

SLP – P24

THE VOICE



FOUNDATION



Nonlinear Analysis by Phase Space Reconstruction in Voice Signals with Benign Laryngeal Lesions

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CAPES



Phase Space Reconstruction Benign Laryngeal Lesions

Nodules

Jiang et al. (2009), Scalassara et al. (2009), Dajer (2010) and Gonçalves (2019)

Cyst

Gonçalves (2019)

Sulcus

Choi et al. (2012) and Gonçalves (2019)

**Authors reported the effectiveness of the NL method
Few studies with the nodule, cyst and sulcus population**



Objective

Describe Phase Space Reconstruction (PSR) in voice signals with benign laryngeal lesions.



Method

ETHICAL CONSIDERATIONS

- Comitê de Ética e Pesquisa da Faculdade de Odontologia de Bauru (FOB-USP)
- Parecer nº2.332.833
- October 11th, 2017



Method

Participants

106 voice signals

Nodules 43

41 women e 2 men
Average = 32 anos

Cyst 40

39 women e 1 men
Average = 31 anos

Sulcus 23

13 women e 10 men
Average = 34 anos

Entry to the clinic for screening between 2010 and 2019



Method

Procedure – Phase Space Reconstruction

Voice Analysis (MONTAGNOLLI, 2019)

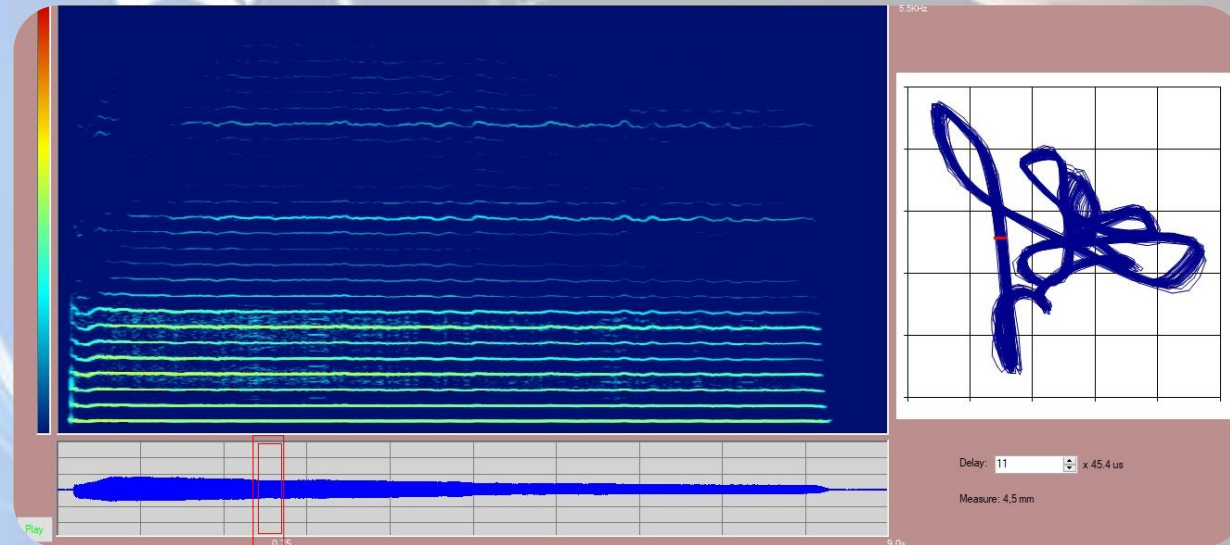


Image: Gonçalves (2019, p. 59)



Method

Procedimentos – Phase Space Reconstruction – Curves Scale

Galdino (2019) e Gonçalves (2019)

