Intelligent Music for Games

Dr. Kjartan Olafsson
Professor, Founder and CEO of Erkitonlist

Baldur J Baldursson
Audio Director - CCP Games

Contents

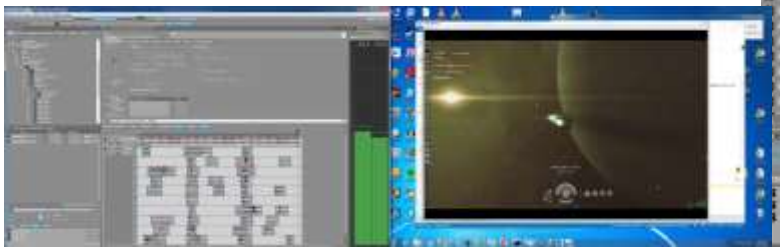
1. 1. Introduction and overview – Music in Eve Online
2. 2. Intelligent Music - CALMUS
3. 3. Connecting game elements with music parameters

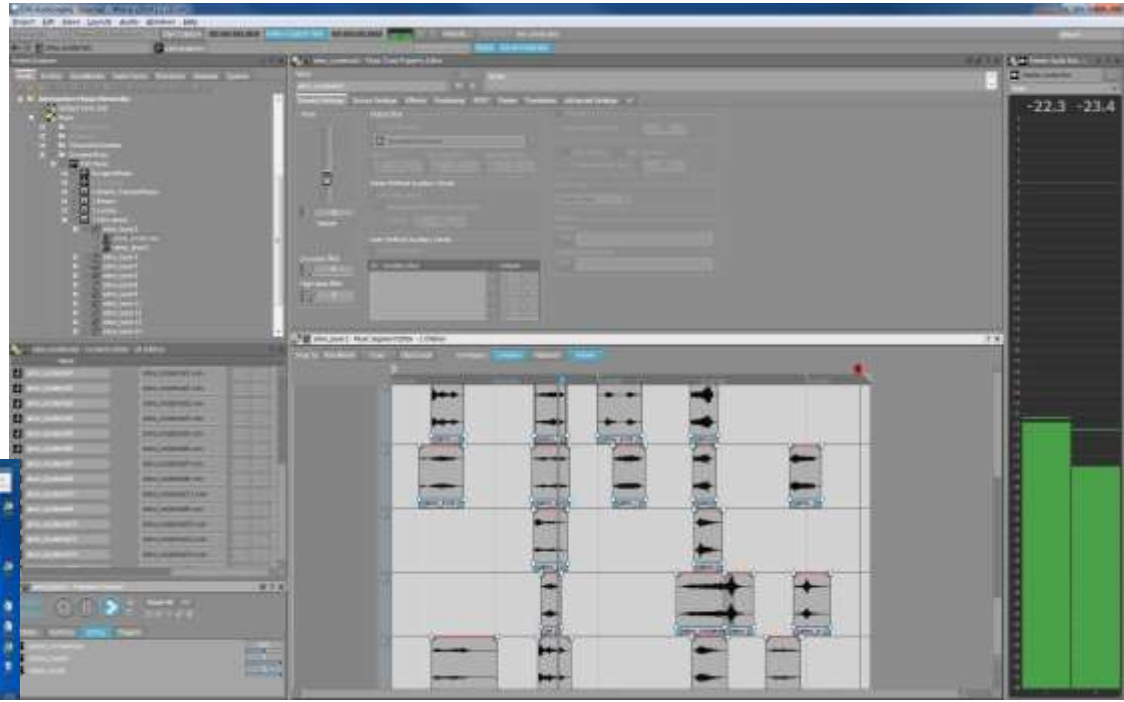
Music in Eve-Online

- 2003-2009: The Jukebox

Music in Eve-Online

- 2009: Wwise



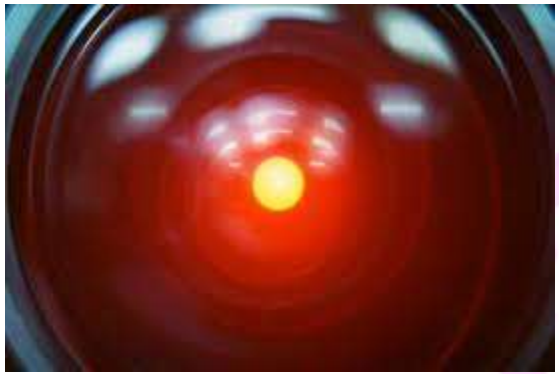


Music in Eve-Online

- Empire space
- Low sec
- Zero sec
- Wormhole space

The benefits of having an itelligent music system

