested the extent to which an extended three-month stress management programme improved QoL among a group of patients being treated for stress-related skin disorders such as eczema.’ **the writer revisits the methodology used in this study.**
- **In Sentence 4** ‘We found that in virtually all cases, participation in our three-month stress management programme was associated with substantial increases in the skills needed to improve QoL.’ **the writer revisits and summarises the results.**
- **In Sentence 5** ‘These findings extend those of Kaliom, confirming that a longer, more intensive period of stress-management training tends to produce more effective skills than when those skills are input over a shorter period via information transfer media such as leaflets and presentations (Kaliom et al., 2003).’ **the writer shows where and how the present work fits into the research ‘map’ of this field.**

4.3 Modelo para a Conclusão III

- In Sentence 6 ‘In addition, the improvements noted in our study were unrelated to age, gender or ethnic background.’ the writer recalls an aspect of the results that represents a positive achievement or contribution of this work.
- In Sentence 7 ‘This study therefore indicates that the benefits gained from stress-management intervention may address QoL needs across a wide range of patients.’ the writer focuses on the meaning and implications of the achievements in this work.
- In Sentence 8 ‘Most notably, this is the first study to our knowledge to investigate the effectiveness of extended psychosocial intervention in patients whose disorder is itself thought to be stress-related.’ the writer notes that one of the achievements or contributions of this work is its novelty.

4.3 Modelo para a Conclusão IV

- **In Sentence 9** ‘Our results provide compelling evidence for long-term involvement with such patients and suggest that this approach appears to be effective in counteracting stress that may exacerbate the disorder.’ **the writer refines the implications of the results, including possible applications.**
- **In Sentences 10 and 11** ‘However, some limitations are worth noting. Although our hypotheses were supported statistically, the sample was not reassessed once the programme was over.’ **the writer describes the limitations which should direct future research.**
- **In Sentence 12** ‘Future work should therefore include follow-up work designed to evaluate whether the skills are retained in the long term and also whether they continue to be used to improve QoL.’ **the writer suggests a specific area to be addressed in future work.**

4.3 Modelo para a Conclusão V

Componentes básicos para a Conclusão

- 1 Componente 1: Revisitando seções anteriores e/ou resultados centrais
- 2 Componente 2: Relação com outras pesquisas
- 3 Componente 3: Contribuições e Implicações
- 4 Componente 4: Limitações e Trabalhos Futuros

Um exemplo simplificado de conclusão. Típica para artigos mais concisos (*Briefs or Letters*)

- **1** *We derive a relation between the maximum DP and the discrete Lyapunov exponent of a bijection.* **2** *One can use this relation to determine, in some cases, whether a given block cipher is resistant to differential cryptanalysis or not.* ²²
- Sentença 1: **Componente 1** - Expõe o resultado principal.
- Sentença 2: **Componente 3** - Contribuiçõeas e Implicações.

²²J. M. Amigó, et al., IEEE Trans. Circuits Syst. II Express Briefs 54, 882 (2007).

Exemplos de Conclusão - Congresso

[Key Result] This paper presented a technique to model hysteresis described by a Bouc-Wen model, using a black-box unit-delayed NARX model with four regressors. More specifically, the concepts of cluster coefficients were used for obtaining a model based only on empirical data, being this a good feature of the proposed approach. **[Method]** The obtained model was able to reproduce the bench test hysteretic behaviour (Eq. 2), using a simpler mathematical representation and also several hysteresis behaviours only re-estimating parameters.

[Implications] Furthermore, it was observed that magnetorheological dampers, usually described by a system of non-linear differential equations (Eq. 2) may also be well described by a non-linear autoregressive model with four unit-delayed regressors, with simply and accuracy. **C3** This model is more suitable for feedforward inverse control purposes, when an estimative of the inverse model is necessary.

[Future work] As a future research topic, it is proposed the use of the nominal model in a feedforward inverse control scenario and model-based control techniques where the inverse-model estimative is frequently necessary. ²³

²³Martins S. A. M. and L. A. Aguirre, in An. XX CBA (2014), pp. 2051–2057.

[Key Result] This paper has provided sufficient conditions to certify the stability of LTI uncertain systems. **[Method]** The Lyapunov function used to certify the stability is composed by an arbitrary number of quadratic functions within higher order derivatives (continuous time) or differences (discrete-time) of the vector field. **[Implications]** The advantages of the proposed approach have been shown by numerical examples. The number of LMI rows, the number of scalar decision variables and the time to certify the stability of uncertain systems have been improved, when compared with techniques available in the literature. It is important to highlight that the conditions presented here can be easily implemented and can be combined with existing LMI relaxations at the price of increasing the computational burden. **[Future work]** As future research the authors are investigating the extensions to compute some performance criterion such as the H_∞ performance and to cope with the control design problem. ²⁴

²⁴[1] M. J. Lacerda and P. Seiler, Automatica 82, 187 (2017).

