

tScore Makes Computers and Humans Talk About Time

Markus Lepper^a Baltasar Trancón y Widemann^{ab}

^a<semantics/> GmbH

^bTU Ilmenau

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1 What Is tScore?

2 tScore Context

- Existing Tabular Text Formats for Denotation of Time
- Computer-Compatible AND Human-Readable Time-Based Notation Is Needed
- Existing Notations Are Not Computer-Compatible

3 tScore Design Principles

- tScore Text Format Definition
- tScore Data Model

4 tScore Application

- Demonstration: Concrete Usage of tScore

What is tScore?

tScore is

a text format

for denotating arbitrary dia-chronic data

What is tScore?

tScore is

a text format

and the corresponding processing software framework

for denotating arbitrary dia-chronic data

Domain experts have developed very different tabular formats for Time

- In very different domains *tabular formats* exist for denoting *time related / diachronic data*
 - These formats are in between *text* and *graphics*
 - Called “symbolic vs. analog” by GOODMAN
 - Tending more to one side or the other
 - Eg. railways schedules, cue lists, kinetographics
 - Most complex: tradit. sheet music
 - = “Common Western Notation” = CWN \supset orchestral score
 - Non-trivial computer interface

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Need of a common notation and a generic infrastructure

A common format $\left\{ \begin{array}{l} \text{readable} \\ \text{writable} \end{array} \right\}$ by $\left\{ \begin{array}{l} \text{computers} \\ \text{humans} \end{array} \right\}$

for denoting arbitrary parameter ranges

in arbitrary time domains

is strongly desired !

- Closely following well-established domain concepts
- Realized by a generic infrastructure

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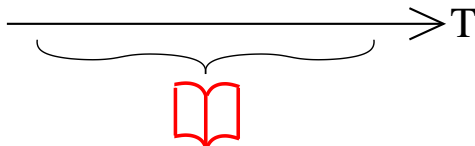
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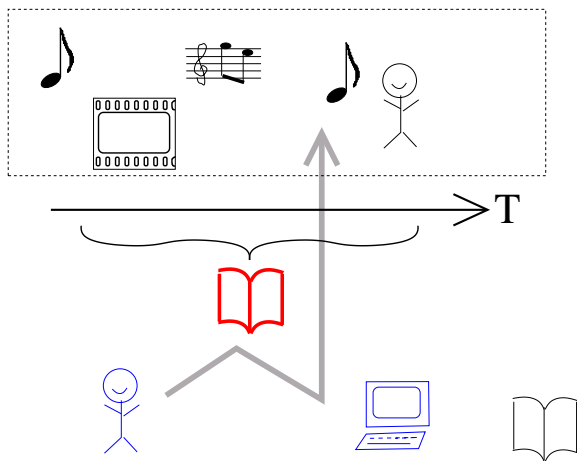
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Use cases in Stage Productions