- we can better support an untold story
- because of repetition



First steps

- 2009: we started looking for possible solutions

Intelligent Music

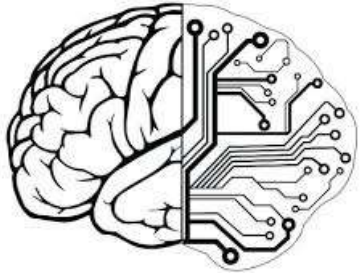
- Calmus

Calmus – a brief history

- Sibelius Academy 1988
- Problems with probability and random processes
- Lisp

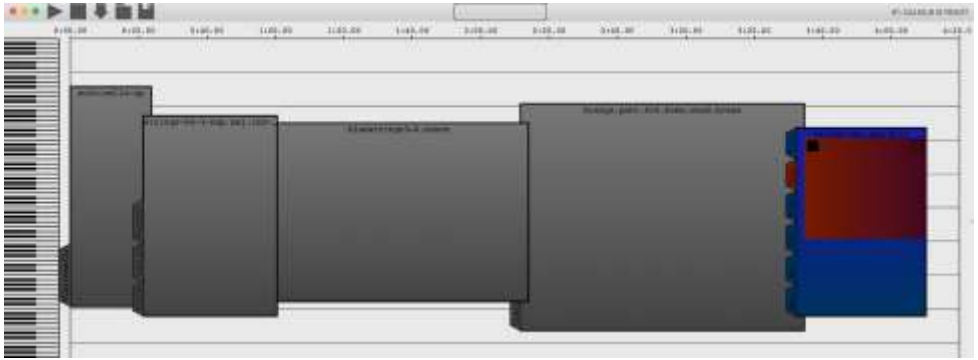
Calmus – the musical theory

- Real-time
- Musical ideas modified with AI functions
- Over 500 years of compositional methods



The hierarchy

- Musical Objects

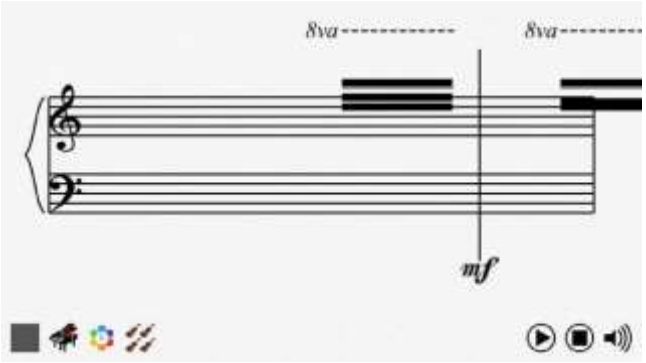


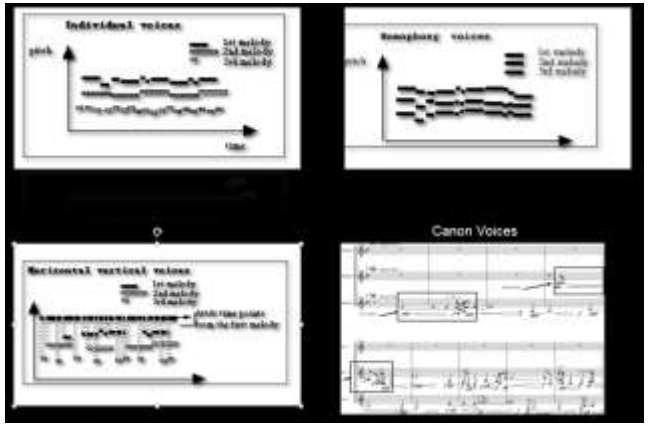
Musical Object

A musical object is based on:

Cells
Melodies
Harmony

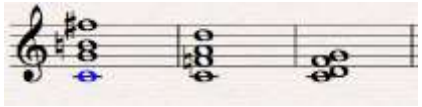
Polyphonic structure



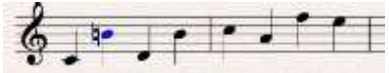


Algorithms

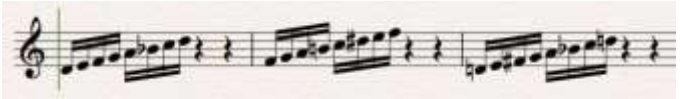
- *Various scales*
- *Interval - melody*
- *Interval - harmony*



Intervals - harmony



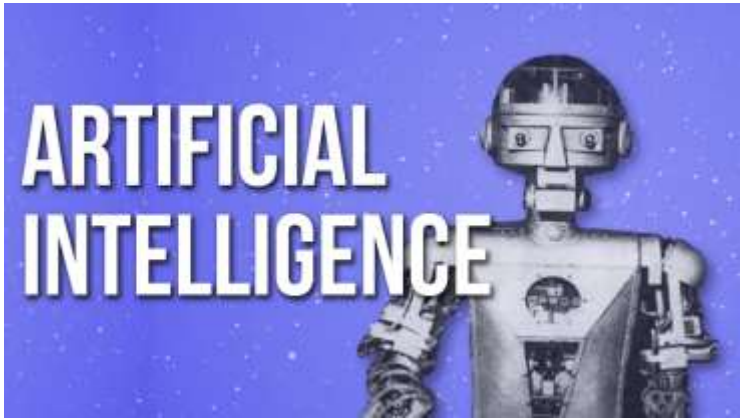
Interval - melody



Various scales

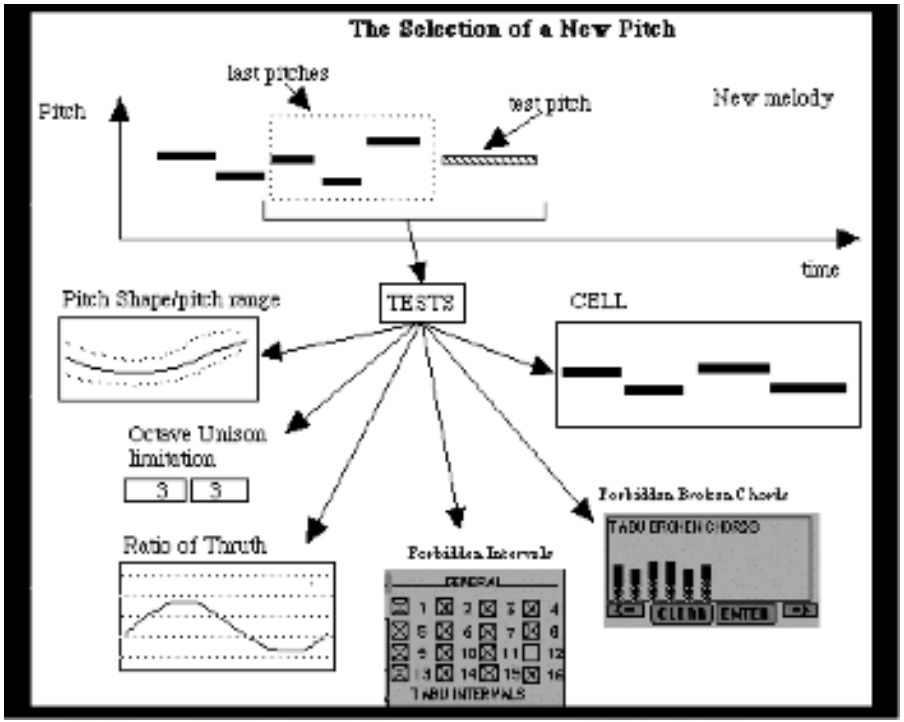
AI

The system is based on artificial intelligence which enables the user to work independently from any given presumption - in real time.