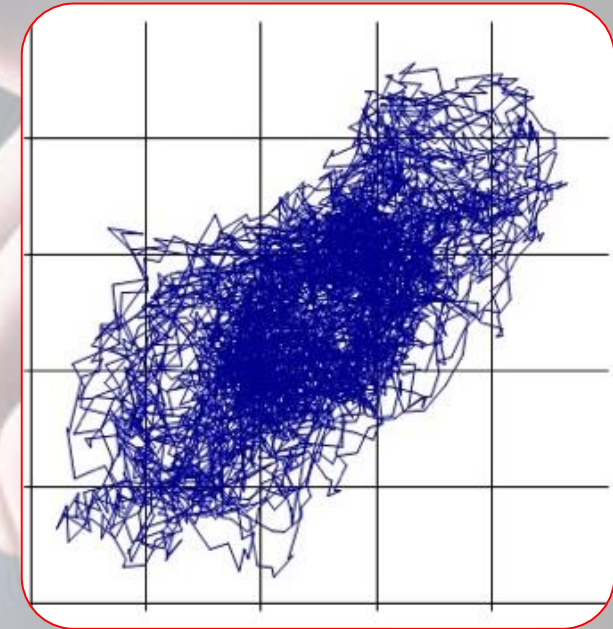
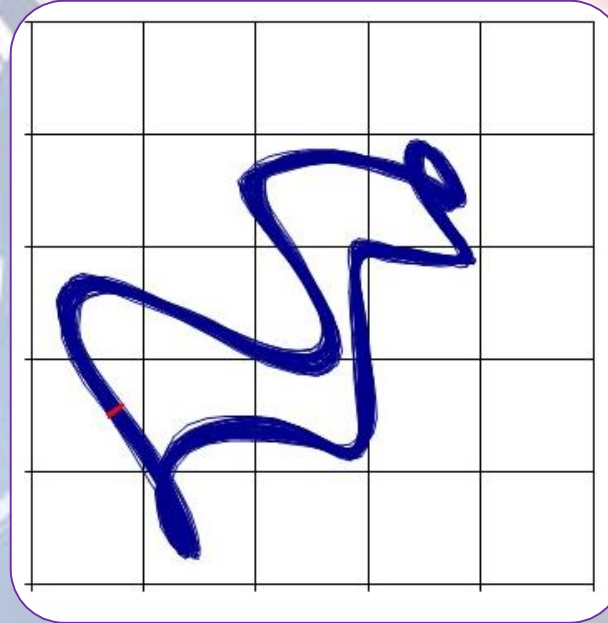
