Universidade de São Paulo Escola Politécnica Curso de Engenharia de XXX



O Efeito Borboleta

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RELATÓRIO apresentado ao Professor Alexandre Roma do MAP/IME-USP como atividade da disciplina MAP3122 - Métodos Numéricos.

São Paulo - SP

Resumo

Este é um "boneco" de um relatório na forma próxima ao que gostaria. As seções não são as mesmas que pedi mas já representa um bom avanço. Modifiquem à vontade. Encontrei fazendo google it em "modelo de relatório em latex". Encontrei também sugestões de editores inteligentes: o Kile para usuários de linux e TeXnic-Center para usuários de Windows. Eu uso o Kile. O para windows eu não conheço. Consta que ambos são programas gratuitos.

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	$4.2 0 < t < 2 \dots \dots \dots \dots \dots \dots \dots \dots \dots $	3					
	$4.3 0 < t < 4 \dots \dots \dots \dots \dots \dots \dots \dots \dots $	3					
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1 Introdução

- $\bullet\,$ introduzir o problema a ser estudado
- $\bullet\,$ apresentar trabalhos relacionados
- apresentar motivação

- apresentar objetivos
- último parágrafo deve conter a organização do documento
- novo item

2 EDOs e Condições Inicias

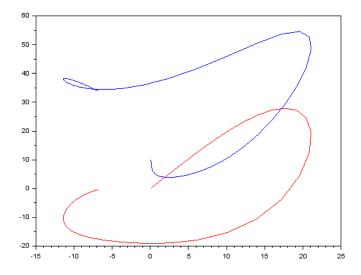
3 Metodologias

4 Análise

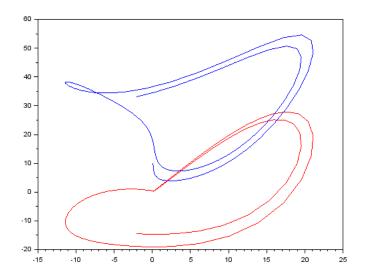
A seguir apresentaremos os gráficos obtidos a partir da resolução das equações diferenciais pelas metodologias aprensentadas no item anterior.

É importante notar que apresentamos apenas um gráfico para cada intervalo de tempo (apesar de termos duas metodologias) pois os resultados foram extremamente parecidos.