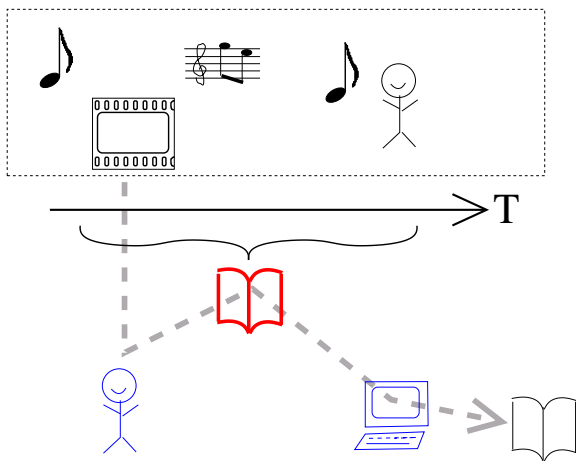
Use cases in Stage Productions

Human writes score and computer executes



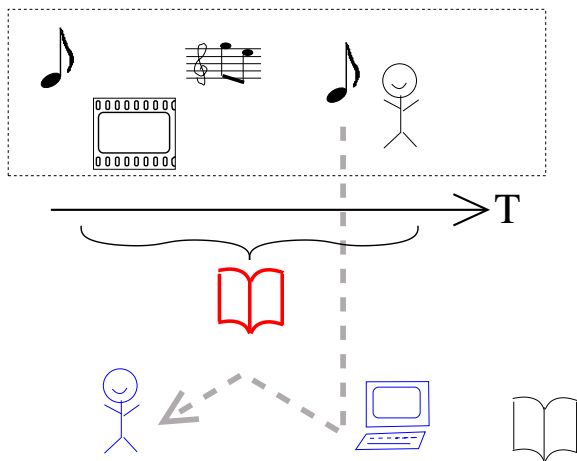
Use cases in Stage Productions

Human writes protocol and computer renders



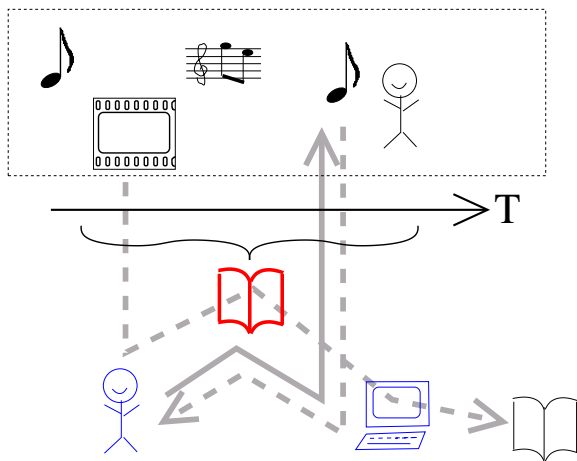
Use cases in Stage Productions

Computer recognizes and writes readable protocol



Use cases in Stage Productions

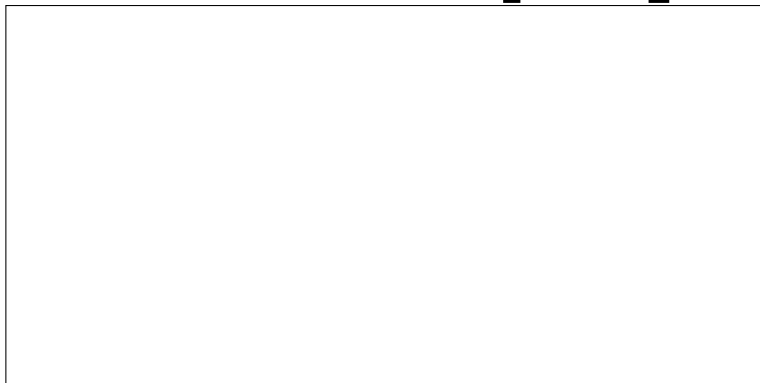
etc.



What are the contents of such a language?

Simply mapping \mathbb{T} to $P_1 \times P_2 \times \dots$

domain "Time" to range "Parameter values"



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(this is SIMPLIFIED !-)

$$\mathbb{T} \longrightarrow P_1 \times P_2 \times \dots$$

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analog

(pure graphical notation, “Streckennotation”)

The image shows two staves of handwritten musical notation. The top staff features a series of vertical stems with dots on a horizontal line, with a squiggly arrow above the first stem and a '< mf >' dynamic marking above the stems. Below the stems is the text 'dürstet, sollen saft werden'. The bottom staff shows a horizontal line with a circle at the start, a diagonal line segment, and a circle at the end, with a '< mf >' dynamic marking above the first part and a '< mp >' dynamic marking above the second part. A '6' is written at the end of the staff.

What are the contents of such a language?

Simply mapping **domain** “Time” to **range** “Parameter values”

