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COMPLEXITY MEASURE REVISITED: A NEW ALGORITHM FOR CLASSIFYING CARDIAC ARRHYTHMIAS

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GOAL

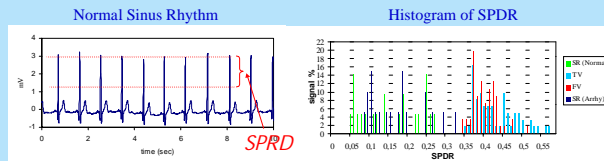
• Classification of cardiac arrhythmias with low complexity algorithm.

Method: SPDR-CM* algorithm

Two-step classification

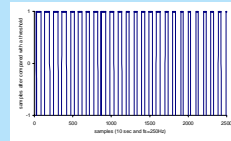
1. SPDR.

Sample Percentage in Dynamic Range. Classification in two groups: SR and VT/VF

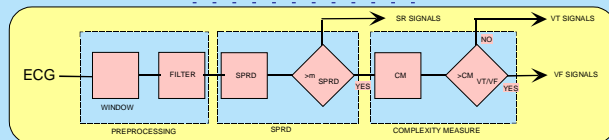


2. CM. Complexity Measure. Based on the well-known Lempel-Ziv algorithm.

It distinguishes VT and VF rhythms. The signal is compared with a threshold and the complexity is measured from the two-level array



Overall Flow-Graph



Results and Comparison

Performance of SPDR-CM for different window lengths

Window Length (sec)	SENSITIVITY* (%)			TOTAL CORRECT
	SR	VT	VF	
3	21/21=100	44/61=72.1	54/56=96.4	119/138=86.2
4	21/21=100	46/61=75.4	53/56=94.6	120/138=86.9
5	21/21=100	47/61=77	53/56=94.6	121/138=87.7
6	21/21=100	47/61=77	53/56=94.6	121/138=87.7
7	21/21=100	50/61=81.9	52/56=92.8	123/138=89.1
8	21/21=100	50/61=81.9	53/56=94.6	124/138=89.8
9	21/21=100	49/61=80.3	53/56=94.6	123/138=89.1
10	21/21=100	48/61=78.7	51/56=91	120/138=86.9

*Sensitivity=TP/(TP+FN), where TP=True positive, FN=False negative

Comparative results of sensitivity among different methods

PAPER METHOD	SR	VT	VF	DATABASE	
[3]CM	100	100	100	OWN-RECORDED FROM BODY SURFACE	
[6]Regression Test (RT)	NA	100	100	OWN-RECORDED FROM BODY SURFACE	
[4]	RT, same [6]	81	90	MIT-BIH MALIGNANT ARRHYTHMIA DATABASE	
		93	96		
[7]	CWA	100	50	OWN-RECORDED AND INTRACARDIAC	
	ALPF	91	75		
[4]	ANN	99.3	59.1	91.2	OWN-RECORDED AND INTRACARDIAC
Here	C	23.8	81.9	94.6	MIT-BIH Malignant Data, MIT-BIH Normal Sinus Data.
	SPDR-C	100	81.9	94.6	

CONCLUSIONS

- CM algorithm is not enough for the correct classification of SR, VT and VF.
- SPDR is capable to separate SR signals from VT/VF signals.
- Combination of both classifies correctly 91% of the signals.