

# The BeatHealth Project: Considerations When Moving Technology from the Lab to the Wider World

**Joseph Timoney<sup>1</sup>, Rudi Villing<sup>2</sup>, Victor Lazzarini<sup>3</sup>, Eoghan Conway<sup>2</sup>, and Dawid Czesak<sup>2</sup>**

Departments of <sup>1</sup>Computer Science, <sup>2</sup>Electronic Engineering, and <sup>3</sup>Music –  
NUI Maynooth, Maynooth Co. Kildare, Ireland.

jtimoney@cs.nuim.ie, { rudi.villing,econway,dczesak } @eeng.nuim.ie, victor.lazzarini@nuim.ie

## **Abstract**

‘Beathealth’ is an EU-funded collaborative research project. The project consortium brings together scientific researchers from four different EU countries: Montpellier University and CHRU in France, Ghent University in Belgium, NUI Maynooth in Ireland and Technalia in Spain. The objective of the research is to harness the power of rhythm to realise new technology applications that can assist us to achieve better health. Furthermore, for those with declining physical health, such as Parkinson’s disease, it will create new tools to facilitate patients in therapeutic sessions and help stimulate an improvement in their condition.

The concept is that technology will first of all monitor bodily movement using real-time sensors. These are connected to a mobile smartphone device using the Bluetooth protocol. The signals are then analysed using algorithms to extract features that highlight the rhythm of the person’s activity. These rhythmic patterns will drive a synchronous adaptation between the beat of some music they are currently listening to, thereby reinforcing the rhythm of the activity at a neurological level. This will produce a harmony of activity between body and mind significantly boosting its beneficial impacts. Hence the name: ‘BeatHealth’.

The responsibilities within the project are that the French teams will study the relationship between rhythm and physical and mental responses. The groups from Belgium and Ireland are working on the technological implementation, while the Spanish group will address the commercialisation of the outputs. The intention is that new insights discovered in the laboratory using specialist equipment will be taken by the other teams and developed into a robust mobile phone-based system. The mobile system will have a combination of new hardware (custom-made sensors) and software (data analysis and music alignment) technologies. This system should be ready for commercial development and exploitation.

However, making that transition from the equipment of the lab to an integrated unit that can be used in an everyday setting is not straightforward. These are the technical challenges for the Irish team of ‘BeatHealth’. The problems include (1) building a complimentary set of physiological sensors that are reliable, portable, and power efficient, (2) knowing the limitations in the communication protocol used between the sensors and the mobile device, (3) finding suitable algorithms to effectively remove noise from the sensor signals and fuse these into a single representative stream, and (4) refining the music adaptation and playback algorithms to cope with latencies inherent in the mobile phone operating system. The presentation will discuss the solutions proposed by the Irish group to overcome these and other problems. It will thus demonstrate the sometime difficult pathway from the ‘ideal conditions’ of the laboratory to the more challenging environment of the wider world, and how it influences all the technical decisions.