$$\mathbb{T} \longrightarrow P_1 \times P_2 \times \dots$$

analog

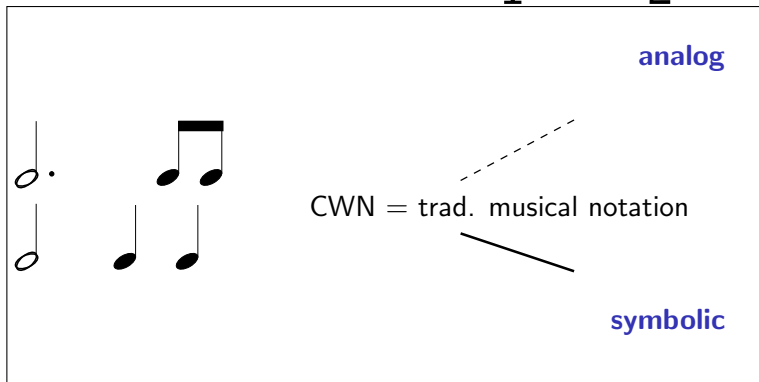
```
\notes
\ib10'ce0\qb0{_e_b}\tb10\qb0{e}
\ib10e0\qb0{-g{'_a}}\tb10\qb0{'g}
\enotes
```

(expressions, like LilyPond, musixTeX, Guido)

symbolic

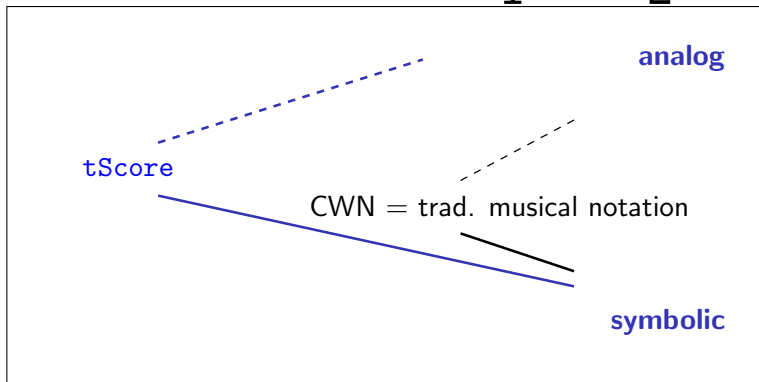
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
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CWN — Common Western Notation

- ✚ well elaborated, centuries of optimization
- ✚ compact
- ✚ easy readable, “one glance”
- ✚ utmost versatile and adaptable
(covers MONTEVERDI to STOCKHAUSEN)
- ▬ specialized, restricted range (pitch information)
- ▬ restricted domain (metrical duration values)
- ▬ diversity of variants, partly conflicting (e.g. enharmonics)
- ✚ used in many “foreign” fields (alternative ranges)
- ▬ hardly computer compatible

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tScore Design Principles

- Keep Principles of Conventional Music Notation
 - time flows from left to right
 - time distribution by division of space
 - synchronicity by super-position / vertical alignment
 - multiple tracks / parameters
- Do NOT keep restrictions
 - do NOT keep idiosyncratic junctims
(e.g duration by note head AND stem AND flags AND dots AND ties AND tuplet brackets)
 - do NOT decide for certain parameter ranges (This is already impossible in “pure” music !-)
 - do NOT decide for a certain domain structure
(there is **NO standard notion** of “time” !!)
 - allow arbitrary tracks with arbitrary parameter range
esp. allow *overloading*
 - make it a (*typewriter*) *TEXT*

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tScore example with standard CWN data

“PARS” separates independent time realms.

PARS prima

T 19 ! ! 20

T 20 21

PARS seconda ...

EOF

tScore example with standard CWN data

“T” lines define flow of time.

PARS prima

```
T          19          !          !          20
```

```
T          20          21
```

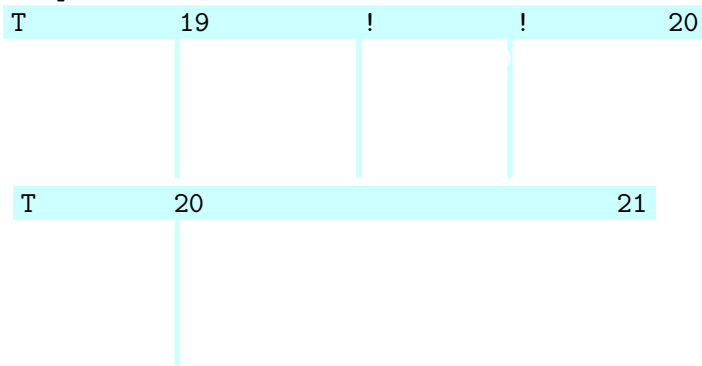
PARS seconda ...