5. Resumo

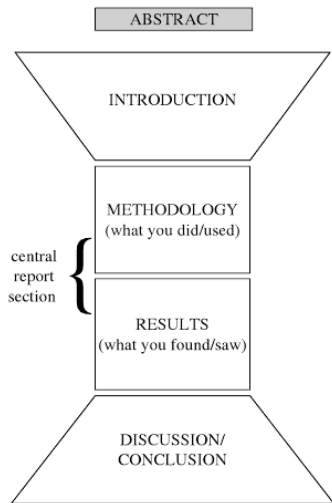


Figura 8: Estrutura geral de um artigo científico ou dissertação/tese. Fonte: (Glasman-Deal, 2010)

5.1 Estrutura

- Banco de dados de resumos (Web of Science, Scopus, IEEE, Google Scholar) permitem cientistas procurar artigos e decidir quais artigos eles querem ler em detalhe.
- O resumo deve ser auto-contido. Exemplo:
 - *Although computational techniques have been extensively applied in nonlinear science, the reliability evaluation of numerical results does not grow in the same pace. Hammel et al. (Journal of Complexity, 1987, 3(2), 136-145) have proved a theorem that a pseudo-orbit of a logistic map is shadowed by a true orbit within a distance of 10^{-8} for 10^7 iterates. We checked this theorem in a modern computational platform, and on the contrary, we found the simulation of the logistic map with less than 102 iterates presents an error greater than 10^{-8} .*²⁵
- O resumo não contém material que não está no texto.

²⁵B. Silva et al., in 6th Int. Conf. Nonlinear Sci. Complex. (2016), pp. 1–4.

5.3 Modelo para o Resumo I

Texto IX

- **In Sentence 1** 'The speed of sound in a fluid is determined by, and therefore an indicator of, the thermodynamic properties of that fluid.' **the writer provides background factual information.**
- **In Sentence 2** 'The aim of this study was to investigate the use of an ultrasonic cell to determine crude oil properties, in particular oil density.' **the writer combines the method, the general aim and the specific aim of the study in one sentence.**
- **In Sentences 3 and 4** 'An ultrasonic cell was constructed to measure the speed of sound and tested in a crude oil sample. 4 The speed of sound was measured at temperatures between 260 and 411 K at pressures up to 75 MPa.' **the writer summarises the methodology and provides details.**

5.3 Modelo para o Resumo II

- In Sentence 5 ‘The measurements were shown to lead to an accurate determination of the bubble point of the oil.’ the writer indicates the achievement of the study.
- In Sentence 6 ‘This indicates that there is a possibility of obtaining fluid density from sound speed measurements and suggests that it is possible to measure sound absorption with an ultrasonic cell to determine oil viscosity.’ the writer presents the implications of the study.

5.3 Modelo para o Resumo III

Texto X

- **In Sentence 1** 'This paper reports the use of a novel water-soluble polymer blend as a coating to control drug release.' **the writer combines what the paper does (This paper reports), the method or materials used (water-soluble polymer blend), the contribution (novel) and the aim of the study (to control drug release).**
- **In Sentence 2** 'It was found that using a blend of methylcellulose and a water-soluble copolymer significantly slowed the release rate of ibuprofen compounds in vitro and allowed for a more consistent release rate of 10–20% per hour.' **the writer refers to the method in more detail and provides numerical details of the results.**

Componentes básicos de uma Introdução

- 1 Componente 1: *Background*, Problema/Gap e Objetivo do artigo
- 2 Componente 2: Metodologia
- 3 Componente 3: Resultados, Contribuições, Implicações
- 4 Componente 4: Limitações e Trabalhos Futuros

[Background] It has been known for at least five decades that control theory can be used to study iterative algorithms. **[Gap]** However, little work can be found in the control systems literature on numerical algorithms, especially on the study of finite precision effects.

[Objetivo] In this technical note, we consider numerical iterative algorithms in finite precision as dynamical systems and study the effects of finite precision using control theory. **[Metodologia]** By using the control tools of input-to-state stability and results from the study of quantization in control systems, **[Key Result]** we present new systematic ways to find bounds on the forward error for iterative algorithms. **[Implicações]** The advantages of the proposed schemes are shown by applying them to find bounds for the classical iterative methods for solving a system of linear equations.²⁶

²⁶A. Hasan, et al., IEEE Trans. Automat. Contr. 58, 1524 (2013).

Um artigo sob a ótica do tempo verbal I

Neste trabalho faremos uma análise do artigo da equipe do Prof. George A. Constantinides (Imperial College): A. Hasan, et al., *IEEE Trans. Automat. Contr.* 58, 1524 (2013).

