Wearable Biofeedback Systems

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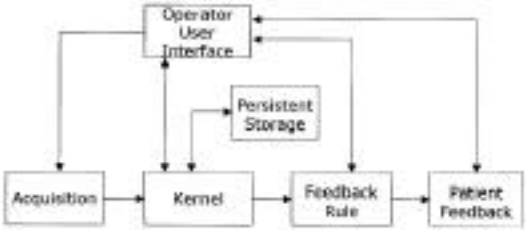
The concept of portable, wearable biofeedback systems has become a reality due to their minimal system requirements and other efficiency-promoting characteristics as well as the increased availability of high-powered microprocessors. These systems

The first requirement for a cognitive biofeedback (CBF) system is voluntarily controlled activities (VCA's), such as physical movement or mental tasks. These actions are then linked to specific functions that are controlled by a dedicated machine. Mental tasks are acquired and processed via an EMG (electromyogram) or EEG (electroencephalogram). Once a signal is found, the proper action associated with it is performed.



A CBF system (above) is composed of six main modules that communicate through well-defined software interfaces.

Each of the subsystems of the entire biofeedback system has a specific function, the most important of which is the *Kernal* module. This subsystem sets the timing for the whole system, recognizes each of the VAC's, sends data to the data classification subsystem, evaluates system performance, and drives the other modules.

The wearable biofeedback systems use a software package, utilizing a C++ framework, has been designed to support the creation of a wide range of CBF systems. The way in which the software has been written allows there systems to be compatible with various hardware and software platforms, such as workstations, pocket PC's, desktop PC's and smart phones. The main advantages of this software package include minimized programming, integration with existing systems and devices, and that if functions independently of the choice biological signal. The biofeedback system has also been designed so that it is possible and easy to use multiple and mixed input sensors, such as EMG, breath, voice, digital video, and EEG. This allows a given patient's residual capabilities to be taken advantage of as well as more freedom in deciding to use various input/output devices without a need to alter or rebuild the whole system.

This study found that biofeedback systems are moving from desktop-based hardware to portable computer-based devices. The utilization of a BF++ framework used in conjunction with low-cost CPU boards provides wearable BF systems that are efficient and affordable.

-Bianchi, Luigi; Babiloni, Fabio, et al, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol. 11, No. 2, June 2003, Pages 117-120
-Bianchi, Luigi. Bio-Feedback/Brain Computer Interface <http://www.luigibianchi.com/bci.htm