EOF

tScore example with standard CWN data

T line entries define division of time.

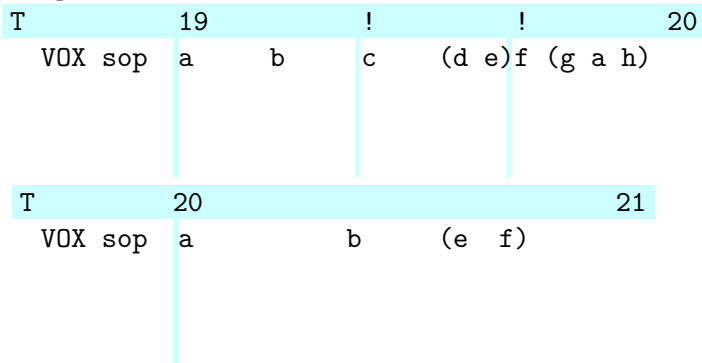
PARS prima



tScore example with standard CWN data

“VOX” main parameter values define **events**

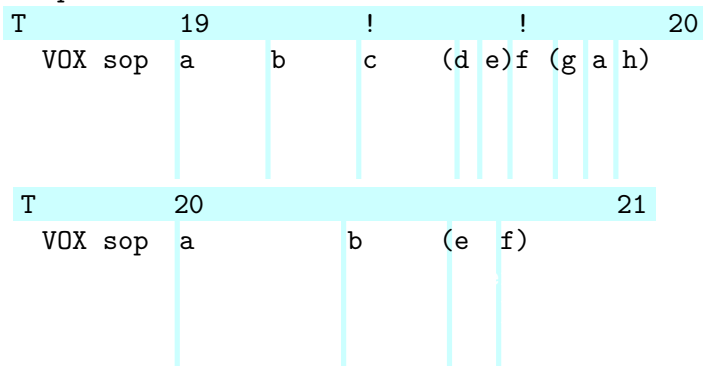
PARS prima



tScore example with standard CWN data

... and thus further division of time.

PARS prima



tScore example with standard CWN data

“P” parameter tracks for further specification of event data.

PARS prima

T	19		!		!		20
VOX sop	a	b	c	(d e)f	(g a h)		
P dyn	f		ff<		>		pp
P art	-	-	>		>		>
T	20						21
VOX sop	a		b	(e f)			
P nota	[!	clef-vl			
]			
P art	().	-		

tScore example with standard CWN data

“P” parameter tracks separate lexical appearance and meaning.

PARS prima

T	19		!		!		20
VOX sop	a	b	c	(d e)f	(g a h)		
P dyn	f		ff<		>		pp
P art	-	-	>		>		>
T	20						21
VOX sop	a		b	(e f)			
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tScore example with standard CWN data

Re-usage (“overloading”) of lexical entities easily possible.

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tScore example with standard CWN data

Re-usage (“overloading”) of lexical entities easily possible.
 (Almost) arbitrary “ASCII ART” permitted.

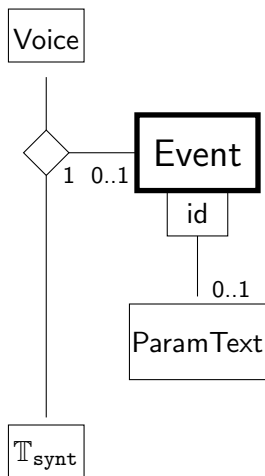
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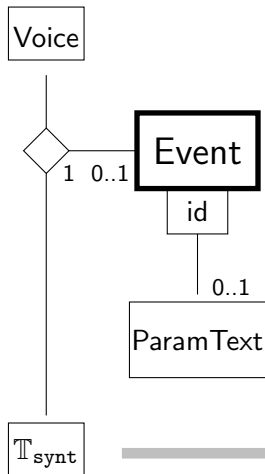
tScore Data Model

