Introduction - Overview

Topics of this Workshop:

- Probablistic Live Coding
- The Mégra Language
- Domain Specific Language (DSL) Design

Introduction - Mégra Installation

Clone Repository (git required):

```
git clone https://github.com/the-drunk-coder/megra
```

Installation Guide:

https://github.com/the-drunk-coder/megra/blob/master/Tutorial/00_Installation.md

If something is unclear, ask at any time !

Introduction - Live Coding Paradigms

Paradigms in Live Coding

What's the main focus of a live coding language ?

Incomplete List of Music Organisation Paradigms:

- Pattern - TidalCycles, Gibber
- Loops - SonicPi
- Counterpoint - Baroque Music
- Serialism - 20th century music, TidalCycles (in some ways)

Probablistic Paradigm

- Probablities of Things Happening in a Certain Sequence

Introduction - DSL Design

Mégra Design History (as an example . . .)

An Example how a Live Coding DSL can come into being:

- **Idea of Organisation** - how do you want Sound to be Organized ?
- **Data Structure** - which structure fits the Idea of Organization ?
- **DSL** - which textual representation fits the data structure ?

Introduction - Ideas Of Organisation

Some Keywords

linear, recursive, serialist, loop-based, monophonic, heterophonic, polyphonic, combinatorial, pattern-based, fractal . . .

Which would you choose, and why ?

Introduction - Data Structures

Which Data Structure fits which Idea ?

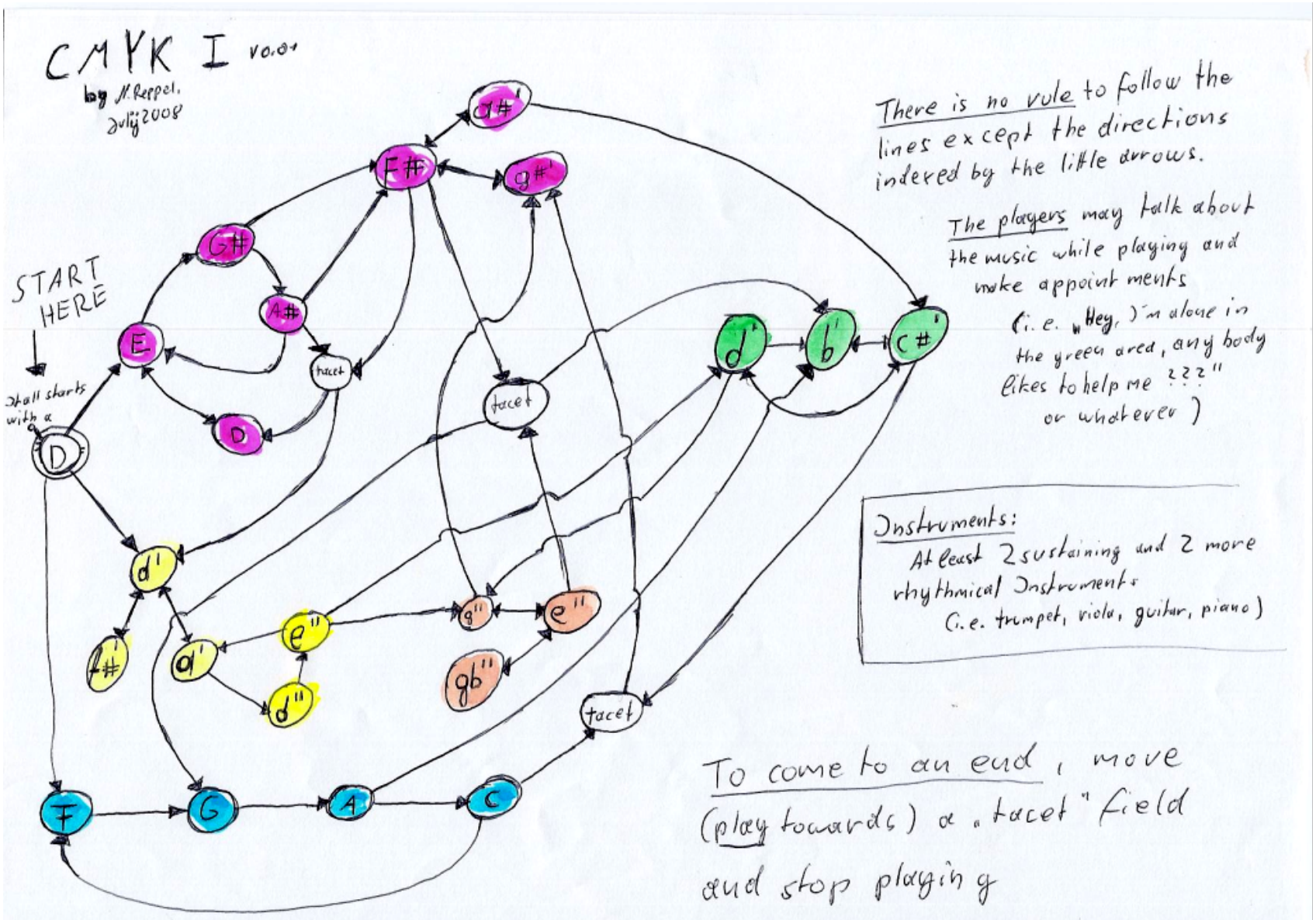
- lists (if sequences are spliced) -> linear or loop
- arrays (fixed length, step-sequencer) -> linear, loop, pattern
- matrices -> step sequencers over multiple parameters ??
- graphs -> see below ...