1 Introdução

- **Presente Simple:** *Many iterative numerical algorithms can be considered as dynamical systems, and therefore can be studied using control systems theory.*
- **Present Perfect:** *Although having known this fact for many years [1], [2] and the possible potential of this approach to provide us with new tools for analysis of algorithms, this idea has not been very popular in the control systems literature.*
- **Present Perfect:** *In recent years, interest has been increasing in this application of control theory [3]–[10].*
- **Present Simple:** *Most of this work is focused on design and analysis of iterative algorithms in exact precision.*

Um artigo sob a ótica do tempo verbal II

- **Future:** *In this technical note we **will use** control-theoretic ideas to study the effects of finite precision in algorithms.*
 - Tranquilamente substituível pelo Present Simple: *In this technical note we **use** control-theoretic ideas to study the effects of finite precision in algorithms.*
- **Present Simple:** *Algorithms **are** implemented on digital hardware, which have a finite precision (inability to store all real numbers).*
- **Present Simple:** *In this technical note we **present** two schemes for forward error analysis based on control-theoretic ideas.*
- **Present Perfect:** *In [5], [7] authors **have also studied** the effects of finite precision errors using control theory.*
 - Se os autores desejassem focar que se trata de um estudo sem repercussão no presente, poderia ser escrito no **Past Simple**: *In [5], [7] authors **studied** the effects of finite precision errors using control theory.*

Um artigo sob a ótica do tempo verbal III

- **Present Simple:** *In the past few years the trend in computer hardware design to speedup algorithms **is** to develop computer architectures that are customized for a specific application [12].*
 - Neste caso, o uso do **Present Perfect** tornaria menos enfática a afirmação.

2 Metodologia (Background)

- **Present Simple:** *In this section, we discuss how iterative algorithms **can be** represented as dynamical systems.*
- **Present Simple/Future:** *If, for some initial state $x_0 = \xi$, the state x_k of the dynamical system **is** equal to the k th iterate of the algorithm, for all k , then we **will say** that the dynamical system represents the algorithm in state space form when the initial state is $x_0 = \xi$.*
 - Pode ser simplificado por: *If, for some initial state $x_0 = \xi$, the state x_k of the dynamical system **is** equal to the k th iterate of the algorithm, for all k , then the dynamical system **represents** the algorithm in state space form when the initial state is $x_0 = \xi$.*

Um artigo sob a ótica do tempo verbal IV

- **Imperative:** *Assume that the algorithm in finite precision can be considered as a dynamical system with input-output maps as in Fig. 1.*
 - Verbos similares: *Consider* ou *Let us define*.
- **Present Simple:** *There is a lot of literature on the study of effects of quantization in control systems. A more detailed discussion on the sources and effects of quantization in control systems can be found in [18] and references therein.*
- **Present Perfect:** *Miller et al. [19] have used a Lyapunov-based approach to find ultimate bounds on solutions of perturbed linear control systems*

3 Resultados

- **Present Simple:** *To compare the bound based on the work by Miller et al. we use numerical results.*
- **Future:** *We will compare the algorithms for the Gauss-Seidel method.*

Um artigo sob a ótica do tempo verbal V

- **Present Simple:** *The calculated error bounds for a 24 bit precision are shown in Fig. 2.*
- **Present Perfect:** *In the figure we have also shown the errors in the calculated solution to give some idea of the conservativeness of these bounds.*
 - Substituível pelo *Present Simple*.
- **Present Simple:** *In the figure, we observe that the Higham/ISS bound is not reasonable for larger values*

4 Conclusão

- **Present Perfect:** *In this technical note we have considered numerical iterative algorithms in finite precision as dynamical systems with disturbances.*
- **Present Simple:** *The first scheme is based on the control concept of input-to-state stability, while the second scheme is based on results from the study of quantization effects in control systems.*

- **Present Perfect e Present Simple:** *The proposed forward error analysis schemes **have been applied** on an algorithm that **can be represented** by a linear dynamical system.*
- **Future:** *However, we **will have** to show that the dynamical system used to represent the algorithm is Lyapunov stable or ISS depending on the forward error analysis scheme that is used.*

5 Resumo

- **Present Perfect:** *It **has been known** for at least five decades that control theory can be used to study iterative algorithms.*
- **Present Simple:** *However, little work **can be found** in the control systems literature on numerical algorithms, especially on the study of finite precision effects.*
- **Present Simple:** *In this technical note, we **consider** numerical iterative algorithms in finite precision as dynamical systems and study the effects of finite precision using control theory.*

- **Present Simple:** *By using the control tools of input-to-state stability and results from the study of quantization in control systems, we **present** new systematic ways to find bounds on the forward error for iterative algorithms.*
- **Present Simple:** *The advantages of the proposed schemes **are shown** by applying them to find bounds for the classical iterative methods for solving a system of linear equations.*