Monitoring Temporal Personal Information Regarding Soundscapes and Movement, as a Way to Enhance Social Interactions

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ABSTRACT

This paper describes the design and implementation of two new modules in Hurly-Burly Sound Based Social Network System: 1) the movement tracking and 2) temporal monitoring. The first module consists of a tracking system, which detects and records the movement in each analysis, turning the system into a multimodal analysis system. The second one is a web-based visualization, which plots the gathered data along a timeline. Hurly-Burly system is comprised of an application for mobile devices, which analyses soundscapes (context sensing) and shares this information with other clients (nodes of the network), in order to provide a framework for assessing new concepts related with the use of sound and movement in social network interactions. A more detailed explanation of the system is made.

Author Keywords

Ongoing research; soundscapes sonic interaction; social media; mobile computing; movement tracking.

ACM Classification Keywords

H.5.5 [Information Interfaces And Presentation]: Sound and Music Computing --- Systems; J.4 [Computer Applications]: Social And Behavioral Sciences --- Sociology; H.5.2 [Information, Interfaces and Presentation]: User Interfaces --- Haptic I/O; H.5.3 [Information, Interfaces and Presentation]: Group and Organization Interfaces --- Theory and Models.

General Terms

Design.

INTRODUCTION

The human sensory system acts as a set of input devices used to bridge the tangible outside world and the conceptual world of the mind. Sound is a sensible phenomenon specially tailored to convey semantic, emotional and omnidirectional information, thus constituting one of the most important vehicles for communication. Nonetheless, the sound information conveyed through standard communication mediums (radio broadcast, telephone…) regards mainly what Michel Chion called Semantic Listening, based on the semantic properties of the code implied - usually the verbal code (Chion, 1994) – over the sound source identification (Causal Listening) or the sound morphological qualities (Reduced Listening).

By the contrary, our proposal focus on the classification of sound sources and sound morphological qualities, which are useful to convey information about the places and activities from where sound emerges. This assumption is rooted in the soundscape research field, where has been proved (Schafer, 1977) that the sound of a given place/time holds meaning and valuable information about it, affects the quality of communication (Truax, 2001) and impacts its livability (Klæboe, 2011). In addition, the goal of tracking body movement is to validate the sound classification. Sound production is often associated with movement of some kind, either by friction, impact or oscillation. Performing a multimodal analysis comprised of these two close related manifestations ensures more conclusive results.

HURLY-BURLY: SOUND-BASED SOCIAL NETWORK

Regarding the motivations described, a sound-based social network system – Hurly Burly - has been designed based on two major assumptions:

1) The analysis of a person's sonic environment is useful to describe his/her social context;
2) Sharing such information over the network may enhance the social interaction experience.

As many other social network applications, the core of the proposed system resides on the exchange of personal information within peers. The novelty of our approach

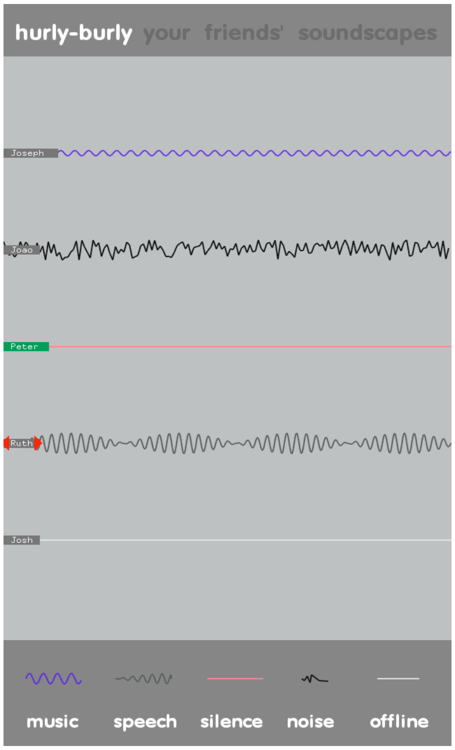

Figure 2 - GUI of the client application on a iOS device.

relies on the nature of the information being exchanged, which focuses on peers' personal soundscapes and movement.