Introduction - Syntactial Representations

. . . see the many DSLs developed by the live coding community !

Introduction - Mégra Design History

Idea of Organisation -> Data Structure -> DSL



Introduction - Mégra Design History

Idea of Organisation -> **Data Structure** -> DSL

Variable-Order Markov Chains

Represented by *Probablistic Suffix Automata* or *PSA* (see Ron, Singer, Tishby - *The Power of Amnesia*).

- representation of conditional probabilites (any Bayesians here?)
- can be represented as a graph
- seemingly a good model for musical expectation (see *Sweet Anticipation*, D. Huron 2007)

Introduction - Mégra Design History

Idea of Organisation -> Data Structure -> **DSL**

Mégra - resulted after two predecessors in Python

```
(graph 'bass-1-lo ()
       (node 1 (tri 60 :dur 510))
       (node 2 (tri 65 :dur 256))
       (edge 1 1 :prob 40 :dur 256)
       (edge '(1 1 1) 2 :prob 100 :dur 256)
       (edge 1 2 :prob 60 :dur 1024)
       (edge 2 2 :prob 40 :dur 512)
       (edge 2 1 :prob 60 :dur 256))
```

Mégra - Technical Foundations

Why Common Lisp ?

- **Common Lisp** - multiparadigmatic, syntactical freedom, fast interpreters (sbcl)
- **Incudine** - scheduling, osc, synthesis (used for scheduling in Mégra)
- **Common Music 2.12** - musical syntax, scales, chords
- **cl-collider** - sclang replacement (not used in Mégra currently)

Together they form a nice base/toolkit for music DSL design !

Mégra - Basic Usage

Work along tutorial:

https://github.com/the-drunk-coder/megra/blob/master/Tutorial/01_getting_started.megra

Mégra - Secondary Paradigms

Event Streaming (related to *Reactive Programming*)

Events are streamed through a pipeline of modificators . . .

https://github.com/the-drunk-coder/megra/blob/master/Tutorial/06_modifying_the_event_stream.meg

Mégra - Secondary Paradigms

Event Arithmetics and Inheritance

- Musical Events have a certain Taxonomy
- Expansion of the Serialist Paradigm
- Elements of Object-Oriented Programming

https://github.com/the-drunk-coder/megra/blob/master/Tutorial/07_event_arithmetics.megra

Mégra - Techniques

- Single-Node (not very probablistic . . .)
- Lifemodeling - Growing Graphs
- Rapidfire-Inhibition (what a fancy name . . .)

(Tutorial chapters on the way . . .)

Mégra - Cognitive Aspects

- generated sequences are not reproducible (no "seed-composition" etc)
- users need to get familiar with the possible outcomes rather than a single one
- tool to play with your expectations ?

Future Outlook

- theoretical foundations
- a training model (machine learning etc.)
- ...

Recommended Literature

- David Huron - *Sweet Anticipation - Music and the Psychology of Expectation*, 2007
- Ron, Singer, Tishby - *The Power of Amnesia*, in *Machine Learning*, Nov. 1996