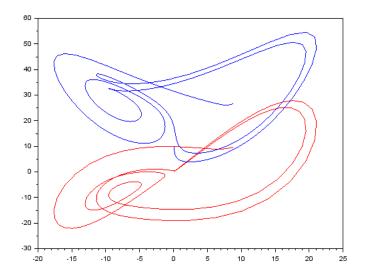
4.1 0 < t < 1



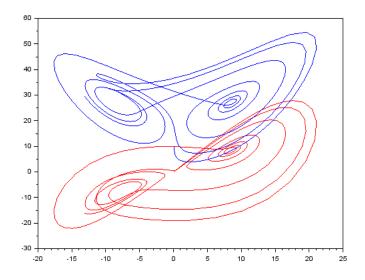
4.2 0 < t < 2



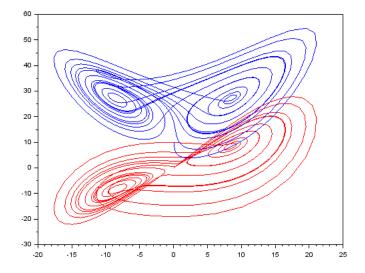
4.3 0 < t < 4



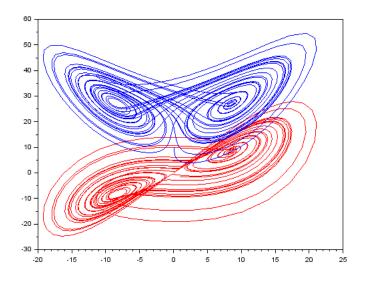
4.4 0 < t < 8



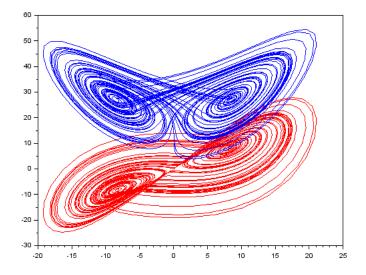
4.5 0 < t < 16



4.6 0 < t < 32



4.7 0 < t < 64



4.8 0 < t < 128

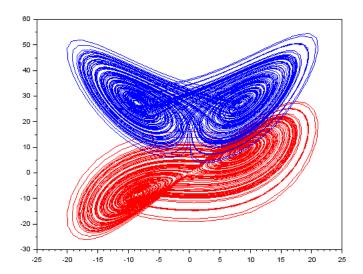


Tabela 1: Euler ExplÃcito

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0.3125 0.9517447837861779 1.9343412929864916 4.529122086184953 0.328125 1.105275488348727 2.2531529231797602 4.369174278984467 0.34375 1.284631337541076 2.6260501031125623 4.226037142841758 0.359375 1.4942280196616209 3.062217721873976 4.102663297146446 0.375 1.7392264106323014 3.572309165230505 4.00321354813506 0.390625 2.0256455910382707 4.168614409014198 3.9334919593655684 0.40625 2.3604844688470092 4.865201932376449 3.901536076658017 0.421875 2.751846572523484 5.677996430528672 3.9184132234511058 0.4375 3.2090574878367946 6.624728236801238 3.9992862404346674 0.453125 3.742756042362489 7.724649205031856 4.164823278643497 0.46875 4.364926849029578 8.997846118931902 4.443030811105178 0.484375 5.088820484951816 10.463886762298115 4.871575466496042 0.5 5.928674590787175 12.139394790242786 5.500606300832646 0.515625 8.013921593907023 16.14356191342				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.359375	1.4942280196616209	3.062217721873976	4.102663297146446
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.375	1.7392264106323014	3.572309165230505	4.00321354813506
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.390625	2.0256455910382707	4.168614409014198	3.9334919593655684
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.40625	2.3604844688470092	4.865201932376449	3.901536076658017
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.421875	2.751846572523484	5.677996430528672	3.9184132234511058
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.4375	3.2090574878367946	6.624728236801238	3.9992862404346674
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.453125	3.742756042362489	7.724649205031856	4.164823278643497
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.46875	4.364926849029578	8.997846118931902	4.443030811105178
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.484375	5.088820484951816	10.463886762298115	4.871575466496042
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.5	5.928674590787175	12.139394790242786	5.500606300832646
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.515625	6.899099621952114	14.033960242463532	6.395953769138265
0.5625 10.714847010675404 20.85847405424829 11.63100460522378 0.578125 12.299788736233667 23.273049168611244 14.63849438783028 0.59375 14.014360678792663 25.47727802890932 18.501269434512825 0.609375 15.805441514748392 27.159174249323385 23.3092545113719	0.53125	8.013921593907023	16.143561913424637	7.642294598600282
0.578125 12.299788736233667 23.273049168611244 14.63849438783028 0.59375 14.014360678792663 25.47727802890932 18.501269434512825 0.609375 15.805441514748392 27.159174249323385 23.3092545113719	0.546875	9.28417789383165	18.440460241631673	9.345322522938321
$\begin{array}{ccccccc} 0.59375 & 14.014360678792663 & 25.47727802890932 & 18.501269434512825 \\ 0.609375 & 15.805441514748392 & 27.159174249323385 & 23.3092545113719 \end{array}$	0.5625	10.714847010675404	20.85847405424829	11.63100460522378
0.609375 15.805441514748392 27.159174249323385 23.3092545113719	0.578125	12.299788736233667	23.273049168611244	14.63849438783028
	0.59375	14.014360678792663	25.47727802890932	18.501269434512825
$0.625 \qquad 17.579462254525733 \qquad 27.893238768569603 \qquad 29.04526588881278$	0.609375	15.805441514748392	27.159174249323385	23.3092545113719
	0.625	17.579462254525733	27.893238768569603	29.04526588881278

Equações Euler

$$\frac{dx}{dt} = -10x + 10y$$

$$\frac{dy}{dt} = 28x - y - xz$$

$$\frac{dz}{dt} = xy - \frac{8}{3}z$$

5 Spline

- 6 Conclusão
- 7 Apêndice

8 Exemplos de Equações

Nesta seção serão apresentados diferentes exemplos de equações.

8.1 Equações simples

Sem numeração

$$\sum_{i=1}^{100} \frac{2^{i-1}}{4}$$

Com numeração

$$\int_{0}^{100} \sqrt[4]{\frac{2n}{7}} \tag{1}$$

$$M^{-1}(AD^{-1}A^T)M^{-T}\bar{y} = M^{-1}(AD^{-1}(r_d - X^{-1}r_a) + r_p), \tag{2}$$

8.2 Equações com mais de uma linha

$$\begin{aligned} & \min \quad c^T x \\ & \text{s.a.} \quad A x = b \\ & \quad x \geq 0, \end{aligned}$$

onde $A \in \mathbb{R}^{m \times n}, \, b \in \mathbb{R}^m$ and $c \in \mathbb{R}^n$. Referenciando a equação (3)

8.3 Sistema linear

$$\begin{bmatrix} A & 0 & 0 \\ 0 & A^T & I \\ Z & 0 & X \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$
 (4)

$$d_i = \left\{ \begin{array}{ll} 1 & \text{se } i = 0 \\ 2 & \text{caso contrário} \end{array} \right\}$$

9 Tabelas

9.1 Tabela Simples

12	13	14
15	16	17

Tabela 2: Título da tabela

9.2 Tabela mais elaborada

	CCF preconditioner		Number of nonzeros	
Problem	η	$\frac{n(AD^{-1}A^T)}{nrow}$	FCC	Cholesky
ELS-19	-11	31	87750	3763686
SCR20	-12	31	103179	2591752
NUG15	-12	32	54786	6350444
PDS-20	15	5	625519	7123636

Tabela 3: Título da Tabela.

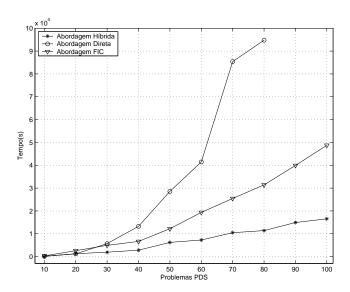
Referenciando a tabela 3.

10 Edição

Comando para preservar a formatação do texto.

11 Inserir figuras

Para citar referências bibliográficas [1], [2].



12 Conclusões

Apresentar as conclusões finais.

Agradecimentos Agradecimentos aos colaboradores, professores que eventualmente vocês procuraram para ajudar em algum aspecto do modelo de vocês, colega que ajudou a compor alguma parte do trabalho e assim por diante.

Referências

[1] I. Adler, N. K. Karmarkar, M. G. C. Resende, and G. Veiga. An implementation of Karmarkar's algorithms for linear programming. *Mathematical Programming*, 44:297–335, 1989.

[2] F. C. Carmo. Análise da influência de algoritmos de reordenação de matrizes esparsas no desempenho do método $CCCG(\eta)$. Dissertação de mestrado, Departamento de Ciência da Computação, Universidade Federal de Minas Gerais, 2005.