Abstracts


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Sonic Representation of Data. Medical Applications of Sonography

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Abstract

Sonification is defined as non-speech audio to convey information or perceptualize data. The scope of sonification is to add supplementary information to that obtained by other methods or replace visualization in certain conditions – for visually impaired or when the visual system is engaged in other tasks (during driving or surgery etc).

Methods. Sonification is formally represented as a function with data space as definition domain and sound space as value domain. The central paradigm of sonification is to define this function. There are several methods to do it; the most common class of methods is the "parameter mapping". Our approach – the "three levels method" – is defined according to the potential values in the sound space: *acoustic level* (A) with continuous spectrum of frequencies and durations, *sonic level* (S) with discrete spectrum of frequencies and durations and *musical level* (M) which adds rhythm and harmony. **Materials**. As input data we have used various biomedical data: biosignals (ECG, pulse wave, heart rate, oxygen saturation), either from our own recordings or from Physiobank data base, as well as molecular sequences (DNA, protein) from NCBI database. **Software**. We have developed a set of programs using MATLAB or PYTHON platforms. Special tools (tempolenses) were also developed for compressing or dilating the original signal.

Results. A library with sonic S-level transformation of various signals and molecular sequences was created. For each signal several parameter mapping schemes were applied in order to select the optimal set for potential practical applications. A study concerning the capacity to recognize or memorize specific types of signals (corresponding to certain physiological or pathological states) was also performed.

Discussions. Like any new system dedicated to capture information, a supervised learning period is necessary. The discriminant power was acceptable for only some ECGs, but was high for the heart rate, both during exercise or for some pathological states (all types of arrhythmias). The user acceptance is limited to some procedures where the training period is short or for specific applications when visualizations is not applicable.

Conclusions. Sonification is a new method with high applicability potential in healthcare, still insufficiently explored. Worth to mention that it is not aimed to replace other ways to represent information (text, visualization) but to supplement them. And we can also add that the musical level (still underdeveloped) can bring new dimensions, being more appropriate for association with the diversity of human physiological or pathological conditions.

Abstract in Romanian: Reprezentarea Sonoră a Datelor. Aplicațiile Medicale ale Sonografiei

Abstract: Sonificarea este definită ca reprezentare audio nonverbală a informației pentru perceptualizarea datelor. Scopul sonificării este de a adăuga informații suplimentare celor obținute prin alte metode sau înlocuirea vizualizării în anumite condiții – pentru cei cu deficiențe de vedere sau când sistemul vizual ocupat (în timpul conducerii mașinii sau în operații chirurgicale etc).

Metode. Sonificarea este formal reprezentată ca o funcție cu spațiul datelor ca domeniu de definiție și spațiul sonor ca domeniu de valori. Paradigma centrală a sonificării este definirea acestei funcții. S-au propus mai multe metode; cea mai comună clasă de metode este „mappingul parametrilor". Abordarea noastră – „metoda celor trei nivele" – este definită conform valorilor posibile în spațiul sonor: *nivelul acustic* (A) cu un spectru continuu al frecvențelor și duratelor, *nivelul sonic* (S) cu un spectru discret pentru frecvențe și durate și *nivelul muzical* (M) care adaugă ritm și armonie. Materiale. Ca date de intrare am folosit diferite date biomedicale: biosemnale (ECG, unda de puls, frecvența cardiacă, saturația de oxigen) fie din înregistrări proprii fie din baza de date Physiobank, precum și secvențe moleculare (ADN, proteine) din baza de date NCBI. Software. Am dezvoltat un set de programe în MATLAB sau PYTHON. Am dezvoltat și instrumente speciale (lentile temporale) pentru comprimarea sau dilatarea semnalelor originale.

Rezultate. Am creat o bibliotecă cu transformări sonice nivel S ale unor diferite semnale sau secvențe moleculare. Pentru fiecare semnal am aplicat mai multe scheme de mapping a parametrilor pentru a selecta un set optim pentru aplicații practice. Am efectuat și un studiu privind capacitatea de recunoaștere sau memorare a unor tipuri de semnale (corespunzătoare unor anumite stări fiziologice sau patologice).

Discuții. Ca pentru orice sistem de captare a informației, este necesară o perioadă de învățare supervizată. Puterea de discriminare a fost acceptabilă pentru unele semnale ECG dar a fost ridicată pentru frecvența cardiacă, atât în timpul probei de efort cât și pentru anumite patologii (tot felul de aritmii). Nivelul de acceptare al utilizatorilor este limitat la anumite proceduri cu perioade scurte de învățare sau pentru aplicații în care nu se poate aplica vizualizarea.

