A COMPUTATIONAL APPROACH TO CLASSIFY MUSIC BY EMOTION

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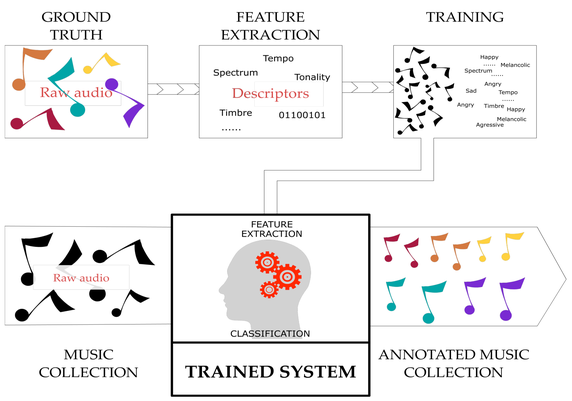
Overview



Hypothesis It is possible to design a computational system able to classify Emotions from Music using audio

Goal To understand better the musical and acoustic features that are involved in the emotional process

Constraints System not Universal, it can be personal or working for a group of people. System based on audio data only

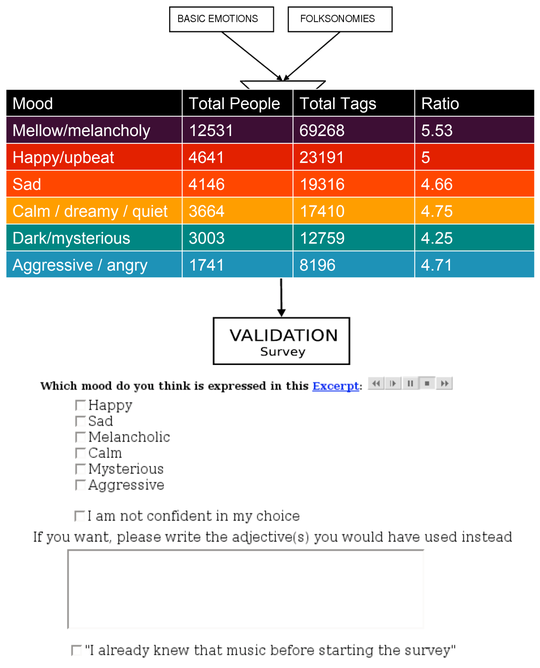
How Using Machine Learning techniques with audio features. Learning from example.

What kind of representation should we use?
How can we gather the ground truth (examples) ?
Which audio features should we use?

Representation

A basic and simple approach

Few and exclusive categories: better agreement between people, easier for the annotation process



Mood	Total People	Total Tags	Ratio
Mellow/melancholy	12531	69268	5.53
Happy/upbeat	4641	23191	5
Sad	4146	19316	4.66
Calm / dreamy / quiet	3664	17410	4.75
Dark/mysterious	3003	12759	4.25
Aggressive / angry	1741	8196	4.71

Get a taxonomy for mainstream music

- Browse Folksonomies
(= taxonomy derived from social networks)
- Compare with Basic Emotions
- Cluster in synonyms->Taxonomy

Validation Survey:

Goal Test the taxonomy

- 16 participants
- 100 instrumental excerpts
- 20s duration
- Not mainstream pop music

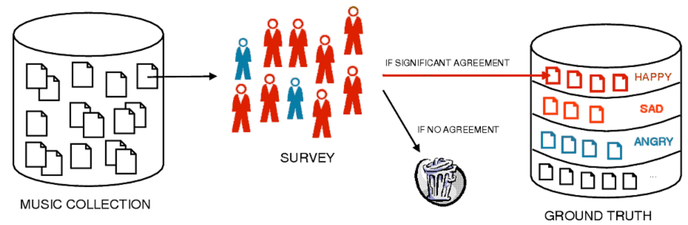
Results:

Mood	Agreement
Mellow/melancholy	63.4%
Happy/upbeat	78.4%
Sad	58.8%
Calm / dreamy / quiet	71.9%
Dark/mysterious	74.4%
Aggressive / angry	77.4%

Taxonomy close to Juslin's adjectives
70% agreement in average
(agreement = best frequency / total answers)
Important Overlapping between Sad/Melancholic

Ground truth

Goal Create a large database of examples according to a taxonomy



Large-scale survey
to annotate a music collection

Problems	Solutions
Cultural background	Western popular music
Social background	Unknown music
Temporal Evolution of songs	Excerpts
Influence of the Lyrics	Instrumental
Preferences	Adapt to the user's preferences

Music to use An eclectic collection of short instrumental excerpts from the western popular musical culture

Result A reliably tagged collection of useful examples according to a taxonomy

Feature extraction

From audio data, we can automatically extract information (features)

Musical attributes to consider

Tempo, Mode, Harmony, Loudness, Pitch, Intervals, Articulation, Timbre, Vibrato etc…

Results

A set of relevant audio features from existing ones (Spectral, Temporal, Rhythmic, Timbre)
New ad-hoc features

Finally these audio features describing the signal will be used as an input to an automatic classifier, several types will be tested and a dedicated classification system can be designed

Open questions

Which audio features could be relevant ?
Is there a model of emotion categorization we could use?
If we want to track it, how can we manage the evolution of the emotion in time ?

References

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