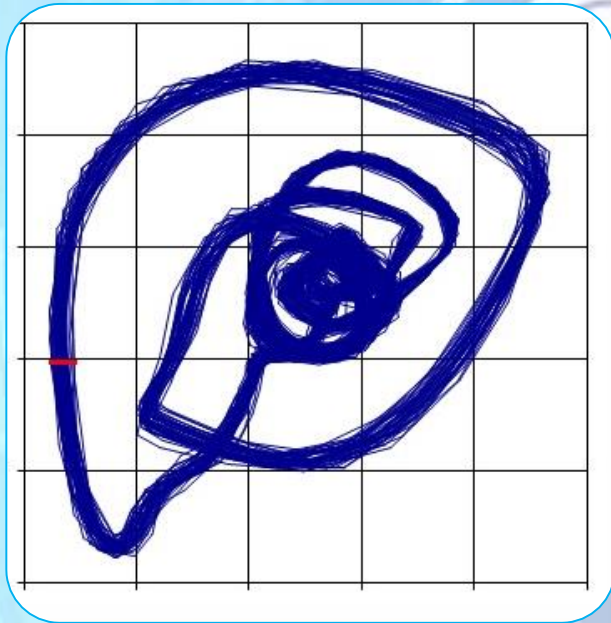
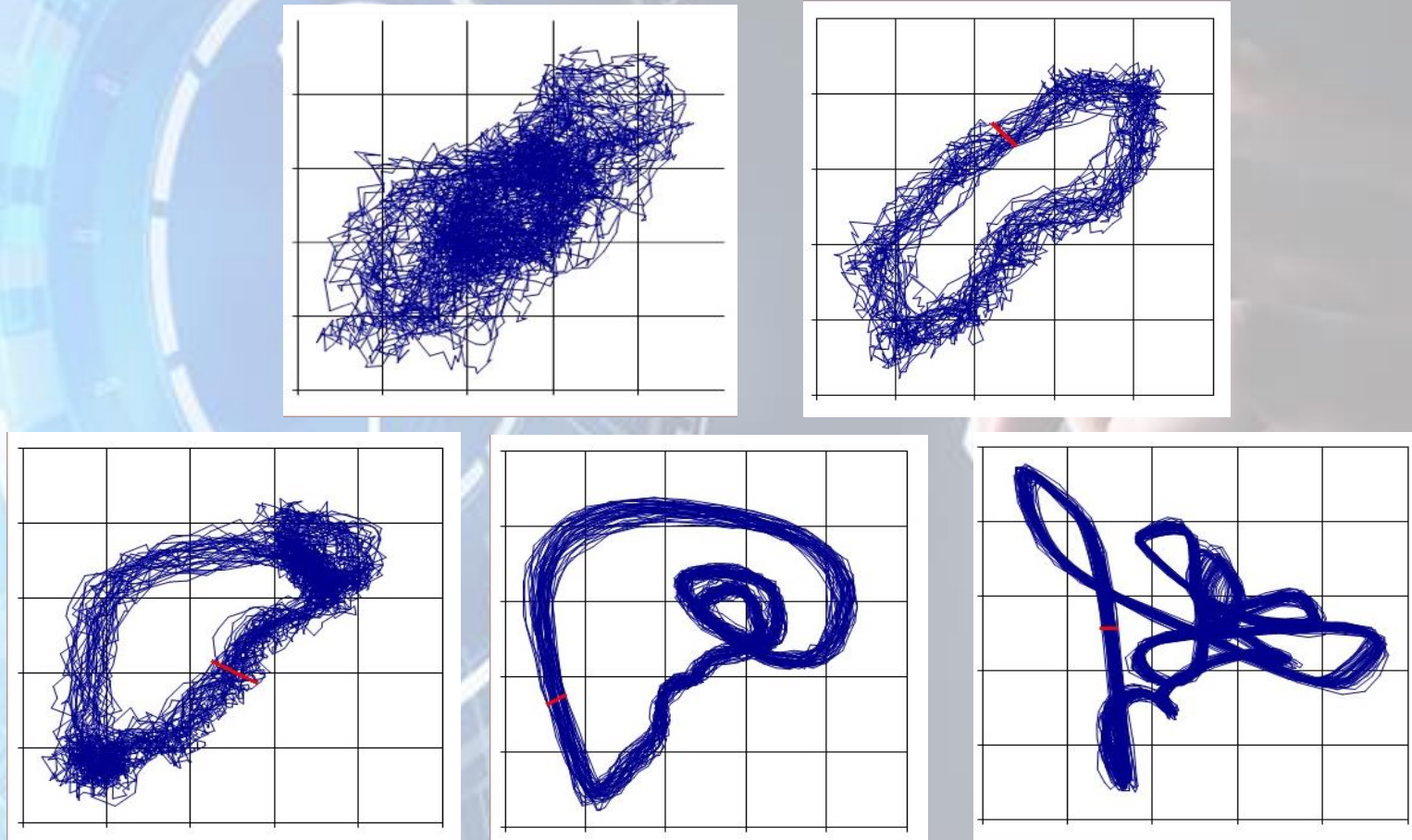