A simple example of Artificial Intelligence in melody construction

Selection of a New Pitch for a Melody Line



Musical parameters and syntax in Calmus

- Theme
- Harmony
- Scales
- Melody
- Texture
- Polyphony
- Tempo
- Pitch register

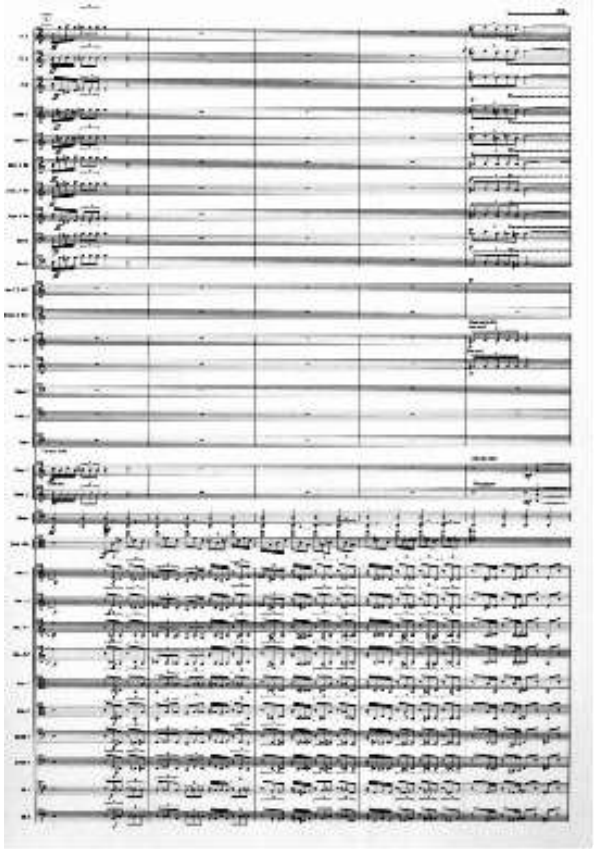
Gesture Control - Dance

Examples

- Viola Concerto 2000

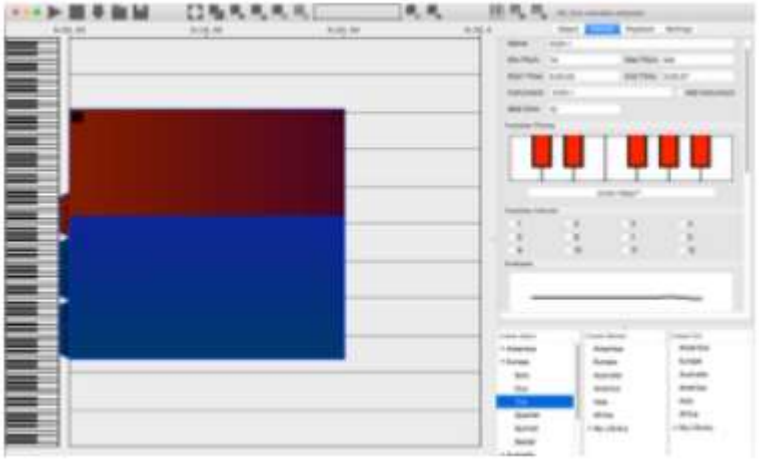
Received the Icelandic music awards in 2001 as the composition of the year

