Computer Generated Content
Games and Open Worlds

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Open Worlds

- Open world is a game mechanic of using a virtual world that the player can explore and approach objectives freely, as opposed to a world with more linear and structured gameplay.
Open Worlds
Metaverse

• The metaverse
  • is a hypothesized iteration of the internet, supporting persistent online 3-D virtual environments
Procedural Level Generation

• Perlin Noise
Procedural Level Generation

• Perlin Noise  https://www.youtube.com/watch?v=7tfvebVU5P0
  • Procedural city based on Perlin noise - Alex Nicola and Nati Goel
Interactive Storytelling

• The interactive storytelling systems are used to tell a story that can be created or modified by the direct influence of the audience.

• The story is created based on a story model written by the author who provides all the context that must be followed.

• To make this possible, the storytelling system provides a list of options from actions that must occur to suggestions that may influence the sequences.

• In the case of stories that are adapted during exhibition, these options are displayed from time to time so that the continuity planning of the story occurs without interruption as shown in.
Simple Story model

- A story is a single sequence of connected events which represents a narrative, also known as plots.

- Event structure:
  - Event Name: unique name for the event;
  - Text: describes what happens during the event;
  - Dramatic Curves: emotional notation

- Branch structure:
  - Action Name: unique name for the action;
  - Text: describes the action and what happens to lead to the new event;
  - Parent Event and Next Event;
A Gamebook is a work of fiction that allows the reader (or player) to participate in the story by making effective choices.
Model of Emotions

• Russel 1980

• Two “dimensions” of emotions: valence and arousal.

• Valence defines positive vs negative feelings (pleasant vs unpleasant)

• Arousal defines how intense the stimulus is
• Selects music from Spotify based on user preferences

• Mood -> Valence
• Danceability -> Tempo
• Intensity -> Arousal

https://moooodify.com/
Model of Emotions

• Ekman, Pictures of Facial Affect (POFA) stimulus set published in 1976

• Robert Plutchik agreed with Ekman's biologically driven perspective but developed the "wheel of emotions"

• Eight primary emotions grouped on a positive or negative basis:
  • joy versus sadness;
  • anger versus fear;
  • trust versus disgust;
  • Surprise versus anticipation.
Model of Emotions

- Plutchik, 1980 - Model of "basic emotions"

Basic emotions can be combined in pairs to produce complex emotions:
- antecipation + joy = optimism
- joy + trust = love
- trust + fear = submission
- fear + surprise = awe
- surprise + sadness = disappointment
- sadness + disgust = remorse
- disgust + anger = contempt
- anger + antecipation = aggression
Alexander Nevsky is a 1938 historical drama film directed by Sergei Eisenstein. It depicts the attempted invasion of Novgorod in the 13th century by the Teutonic Knights of the Holy Roman Empire and their defeat by Prince Alexander, known popularly as Alexander Nevsky (1220–1263).
2D space of Genres

• Each scene has a genre that represents the emotional state.

• This genre is the barycentric coordinates of the polygon defined by the main elements of the scene
Time-Series Data Mining

• Time-Series Data Mining PHILIPPE ESLING and CARLOS AGON, Institut de Recherche et Coordination Acoustique/Musique (IRCAM)

The task of motif discovery
Dynamic Time Warping

Chroma Representation of $X_1$

Chroma Representation of $X_2$
Dynamic Time Warping

Live performance → On-line computed audio features → Threads → DTW alignment → Tempo ratio estimation → Score position prediction

Reference → Off-line computed audio features

$h_{DTW}$, $w_{DTW}$

Institut de Recherche et Coordination Acoustique/Musique (IRCAM)
Chord progressions vs Emotions

- Chord progression
- [https://howmusicreallyworks.com/Pages_Chapter_6/6_17.html](https://howmusicreallyworks.com/Pages_Chapter_6/6_17.html)

### TABLE 52 Emotional Effects of Chords

<table>
<thead>
<tr>
<th>Chord Type</th>
<th>Associated Emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major (e.g., C)</td>
<td>Happiness, cheerfulness, confidence, brightness, satisfaction</td>
</tr>
<tr>
<td>Minor (e.g., Cm)</td>
<td>Sadness, darkness, sullenness, apprehension, melancholy, depression, mystery</td>
</tr>
<tr>
<td>Seventh (e.g., C7)</td>
<td>Funkiness, soulsfulness, moderate edginess</td>
</tr>
<tr>
<td>Major Seventh (e.g., CM7)</td>
<td>Romance, softness, jazziness, serenity, tranquility, exhilaration</td>
</tr>
<tr>
<td>Minor Seventh (e.g., Cm7)</td>
<td>Mollowness, moodiness, jazziness</td>
</tr>
<tr>
<td>Ninth (e.g., C#)</td>
<td>Openness, optimism</td>
</tr>
<tr>
<td>Diminished (e.g., C*)</td>
<td>Fear, shock, spookiness, suspense</td>
</tr>
<tr>
<td>Suspended Fourth (e.g., Cus4)</td>
<td>Delightful tension</td>
</tr>
<tr>
<td>Seventh, Minor Ninth (e.g., C7/S9)</td>
<td>Creepiness, ominousness, fear, darkness</td>
</tr>
<tr>
<td>Added Ninth (e.g., Cadd9)</td>
<td>Steeliness, austerity</td>
</tr>
</tbody>
</table>

**Legend**

- **Accessible** (Sufficient Unity)
- **Boring** (Lacking Variety)
- **Confusing** (Lacking Unity)
- **Accessible but Boring (Irritating)**
- **Confusing and Boring (Complete Turn-off)**
- **Accessible and Entertaining (Emotionally Powerful and Memorable)**
- **Entertaining (Sufficient Variety)**
Chord progressions vs Emotions

- Two Possible Goals:
  - Music Generation vs Score Selection
Autoencoder

• Learn the underlying structure of the dataset in an unsupervised way.
  • Characteristics identified during learning can be used later in supervised learning tasks.
Latent Representation

- Pitch
- Scale
- Tempo
- Music Genre
- Rhythmic Pattern
- ???
Dimensionality Reduction

PCA
(k=2)

Autoencoder
(2000-500-250-125-2)

Reducing the Dimensionality of Data with Neural Networks (Science, 2006)
Dimensionality Reduction

Autoencoder
(2000-500-250-125-2)

Reducing the Dimensionality of Data with Neural Networks (Science, 2006)
Generating Songs With Neural Networks (Neural Composer) jul, 2018

https://github.com/HackerPoet/Composer/
https://www.youtube.com/watch?v=UWxfnNXIVy8&t=251s
Publication coming soon to a conference near you

Questions?