NOVA I4H – Thesis Proposal

Title:

Biosignals for human factors evaluation

Objectives (recommended length: 2000-3000 char):

The study of human factors related to the development of medical devices require tools to evaluate the ergonomics and human interaction, e.g. easiness and usability. With the advances in biosignals monitoring and biomechanical techniques, the evaluation of interaction with medical devices can promote new ways to evaluate its development. The user experience field can also be applied to the area of medical device development following the successful application, mainly to application design.

The extended list of multimodal biosignals that can be used for identifying the level of interaction with devices opens new doors to create design methods. Electromyography can be used to detect fatigue; FNIRS can give inputs about the concentration level of a user while interaction; Accelerometry can provide information about the physical activity needed to operate devices; Motion tracking can provide details on the full movements of the body or the hands to understand the changes needed to improve devices operations.

The main goal of this thesis is to review the state of the art on user experience and human factors analysis on multiple fields and the relation to the medical device evaluation. The study should provide methods to support the informed development of medical devices based on information extracted from biosignals and biomechanical information. The student should be involved in the design of new medical and research devices and disseminate both by creating training materials and research output on relevant scientific venues.

Framework (recommended length: 500-2000 char):

Established in 2007, PLUX creates innovative products for industry, clinicians and researchers, by developing advanced biosignals monitoring platforms that integrates wearable body sensors combined with wireless connectivity, algorithms and software applications. PLUX has a strong background on research collaboration with Universidade Nova de Lisboa. In the context of this thesis, the research on novel applications of sensors for human factors and user experience with the respective data analysis will enable the creation of novel methods for evaluation and development medical devices.

This project will be developed in collaboration with the laboratory of Biomedical Instrumentation Lab – LIBPhys of Universidade Nova de Lisboa and will be will be supported by a company/faculty PhD grant assigned by FCT.

Tasks (recommended length: 1000-3000 char):

The candidate should investigate the current state of the art of user experience and human factors. The candidate should produce training materials about biosignals monitoring in device interaction tasks. The student should become proficient on biosignals analysis and ergonomics evaluation. The intermediate results of the PhD should be presented in conferences and published in journals with known impact factor, on the areas of biomedical engineering, psychology or human factors. During the innovation process, careful attention should be given to identify ideas that can be part of intellectual property protection.

Venue:
This project will take place in the Biomedical Instrumentation Lab of FCT/UNL, as well as in PLUX Wireless Biosignals.

Candidate profile:

Considering that this project focuses heavily in human factors, cognitive psychology and physiology, the candidate should have expertise on biomedical engineering (or similar) with strong interest on cognitive psychology or should be a psychologist with interest on engineering and specifically, data analysis and human physiology.

The capacity to innovate, and develop new research ideas for sensing systems and attention experiments

In addition, since this collaboration is between a faculty and an enterprise, the candidate must be prepared to develop his/her activity in an industrial environment, when necessary.

Supervisor

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