EVALUATION OF THE MENTAL WORKLOAD IN THE NUCLEAR SECTOR WITH PHYSIOLOGICAL SIGNALS TO MINIMIZE HUMAN ERROR.

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Synopsis

In the nuclear field, there is an established safety culture to achieve the goal of zero accidents. However, it is certain that the majority of accidents in most fields, and the nuclear field is not an exception, occur due to human error, which could be due to an inadequate mental workload, in both ways: very low workload (‘’out of the loop’) and excessive workload (‘burn out’). Different methodologies have been implemented to minimize errors and its impact, being quasi static assessments, without incorporating worker mental status in each moment.

This work shows the possibilities and advancements of the implementation of a cognitive model based of physiological signals (specifically heart rate variability - HRV) in the nuclear field. This model could predict the level of mental workload a worker has in a particular moment and then activate some prevention measures, anticipating to human errors. This type of models differs from the traditional static characterization of workplaces by evaluating dynamically the workload of workers, which is accomplished with a personalized mental characterization test and with a monitoring of the worker.

Different models have been developed in this work, all working with parameters of the HRV. The models classify the workload in 4 levels: low, medium, high and overload. The best model, based on a support vector classifier, achieved 75% accuracy to classify mental workload in these 4 levels in crossed validation. The models substantially improve when personal worker characterization test is included. Finally, different types of situations are easily detected, ranging from breaks or low workload situations to high workload moments or tasks.

KEYWORDS: MENTAL WORKLOAD, PHYSIOLOGICAL SIGNALS, HUMAN ERROR, NUCLEAR.