



Master 1 Informatique
Parcours SRS

Final report

Epilepsy seizure detection using multisensors

Abla Errahmane, Tanguy Le Bretton
Supervisors : M.Gheryani, O.Salem

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1 Introduction

1.1 Context

Our project...

1.2 About the situation

Let X_1, \dots, X_n independent and identically distributed random variables with a mean μ and a standard deviation σ . We denote $\bar{X}_n = n^{-1} \sum_{i=1}^n X_i$. Then the law of $\frac{\bar{X}_n - \mu}{\sigma/\sqrt{n}}$ tends to the reduced central normal law. This is also written : for all a and b real numbers,

where Z is a reduced centered Gaussian variable, $Z \sim \mathcal{N}(0, 1)$

Algorithm 1: quantization

Result: *quantized* : the data quantized

Data: *data* : One feature of an activity (a matrix), *TS* : a threshold

quantized $\leftarrow []$;

foreach $data_{i,j}$ **in** *data* **do**

if $data_{i,j} \geq TS$ **or** $data_{i,j} \leq -TS$ **then**

 | *quantized* $_{i,j} = 1$;

end

else

 | *quantized* $_{i,j} = 0$;

end

end

$$S_{n+1} = \max(0, S_n + X - \omega_n)$$

$$Z = \frac{X - \mu}{\sigma}$$

Algorithm 2: CUMSUM

Result: A boolean if there is an abrupt changing

Data: X : a Gaussian distribution, TS : a threshold, ω : a weight

$n = 0$;

$S_n = 0$;

while $S_n < TS$ **do**

if $n == \text{length}(X)$ **then**

return false;

end

$S_n = \max(0, S_n + X - \omega)$;

$n = n + 1$;

end

return true;

Algorithm 3: Rupture detection

Result: A boolean if there is a rupture

Data: *previous* : the previous window, *actual* : the actual window, TS_{mean} : a threshold for the mean difference, TS_{sd} : a threshold for the standard variation difference

$localAnomalies = 0$;

foreach *axis* **in** *actual* **do**

if $\text{mean}(\text{actual}) - \text{mean}(\text{previous}) > TS_{mean}$ or $\text{var}(\text{actual}) - \text{var}(\text{previous}) > TS_{sd}$ **then**

$localAnomalies = localAnomalies + 1$;

end

end

if $localAnomalies \geq 2$ **then**

return true;

end

else

return false;

end