Generic Syntactic Data



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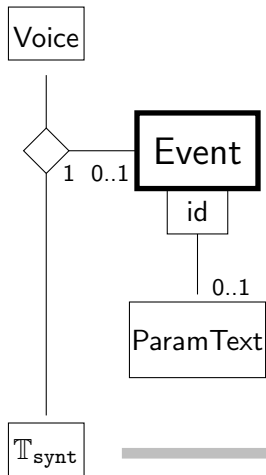


Specific Semantic Interpretation



tScore Data Model

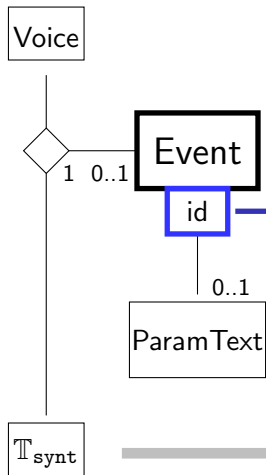
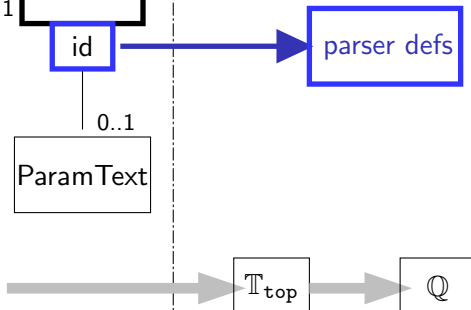
Generic Syntactic Data



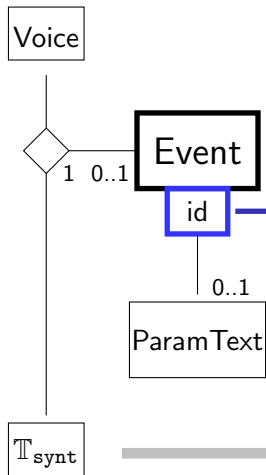
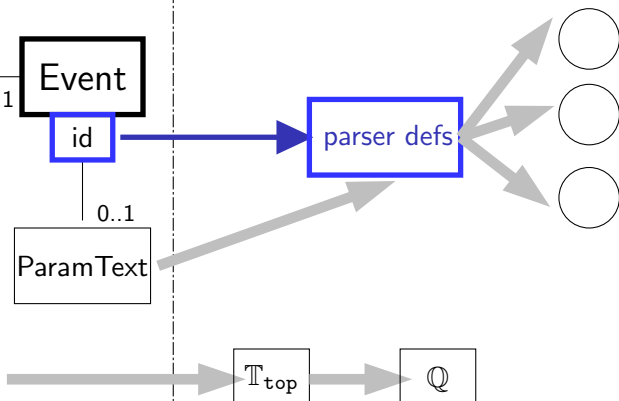
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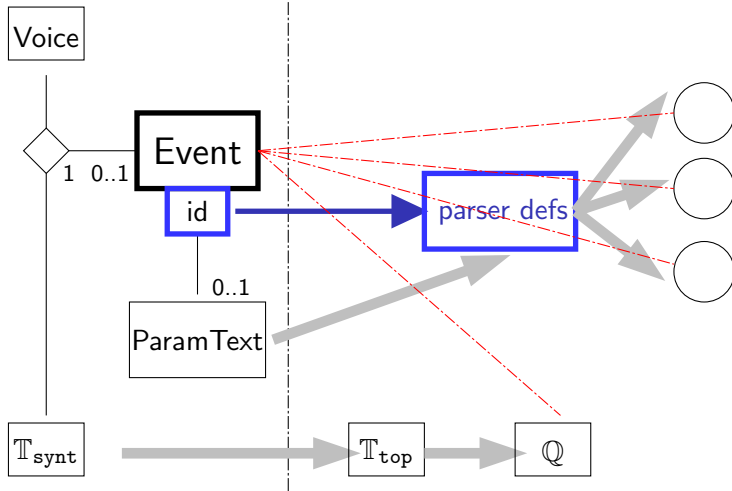
tScore Data Model

Generic Syntactic Data*Specific Semantic Interpretation*

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*Generic Syntactic Data**Specific Semantic Interpretation*

tScore and dynamic SVG demonstration

More info and contact at ...

<http://www.bandm.eu/music>

post@markuslepper.eu

baltasar@trancon.de