The system is based on a software application for mobile devices (iOS), which analyses the sound in the user surroundings by means of the on-board microphone. The data exchanged by the peers of the network comprises: 1) the classification of the captured sound (music, speech, environmental sounds), 2) its loudness, 3) quantity of movement and 4) timestamp. The gathered data feeds a database on a web server, which constitutes the nucleus of the network. All registered peers can write and read from this database. The system - Hurly-Burly – is decided into five modules, three of them minutely described in (Cordeiro & Makelberge, 2010) and two described next.

With the system running on all clients' devices, users can see a real-time visualization of their *friends'* individual soundscapes, without demanding any active input interaction from those (Figure 1 shows the GUI of the application where *friends* current soundscapes classification are displayed).

MOVEMENT TRACKING

Preliminary user tests showed that the sound classification is less accurate when the users are on the move, due to the fact that they usually carry their devices inside pockets or bags. The sound captured during this periods corresponds to noises resulting from friction between the device and cloths

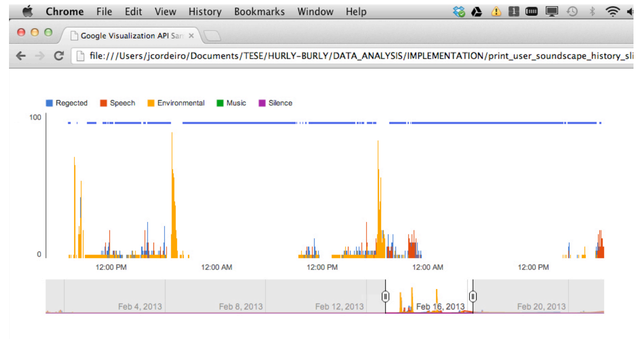

Figure 1 - Temporal monitoring of sound and movement.

or other objects, and not to the actual sound environment surrounding the user.

To partially solve this issue, the movement of the device is now analyzed using the device's accelerometer and shared within the *friends* network as a boolean value (true if moving, false if steady). In the GUI, two red arrowheads in the nameplate represent this information (Figure 1). The goal is to add an implicit confidence level to the sound classification, while conveying useful but non-intrusive information.

TEMPORAL MONITORING OF COLLECTED DATA

All the data collected by the client application is stored on a server using MySQL open source relational database management system. The application analyses sound and movement every one minute and uploads this information into the database via an HTML form sent to a PHP script hosted on the server. Every thirty seconds the client application sends an HTML form to a PHP script querying the database about *friends* updates, which fuels the visualization on the mobile device. On the other end, a temporal display of the collected data is made available through a web-browser using a Column Chart, with continuous time on the *x*-axis and sound intensity on the *y*-axis (0 to 120 db LeqA (2,79s)). There are five possible categories (columns/colors) in which sound analyses can be displayed: music (green), speech (red), silence (purple) and rejected (blue) when the algorithm can't recognize the sound source. On top of this char is displayed a Line Chart regarding information relative to the movement of the device (**Figure 2**). The plotting of both charts is made using Google Visualization API Reference of the Google Chart Tools service.

CONCLUSIONS

All the modules of the system were successfully implemented. Preliminary tests suggest that the additional layer of information regarding movement contextualizes and contributes to a better comprehension of the sound information. The temporal plotting of collected data conveys an evolutionary perspective over the user sonic surroundings, allowing the detections of patterns and cycle related with his/her daily routines. Further steps of this study include large-scale user tests, in order to access the validity of the system within the social network paradigm.

ACKNOWLEDGMENTS

Research supported by FCT - Science and Technology Foundation of the Portuguese Government (SFRH/ BD/ 47844/ 2008).

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