

SENIAM 8

European Recommendations for Surface ElectroMyoGraphy

Results of the SENIAM project

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PREFACE

Surface EMG for Non-Invasive Assessment of Muscles (SENIAM) is one of the concerted actions funded by the European Commission (BIOMED II-Program). The aim of these concerted actions is to enhance international co-operation in a given field of interest. A mere fact that the EC has decided to fund this concerted action on Surface ElectroMyoGraphy (SEMG), should be regarded as a real acknowledgement of the maturity and potential benefits of SEMG.

At the beginning of the SENIAM project we have formulated two main objectives:

The first objective was to exchange knowledge and experience on SEMG between different countries and disciplines and to enhance the transfer of knowledge between basic and applied research. This objective has been realised especially by the organisation of four general workshops, each of them covering a wide range of topics, enabling cross fertilisations between the different disciplines and enabling the start of a real European body of knowledge on SEMG. Another activity that has contributed significantly to this objective were the small projects. These were relatively short visits involving at least 2 SENIAM partners in order to combine knowledge and experience to solve particular questions of common interest. These visits have started in many cases a fruitful collaboration and have resulted in many papers in the scientific journals.

The second objective of SENIAM was to develop recommendations on key items that presently prevent a useful exchange of knowledge and experience, especially with respect to experimental / clinical data. These key items were considered to be sensors, sensor placement procedures, signal processing and modelling. The general approach was that an inventory was made on the actual use of the topics in the European labs and in parallel a topical workshop was organised to obtain the scientific state of the art. Extensive discussions resulted in a set of preliminary recommendations. These were then sent to the SENIAM partners and members of the SENIAM club to create consensus. Many, over 100, European experts in the field of SEMG have contributed to the results and as such a real European body of knowledge on SEMG has been created.

One could state that certainly with respect to this second objective, this booklet contains the summary of the SENIAM project. It indeed contains all the recommendations on these four topics. As such it is expected that acceptance of these recommendations will bring the use of SEMG a major step forwards. This will facilitate to a large extent the exchange of data of e.g. patients with neuromuscular disorders, ergonomic field studies and gait analysis. As such it will contribute to bringing SEMG one step further, as a mature tool to investigate the functioning of the neuromuscular system.

Acceptance of these recommendations is crucial and not obvious. But the fact that the majority of the European experts in SEMG have contributed to its development will strongly facilitate its acceptance. In addition, the large majority of the SENIAM club has already stated that they will use the recommendations in their labs. As such, due to their outstanding reputation they will contribute to the dissemination of the standard. The interest of non-European SEMG users is growing and also the ISEK (Int. Society of Electrophysiology and Kinesiology) has stated its interest and support.

In chapter 1 a description of the project has been described, showing also the way how the different tasks have been handled. Chapter 2-5 contain the recommendations which are a result of the activities within each of the SENIAM tasks. Although many people have contributed to all these tasks, I would like to use this opportunity to thank a few people that have contributed in an outstanding way to these tasks.

Chapter 2 contains the recommendations for SEMG sensors, a sensor placement procedure as well as a detailed description of the sensor locations for 27 different muscles. I would like to acknowledge the considerable contributions of Günther Rau, Cathi Disselhorst-Klug and Bart Freriks to this task. In addition I would like to thank the Nijmegen group for all their modelling and experimental work which contributed a lot to the explanation of various influences of electrode properties on SEMG characteristics.

Chapter 3 contains the recommendations for the recording and processing of SEMG signals. The discussions that have started at the topical workshop, organised by Herve Rix and Roberto Merletti, were condensed in a number of relevant items concerning the signal processing of SEMG as is used nowadays in most applications. I would like to thank Roberto Merletti and Dario Farina who really put a lot of efforts in this task. In addition I would like to thank Göran Hägg who contributed to the aspects that are relevant for long time recordings (as in ergonomics) and Jaap Harlaar who contributed to the recommendations for dynamical SEMG.

Chapter 4 contains the results of the modelling task, at least partly. The other part of the result, being four simulation models that have been made available to SENIAM by their developers, can be found on the SENIAM CD-rom. Chapter 4 contains the guidelines for how to use the models in an adequate way. Especially Dick Stegeman and Joleen Blok have put a lot of effort in these guidelines, explaining what the features of the models are and how to choose a particular model to solve a particular question. They have done a great job with this.

Chapter 5 contains the recommendations on how to report on SEMG investigations. This is especially relevant as it is a basic requirement in science that reproduction of the results should be possible at the hand of adequate documentation. In addition it is a basic requirement for the useful exchange of data and experience and to understand differences and similarities in each others data sets.

Chapter 6 contains a brief description of the SENIAM CD-rom including some guidelines how to use this CD-rom. Personally I think that this CD-rom is a very pleasant and educating way to learn about all the results of the SENIAM project. This CD-rom has become reality especially by the work of one man: Bart Freriks. He has put an enormous effort in the creation of this CD-rom during the last months of the SENIAM project. The result is certainly worth showing!

Chapter 7 contains a list of all the contributions and papers that have been made and presented during the SENIAM project and the workshops by the partners and all the experts that have been invited to the workshops. Overlooking this long list, it is impressive to see what has been done during the past years in this concerted action. I think we should be proud on the results of this joint effort at a real European level.

Finally I would like to thank the European Community for making this project possible by giving the grant for the SENIAM project.

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