

MIREs ROADMAP: CHALLENGES FOR DISCUSSION

MIREs consortium

<http://www.mires.cc>

1. INTRODUCTION

In this document we present a number of challenges relevant to MIR research that were discussed during the IS-MIR 2012 late-break session. They are part of a Roadmap for MIR being elaborated in the context of the MIREs European project¹. These challenges were presented to the MIR community with the goal to get some feedback while the Roadmap is elaborated. A more detailed -and in-the-works until mid-2013- version of the challenges is available online on a wiki², where we invite the community to provide input.

For the purpose of the Roadmap we consider that Music Information Research (MIR) covers all the research topics involved in the understanding and modeling of music and that use information processing methodologies. We consider this research to be very much within the field of Information Technologies, thus with the major aim of developing methods and technologies with which to process musically relevant data and to develop products and services with which to create, distribute and interact with music information.

2. CHALLENGES

2.1 Musically relevant data

We define “musically relevant data” as any type of machine-readable data that can be analyzed by algorithms and that can give us relevant information for the development of musical applications. The grand challenge is to gather musically relevant data of sufficient quantity and quality to enable music information research that respects the broad multi-modality of music. More specifically: identify and use as many data sources as possible to describe music (audio, scores, text, video, blogs,); clarify the legal and ethical concerns regarding data availability and usage; or develop and make available to the research community more-better data and more-better annotated corpus.

¹<http://www.mires.cc>

²http://mires.eecs.qmul.ac.uk/wiki/index.php/MIR_Challenges

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2.2 Music representations

Data representation decisions impact the effectiveness of MIR systems in two ways: algorithms are limited by the type(s) of input data they receive, and the user experience depends on the way that MIR systems present music data to the user. A major challenge is to provide abstractions which enable researchers to develop algorithms that meet user needs and to present music information in a form that accords with users understanding of music. More specifically: develop more musically meaningful features and representations; determine and develop the most appropriate data representation for each application; or unify standards, data formats, representations, developing ontologies to describe all types of music information.

2.3 Data processing methodologies

Since its origins, the MIR community has used and adapted data processing methodologies coming from related research fields like e.g. text information retrieval, machine learning or speech processing. The challenge is to more systematically identify potentially relevant methodologies from other disciplines and stay up-to-date with their latest developments. More specifically: systematically identify relevant data processing methodologies from other disciplines; or develop methodologies for cross-modality processing.

2.4 Knowledge-driven methodologies

The MIR community has for a long time been focusing on a range of bottom-up approaches: starting with the kinds of data we use to the types of algorithms we apply to it. The challenge is to transcend this focus and explore other methodologies and fields of science that approach music in a more integral way. More specifically: learn from music psychology and use its methodologies; emphasize the social function of music; learn from neuroscience and use their results concerning music; make a more systematic use of concepts from musicology and music theory, or use HCI methodologies in the design and the evaluation of MIR applications.

2.5 Musical concept extraction

The challenge here is to automatically derive musical concepts from audio signals or commonly available symbolic data, such as MIDI or scores. More specifically: develop better source separation algorithms; develop methodologies for joint estimation of music content parameters; or use symbolic information plus audio data to extract higher level semantic concepts.

2.6 Evaluation methodologies

It is paramount to MIR that independent researchers can build upon previous research. An overarching challenge in MIR is to define and implement sustainable research evaluation methodologies that effectively contribute to creation of knowledge and general improvements in the field. More specifically: sustain MIR evaluation initiatives like MIR; evaluate whole MIR systems; or use evaluation strategies that can provide quantitative insights on how to improve the systems.

2.7 Social aspects

Music is a social phenomenon, thus its understanding and modeling requires the inclusion of this dimension. In MIR, the description of a piece of music is normally approached as the study of a data object with no context. This is a partial view of what music is. With the availability of digital data that reflects the social dimension of music, especially from digital social networks, we can approach this topic from an information processing perspective. Some specific challenges would be: adopt and adapt complex networks and dynamic systems methodologies; or study social context by analyzing interaction and activity in social networks.

2.8 Multiculturalism

Most music makes very little sense unless we experience it in its proper cultural context, thus the processing of music information has to take into account this cultural context. Most research and development on MIR has focused on the commercial Western music of the past few decades and thus most research results and MIR technologies have a cultural bias towards that particular cultural context. The challenge is to open up our view on music, to develop Information Technologies that take into account the existing musical diversity and thus the diverse musical cultural contexts. More specifically: identify music cultures that can be approached from an MIR perspective (mainly nonwestern); identify specific music characteristics for each culture and methodologies to analyze them; or carry out comparative studies between music cultures.

2.9 User perspective

The challenge concerning the user perspective is how to design MIR systems that put the user at the center of the system. This applies to the whole interaction loop, including visualization, input devices, manipulation metaphors, and also system adaptation to user behavior. More specific challenges are: take into account user needs; or target collaborative, sharing and multi-user applications.

2.10 Music distribution applications

One of the major applications of MIR is the development of technologies for music distribution. The music industry is developing new distribution services and the challenge is to develop technologies that are relevant to these services.

Mores specifically: demonstrate exploitation possibilities of the MIR technologies; develop music similarity methods for particular applications; develop scalable systems to millions of songs; develop systems beyond recommendation, towards discovery; or contribute to industry standards for music data and representations.

2.11 Creative tools

Creative practitioners tend to reuse existing sound materials, or transform materials produced in a variety of contexts, including live performance, soundscaping etc. They require analysis tools for automatically extracting relevant information from these materials for various purposes: content-based manipulation, generativity, synchronization with other media, real-time processing. Some specific challenges would be: involve creative and artistic thinking in technology development; develop flexible tools for composers; develop tools for performers, thinking in realtime; or develop tools for art installations.

2.12 Research, educational and health applications

A challenge exists in utilizing MIR tools for producing useful applications in other research fields and to exploit that technology in traditional fields such as music pedagogy. More specifically: develop tools for musicologists; develop tools for music education; or develop tools for enhanced listening.

3. CONCLUSION

This work is funded by the ICT-7th Framework Program from the European Commission (Grant Agreement nr 287711). With the involvement of the MIR community hope to produce a document that is both useful for the research community and for the policy makers that have to take decisions on what research topics are important to be supported and funded.