



Breathing Feedback System with Wearable Textile Sensors

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Overview

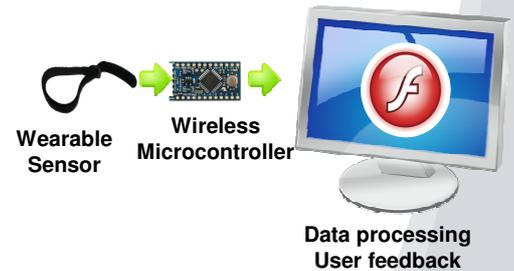
Breathing exercises form an essential part of the treatment for respiratory illnesses. Here we present an interactive system using a wearable textile sensor to monitor breathing patterns. A graphical user interface provides visual real-time feedback to patients. The aim of the system is to encourage the correct performance of prescribed breathing exercises by monitoring the rate and the depth of breathing.



Figure -Recording the Reference signal

System

The system consists of a textile sensor which tracks breathing patterns via an embedded microcontroller. The microcontroller was used to sample and transfer the user's breathing signal to a computer for signal processing and analysis. The user interacts with a Graphical User Interface (GUI) which gives real-time feedback of the breathing technique and facilitates continuous assessment of the patient's performance.



Signal Analysis

The software provides instruction and real-time feedback to the user and also records the data so that the user's performance can be logged over time. The software allows the patient and doctor/therapist to perform a breathing exercise for a specified length of time that the patient must attempt to emulate. This signal is recorded as a reference breathing signal. The user performs against this signal at home and a comparison is given in real-time.

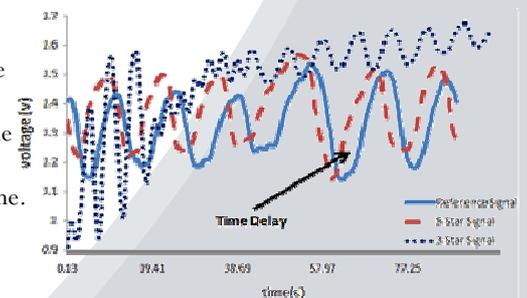


Figure -Comparison of different signal grades



Shallow breathing only fills the top part of the lungs.



Deep breathing fills the lungs fully!

Figure - Deep breathing is important to maximise oxygen delivery and to strengthen the respiratory muscles

CONCLUSIONS

The visualization of data is imperative in improving the overall user experience. This, combined with encouraging feedback, helps retain users and grow the user base. It is also important to work with potential users of the system from the start of the design process. This allows the system to be custom-built to suit user defined requirements and takes a multi-disciplinary approach to system development.

Future

Future work will focus on an assessment of sensor robustness and the importance of garment fit for clinical trials. Discussions with healthcare specialists are in progress to obtain early feedback on system usability in a clinical setting



Figure - User emulating reference signal

Acknowledgement – This work is supported by Science Foundation Ireland under grant 07/CE/I1147

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d1 dcu, 01/06/2010