Image: Gonçalves (2019, p. 59)



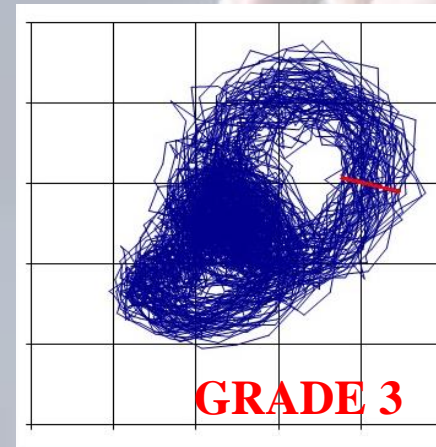
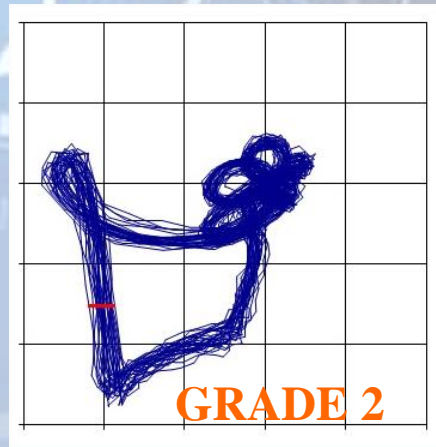
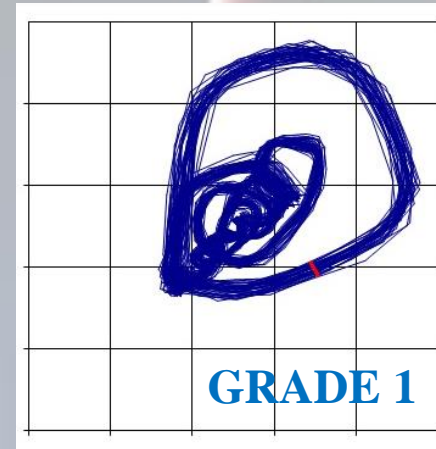
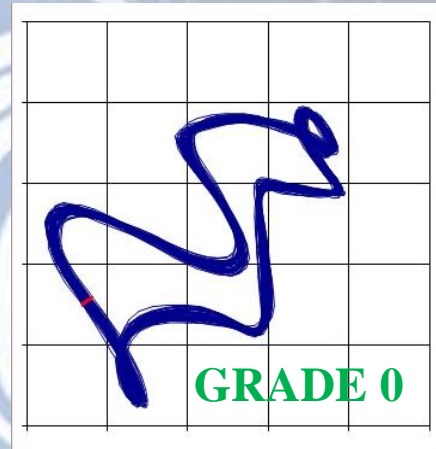
Method

Procedure – Phase Space Reconstruction – Curves scale



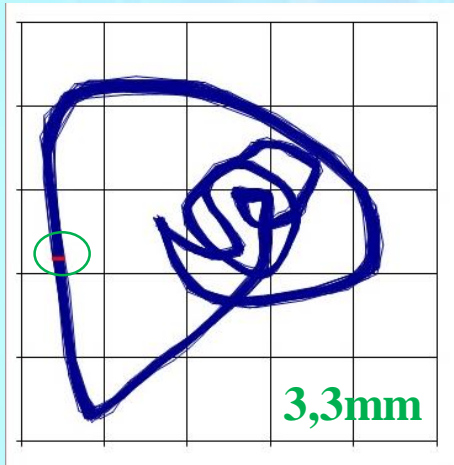
Method

Procedure – Phase Space Reconstruction – Irregularity scale

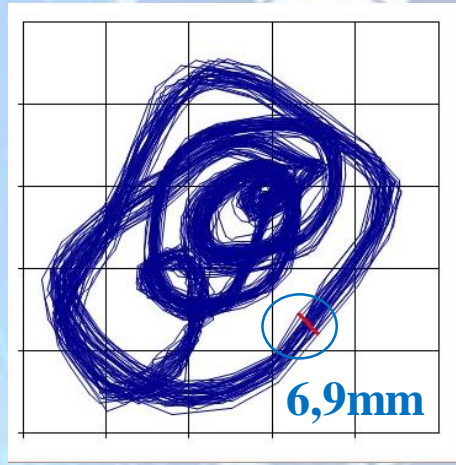


Method

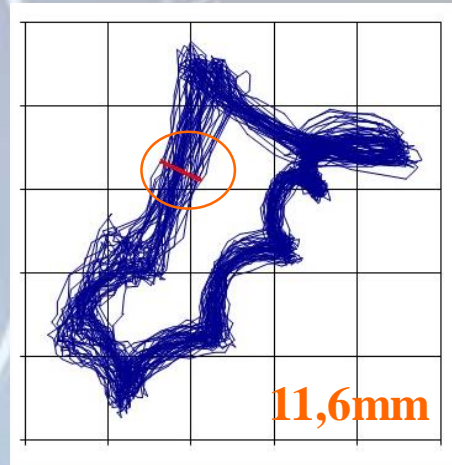
Procedure – Phase Space Reconstruction – Spacing scale



