Audio Commons Ontology

a data model for an audio content ecosystem

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Motivation

- lot of audio content available online (e.g., Spotify, SoundCloud, …)
- content has rich metadata and links
- need of common data models to support integration
Specific Context: the Audio Commons Project

• providers of Creative Commons audio content (Jamendo, Freesound, Europeana Sounds)

• content may be reused in creative ways both by end users and professionals of audio production

• how can we integrate existing providers and facilitate exploration and use of the content?
Audio Commons Ecosystem and the Ontology
Design Method

1. **specification** of scope and audience
2. **user survey** to identify scenarios of use and requirements
3. **research** on related ontologies and data models
4. **conceptualisation** on the model
5. **formalisation** in OWL
6. **integration** with other ontologies
7. **implementation** and **publication** online
8. **use**, **evaluate**, and **update** accordingly (repeat as needed…)
Use Cases Identified

• A **cafe owner** search on browser for tracks that play well together.

• A **audio producer** access high-quality audio loops from within a digital audio workstation (search by instrument, key, tempo, etc.).

• A **game sound designer**, search by effect type, mood, etc.
Requirements

• concept of audio clip published in a repository, alongside basic metadata (e.g., title, duration, licence);
• attributes of digital signal (e.g., number of channels, sample rate);
• attributes of media (e.g., media format, bit rate);
• multifaceted classification (e.g., musical genre, mood);
• collections (e.g., music albums, sound packs);
• compatible with existing specific models (e.g., music);
• optionally, details of production/publishing process (e.g., where and when an audio clip was recorded).
Related Data Models

• Functional Requirements for Bibliographic Records
• Music Ontology
• EBU Core Ontology
• W3C Ontology for Media Resources
• schema.org (CreativeWork, MediaObject, AudioObject)
• Dublin Core
• W3C SKOS
Audio Commons Ontology

Categorizations

by source

by genre

by mood

Content

Sound

Signal

AudioClip

available as

AudioFile

Events

Recording

Synthesis

Publication
Available Online

https://w3id.org/ac-ontology/aco

• Web page documenting classes and properties

• Download in multiple OWL serialisations (RDF/XML, JSON-LD, Turtle)

• Links to view it with external online tools
In Use Evaluation:
Audio Commons Mediator
AC Mediator

AC Client

Adapter

Adapter

Adapter

Jamendo

Freesound

Europeana
AC Mediator + Semantics

AC Client

Semantic Client

Adapter

Jamendo

Freesound

Europeana

AC Mediator + Semantics
AC Semantic Mediator

AC Client

Semantic Client

Semantic Mediator

Semantic Adapter

Jamendo

Semantic Adapter

Freesound

Semantic Adapter

Europeana
Conclusions

- represent multiple types of audio content
- beyond object-centric model for Media Resources (e.g., audio categories, collections)
- layered approach to represent multiple levels of granularity and specificity
- designed and evaluated for usage in concrete scenarios
:-)

Questions?
Backup Slides
Survey

• **target**: people working with audio content in a creative workflow

• **method**: online public survey

• **participants**: 661 (45.5% of which professionals)

• **questions**: 8 on context of usage, 12 on potential interface, 4 on demographics (24 in total)
Functional Requirements for Bibliographic Records

![Diagram showing the relationship between Work, Expression, Manifestation, and Item]

- Work
  - realization
  - realizationOf
- Expression
  - embodiment
  - embodimentOf
- Manifestation
  - exemplar
  - exemplarOf
- Item
  - part/partOf
  - relatedEndeavour
ACO: top-level concepts
Metrics

- 21 classes, 18 object properties, 5 data properties
- every term has a label and a description for human consumption
Competency Questions

• Which are the songs that are slow (tempo) funk (genre) tracks without vocals (instrumentation)?

• What other tracks “play well” together with a given song in a playlist (e.g., are in the same category according to some classification)?

• Retrieve high-quality (sample rate, bits per sample) audio loops (type of audio content) for a given instrument type, genre, key, tempo.

• Retrieve high-quality (sample rate, bits per sample) sound effects (type of audio content) for a given effect type, mood, and a set of perceptual features (e.g., warm and bright).
Audio Commons Ecosystem and the Ontology

• the ontology integrates the data models of the providers (and their diverse APIs)

• heterogeneous data consumers access the information through the common data model defined by the ontology
New Mediator: How?

AC Client

JSON API

AC Mediator

Adapter

Adapter

Adapter

JSON

- LD

Context

Semantic Client

JSON-LD Processor

JSON-LD Context

Jamendo

Freesound

Europeana