Wearable sensor network to study laterality of brain functions

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In the last decade researches on laterality of brain functions have been reinvigorated. New models of lateralization of brain functions were proposed and new methods for understanding mechanisms of asymmetry between right and left brain functions were described. We design a system to study laterality of motor and autonomic nervous system based on wearable sensors network. A mobile application was developed for analysis of upper and lower limbs movements, cardiac and respiratory function. The functionalities and experience gained with deployment of the system are described.

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Various model of functional lateralization of human brain were proposed. Models of hemisphericity [1], hemisity [2], quadrant model of lateralization of autonomic nervous system [3] or local lateralization of neurons connections hub [4] have been incited researches on techniques and technologies that paved the way for better understanding of brain functions. However, in the last years accumulated data suggest that coordination and entrainment between motor and non-motor functions, which normally occurs in natural environment, can extensively modify the brain functions. Therefore these interactions may account for observed interpersonal variability in left-brained' or right-brained' neuronal network strength. Most of these interactions are complex and poorly understood. To this day, robust evidence on influence of coordination between motor and non-motor systems and entrainment in laterality of brain functions are scarce and yet to be shown, if for no other reason than for improving treatment in patient with affected right or left brain. Entrainment is defined as the process where two interacting periodic systems, such as the regions of the brain, heart, lungs, or voluntary musculature, become synchronized. Although various technique and technologies were developed for lateralization evaluation of human brain, in our knowledge, methods that may allow assessment and monitoring of laterality of brain functions in free living conditions are not described. It is know that in specially arranged environment the motor performance or physiological response to stimuli may not be the same as that in a more natural environment such as in home or daily environments and therefore methods for unobtrusive monitoring of functional lateralization of brain are desirable.