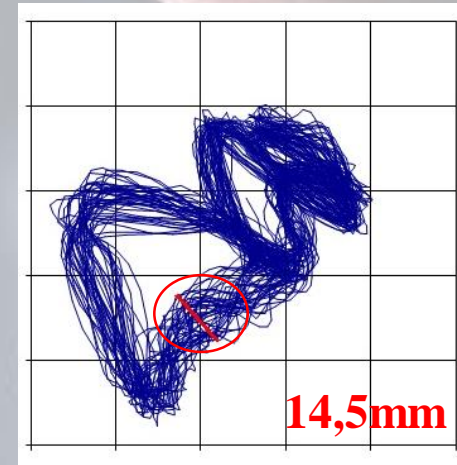
Minimum



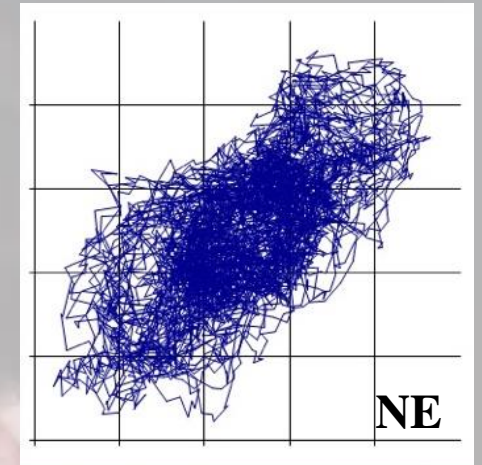
Small



Medium



Large



Not Evaluable

Method

Procedure – Statistical analysis

Statistical analysis consisted of the Mann-Whitney Test with significance of 5%.



Results

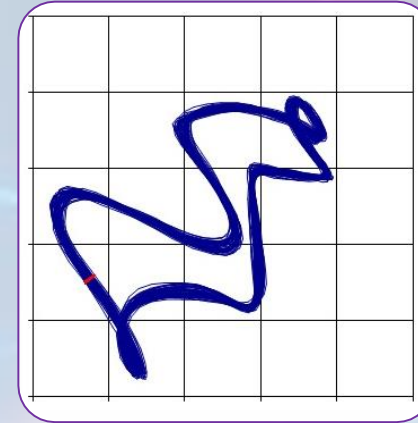
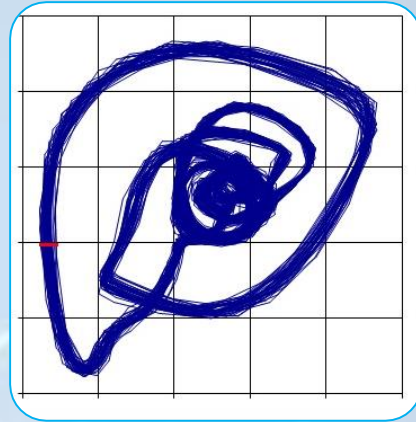


Table 1. Percentage of the number of curves in the PSR in the nodule, cyst and sulcus groups.

Nodules (N 43) Curves				Cyst (N 40) Curves				Sulcus (N 23) Curves			
4	3	2	1	4	3	2	1	4	3	2	1
N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
27 (63)	12 (29)	3 (9)	1 (7)	24 (60)	13 (33)	3 (8)	0 (0)	13 (53)	5 (22)	5 (22)	0 (0)



Table 2. Percentage of the grade of irregularity in the PSR in the nodule, cyst and sulcus groups.

Nodules (N 43)				Cyst (N 40)				Sulcus (N 23)			
Grade of Irregularity				Grade of Irregularity				Grade of Irregularity			
0	1	2	3	0	1	2	3	0	1	2	3
N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
7 (16)	18 (42)	11 (26)	7 (16)	7 (18)	17 (43)	10 (25)	6 (15)	2 (9)	13 (52)	3 (13)	5 (22)

Table 3. Percentage of the grade of spacing in the PSR in the nodule, cyst and sulcus groups.

Nodules (N 43)				Cyst (N 40)				Sulcus (N 23)			
Grade of Spacing				Grade of Spacing				Grade of Spacing			
0	1	2	3	0	1	2	3	0	1	2	3
N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
12 (30)	19 (46)	11 (26)	1 (4)	8 (20)	20 (48)	8 (20)	4 (10)	2 (9)	9 (39)	12 (52)	0 (0)

There was no significant difference ($p > 0.05$) between laryngeal lesions on the C-IS scale.



Conclusion

Benign lesions of the larynx, nodules, cyst and sulcus presented the PSR graph with open and closed trajectories, predominance of 4 curves, slight irregularity and small to medium spacing.



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Thank You!

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