Concluzii. Sonificarea este o metodă nouă, încă insuficient explorată, dar cu potențial ridicat de aplicare în medicină. Ea nu își propune să înlocuiască alte moduri de reprezentare a datelor (text, vizualizare) ci să le suplimenteze. Adăugăm și că nivelul muzical (încă subdezvoltat) poate aduce noi dimensiuni, fiind mai potrivit pentru reprezentarea stărilor specific umane.

From Smart City to Smart Citizen. ICT Innovation for Improving Life in Contemporary Cities.

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In a nutshell, a smart or intelligent city is that where the citizens are provided good quality digital services through efficient ICT solutions. The concept involves urban planning, public services, culture, sports, leisure. But how can administrations turn a city into a smart one? The experience of the multidisciplinary teams that developed smart city strategies revealed several important lessons: the key issues for developing integrated systems of smart city tools are: accessibility, interoperability and ease of use; all citizens' problems must be addressed; efficiency must be followed at all times. Cities can reach their full potential if the focus is on: data, health, education, and cyber security. But it takes time (and money) for a city to become smart. Some cities have created their own concept of "smart city" – there are numerous examples, such as Barcelona, Dublin, Vienna, Leuven, Tallinn, or Tartu. Digitalization depends on the context, and different strategies must be designed according to the local realities, considering every aspect – from legislation to culture. The common denominator of all the successful cases appears to be the trust in progress and the new technologies. Innovation is needed to add value and improve life in our cities. Our paper presents several solution proposed by the master students of the study programme "Informatics Applied in Science and Technology", organized by the Faculty of Sciences, "Vasile Alecsandri" University of Bacău, Romania. The challenge addressed to the students was formulated as follows: How can we shift from "smart city" to "smart citizen" and how can we bring the ICT solutions close to the citizen, so that they can benefit from and have access to data. The students proved to be creative and with a sustainable view: they proposed solutions for the cities of the future.

Acknowledgment: Present research was evaluated under the guide and with the support of COST CA19136: NET4Age-Friendly the main aim and objective of which is to establish an international and interdisciplinary network of researchers from all sectors to foster awareness, and to support the creation and implementation of smart, healthy indoor and outdoor environments for present and future generations. The results will contribute to solving problems and actions carried out within the COST CA 16226, Indoor living space improvement: Smart

Process mapping to integrate an innovative tool in the prescription of adapted physical activity.

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Abstract
Description of the methodological approach used in the process of integrating a digital platform for the prescription of adapted physical activity (AFA) of the AFA programme into the current service delivery context. This innovative tool was initiated in the FP7 funded European project Personalised ICT Supported Service for Independent Living and Active Ageing (PERSSILAA), which aimed at the screening and prevention of frailty in community-dwelling older adults. Four dimensions (physical, cognitive, nutritional and social) were taken into account in the assessment of the health status of older people, and targeted interventions were implemented to improve their quality of life. The development and scale-up of the innovative solution took place within the framework of the twinning activities between the Reference Sites of the European Partnership for Innovation on Healthy and Active Ageing in Twente (The Netherlands) and Campania (Italy).

Design/methodology/approach: We carried out an organizational process mapping including the identification of the key points for the integration of the innovative solution in the current service delivery context. Process mapping implies an analysis of the characteristics of services associated with the pathologies most frequently occurring in older people. Active workflows and possible interdependencies between health and prevention services. Especially from the perspective of frailty prevention, it is necessary to identify actions that can be integrated. Screening activities are functional to the creation of an integrated, multidisciplinary and multidimensional system that is able to customize the prescription of adapted physical activity in a more precise and effective way. In this way the digital platform will be able to manage data and process information useful for both professionals and patients.

Findings: Rehabilitation and secondary prevention programmes are recognized as an integral part of many patients' treatment pathways, and are therefore recommended as useful, safe and effective tools to improve patients' symptoms, functional capacity and quality of life. The development of remote rehabilitation tools allows patients to perform the exercises prescribed by the rehabilitation physician at home, through a web-based platform that also allows the healthcare professional to monitor the patient's adherence to treatment. Currently, following the discharge from the rehabilitation therapy there is no standardized approach to ensure that physical activity regimens are personalized upon individual functional capacity. Despite experiences supporting the effectiveness of digitally supported Adapted Physical Activity customized to specific patients needs are currently available, their large scale uptake has not been implemented yet. The present research provides an overview of the bottlenecks hindering implementation in a specific setting, such as mainly represented by the lack of digital literacy for the elderly population, organisational gaps, technological gaps involving interoperability, and the lack of training of healthcare professionals in the management of these innovative solutions.