- Play example



Calmus Composer

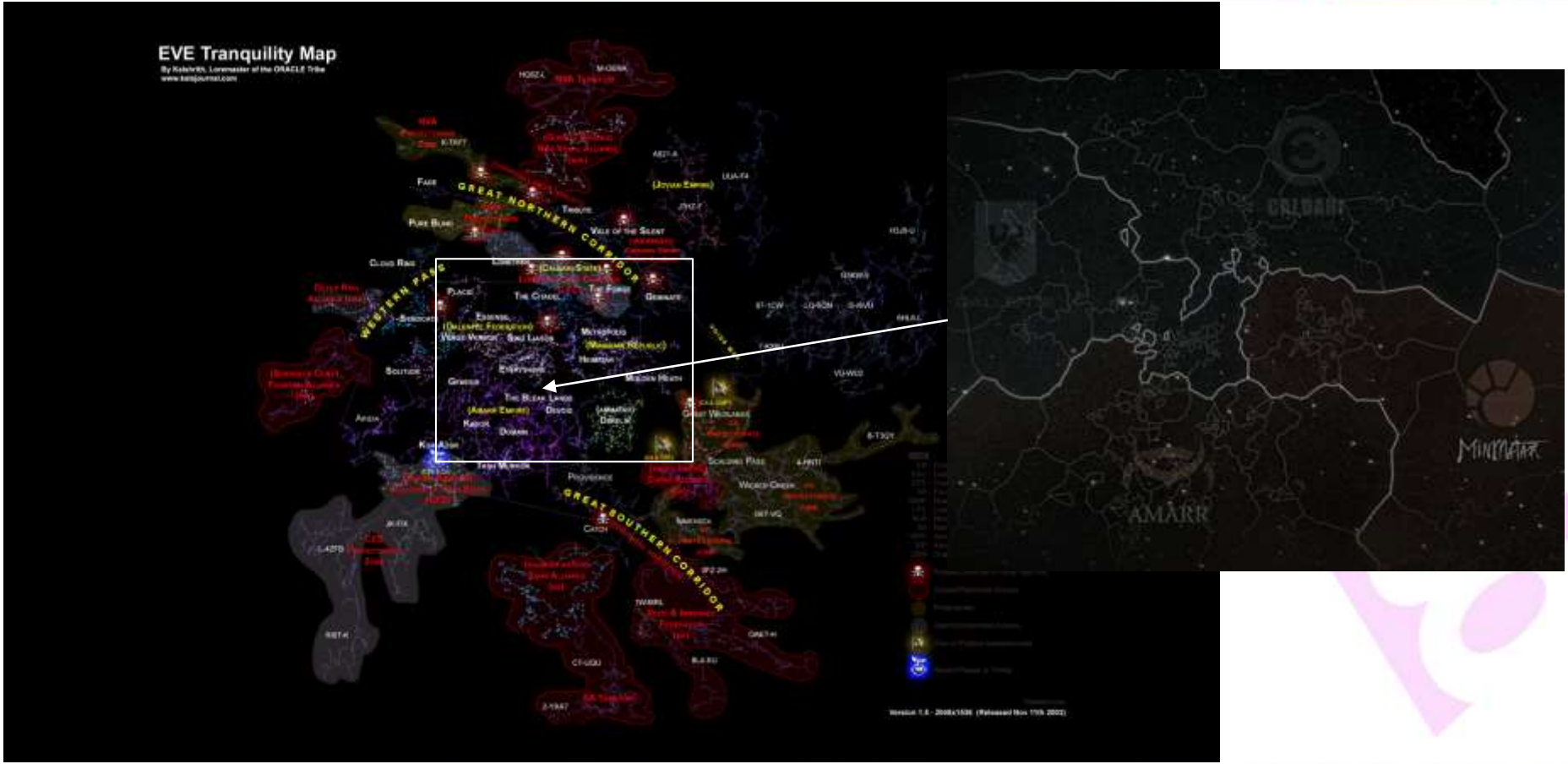
- creates libraries for Calmus Gaming



Identify elements in the game for music creation

Eve Online:

- Characters
- Environment
- Conflict
- Development


EVE Tranquility Map
GREAT NORTHERN CORRIDOR
GREAT SOUTHERN CORRIDOR
WESTERN PASS
AMARR

Types of characters - four basic / player races:

- **Amarr / Amarr Empire:** noble, regal and elegant (a bit evil)
- **Gallente / Gallente Federation**: smooth and curvy, flamboyant
- **Caldari / Caldari State**: hard and edgy - cold, functional
- **Minmatar / Minmatar Republic**: rusty and a bit dirty (slaves)

Types of characters - other NPC races:

- **Jove**: mysterious and enigmatic - also technically superior
- Numerous **Pirate Factions** with various background and behavior

Character Definitions / Character Cells

Amarr – regal and noble (evil)

- **Character cell(territory):**
- Principal melody intervals: Thirds, Sixths
- Scale: Dorian
- Pitch register: around C2
- Tempo: Adagio
- Polyphonic structure: Horizontal/Vertical
- Instrument texture: Classical

Caldari – cold, hard, functional

- **Character cell(territory):**
- Principal melody intervals: Minor 2nd / Aug 4th
- Scale: Kumoi
- Pitch register: around C'
- Tempo: Moderato
- Polyphonic structure: Homophonic
- Instrument texture : Electronic

Jove – mysterious, unknown, tech superior

- **Character cell (terrotory):**
- Principal melody intervals: m2 / m6
- Scale: Double Harmonic
- Pitch register: around C3
- Tempo: Largo
- Polyphonic structure:
- Instrument texture : Electronic

Gallente – smooth, curvy – flamboyant

- **Character cell(territory):**
- Principal melody intervals: Thirds, Fifths
- Scale: Aeolian
- Pitch register: around C1
- Tempo: Moderato
- Polyphonic structure: Homophonic
- Instrument texture: Classical

Minmatar – rusty, dirty, painful

- **Character cell(territory):**
- Principal melody intervals: Aug 4 / Min7
- Scale: Prometheus
- Pitch register: around C2
- Tempo: Adagio
- Polyphonic structure: Canon
- Instrument texture: Electronic

Pirates

- **Character cell (terrotory):**
- Principal melody intervals: m6 / m/M7
- Scale: Leading Whole Tone
- Pitch register: around C1
- Tempo: Allegretto
- Polyphonic structure:Individual
- Instrument texture: Electronic/Percussive

Character Definitions / Character Cells

Amarr – regal and noble (a bit evil)

Character cell(territory):

Principal melody intervals: Thirds, Sixths
Scale: Dorian
Pitch register: around C2
Tempo: Adagio
Polyphonic structure: Horizontal/Vertical
Instrument texture: Mixed

Musical parameters affecting the character cell (territories) in real-time according to the development of the game:

- Interval changes in harmony – various tensions in-game
- Type of polyphony – complexity and conflicts
- Change in pitch – darkness vs light
- Change in tempo – in-game tension, emerging threats
- Timbral character – cosmic anomalies such as wormholes etc.

Eve-Online - example

Normal

Amarr

Character cell (terrotory):
Melody intervals: Thirds, Sixths
Forbidden intervals: m2,M7
Scale: Dorian
Pitch register: around C2
Tempo: Adagio
Instrumentation: Mixed

Danger

Amarr

Character cell (terrotory):
Melody intervals: Thirds, Sixths
Forbidden intervals: **none**
Scale: Dorian
Pitch register: around **C1**
Tempo: Adagio
Instrumentation: Mixed - **changed**

Normal – new system

Gallente

Character cell (terrotory):
Melody intervals: Thirds,Fifths
Forbidden intervals: 2/7
Scale: Minor
Pitch register: around **C2**
Tempo: **Moderato**
Instrumentation: Classical

Play Demo

Technical implementation

- Calmus is written in Lisp
- Runs in ECL which is open source interpreter for CL (Common Lisp)
- AudioKinetic opened its API to allow us to send MIDI events into the sound engine. (Now open to everybody since 2015 version)
- Calmus feeds the MIDI events into WWise which host the instruments

Summary:

- For an sandbox MMO where the story still hasn‘t happened we‘d greatly prefer non pre-composed music
- Some kind of a system is needed – one such system is the AI based Calmus
- No system can work without first thoroughly defining game elements
- Currently, the system runs outside Wwise but ideally it should be a plug-in

Thank you

Q&A