Research limitations/implications: The limitations of this research are due to the current fragmentation of data and the processes and flows in which they are produced. This causes a difficulty in exploitation towards other areas and services where this approach could be used. In fact, this problem results in limited scale-up, particularly because it prevents involvement of patients with heterogeneous diseases. The development of this research will therefore be oriented towards improving the outcomes of services related to new digital solutions. At the same time, it will identify possible solutions to build a model organized through integrated and multidisciplinary processes that allow scale-up to a much larger audience of patients.

Practical implications: Facilitating the process of integration of innovative mobile health solutions in current service provision.

Originality/value: Our approach might also be applied to enable the use of digital solutions such as telemedicine and teleconsultation. Considering the increase in the elderly population, and the need to manage sustainably health threats such as the Covid-19 pandemic, may bring benefits in terms of overall health outcomes, quality of life and improved sustainability of health service provision.

Intergenerational family solidarity

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Relations between generations in a family can be complicated. How connected do you feel to those older and younger than you? The dimensions of ‘intergenerational solidarity ’below can help you consider how the bonds in your family work. Intergenerational solidarity refers to the degree of closeness and support between different generations. The notion of solidarity helps us to understand how people of different generations relate to, help and depend on one another in their daily lives. In the video, we look at the different dimensions of intergenerational family cohesion.
Keywords: Structural solidarity, Associational solidarity, Affectual solidarity, Consensual solidarity, Functional solidarity, Normative solidarity
Structural solidarity: This means how factors like geographical distance can constrain or enhance interaction between family members. It is easier to give and receive help, care and support if family members live near one another, but new technologies, such as Skype, can aid communication between family members who live far from one another.
Associational solidarity: This dimension refers to the frequency of social contact and shared activities between family members. Some adults visit their parents very frequently, others less often.
Affectual solidarity: Solidarity can manifest itself in feelings of emotional closeness, affirmation, and intimacy between family members, also known as affectual solidarity. Some ageing parents and their adult children declare that they are very close to each other; others feel more distant.
Consensual solidarity: Family members have different levels of actual or perceived agreement in opinions, values, and lifestyles. For instance, the family members might all vote for the same party or believe in a similar ideology. In other cases, parents and their children might have very different opinions on issues, for instance, same-sex marriage.
Functional solidarity: Exchanges of practical and financial assistance and support between family members are examples of functional solidarity. Examples of functional solidarity are gifts of money but also very practical things such as buying groceries, preparing meals, allowing family members to move in with you, or looking after their care needs. Older family members can be both beneficiaries and sources of functional solidarity. For instance, some look after their grandchildren; others receive visits from their children to help with household tasks.
Normative solidarity: Normative solidarity refers to the strength of obligation felt towards other family members. In some families, there is a strong belief in the need for and importance of family cohesion and assistance between family members; in others, family members consider that it is quite acceptable for them to feel and to be very independent of each other.
Acknowledgment: Present research was evaluated under the guide and with the support of COST CA19136: NET4Age-Friendly the main aim and objective of which is to establish an international and interdisciplinary network of researchers from all sectors to foster awareness, and to support the creation and implementation of smart, healthy indoor and outdoor environments for present and future generations. The results will contribute to solving problems and actions carried out within the COST CA 16226, Indoor living space improvement: Smart Habitat for the Elderly (SHELD-ON), this way creating a better society for everybody.
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Analiza funcționalităților dispozitivelor inteligente

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Abstract: Progresul tehnologiilor moderne este cu adevărat impresionant. Casa inteligentă nu este încă departe mâine, ci chiar lucru care este aproape astăzi. Majoritatea companiilor mari au realizat proiecte pentru construirea de case inteligente în ultimul deceniu. Cu toate acestea, pentru ca o casă inteligentă să devină realitate, trebuie mai întâi să reconstruim conștiința proprie. Una dintre cele mai importante caracteristici care permite să facem distincția "casei inteligente" este organizarea eficientă a spaţiului de locuit. Prin implementarea celui mai eficient concept de interacțiune între om şi casă, putem organiza și implementa în casă un mediu optim. În "casa inteligentă" omul cu ajutorul micilor impulsuri este capabil să monitorizeze tehnica din jur care va determina nevoile individuale ale omului

Cuvinte-cheie: Smart-Home, Casă inteligentă, Internet of Things, Robotizare, Sistem.