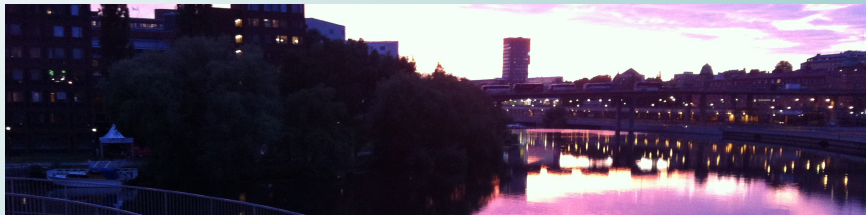


# The libTuiles experiment

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# Research objectives: Intention vs realization ?

## Question

In audio/video processing/composition, are we bound to low level primitives/point of views ?

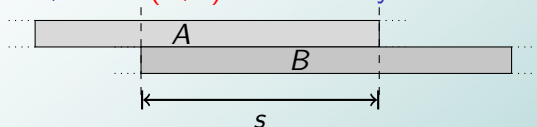
## A methodological way out

- **Abstract** low level primitives,
- **Analyze** of their algebraic properties,
- **Derive** high level & generic timed media primitives.

An rich mathematical field: **inverse semigroup theory** turned out to be available for such a purpose !

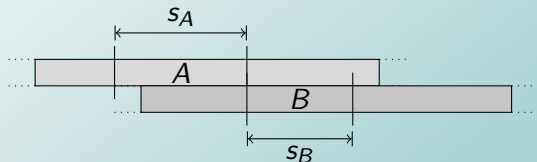
## From external to internal sync. spec.

Mixing signals, **SYNC(A,B)** : external synchronization spec.



with a **mixed constraint** to define the overlap.

Combining tiles, **simply A;B** : internal synchronization spec.

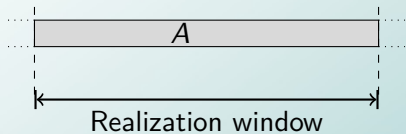


with two **internal synchronization specification** over  $A$  and  $B$ .

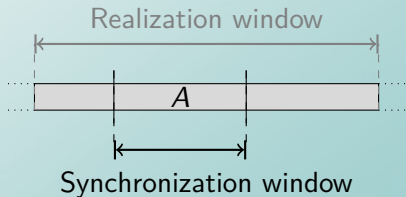
e.g. **bars** in western music !

# From signals to tiled signals

A signal

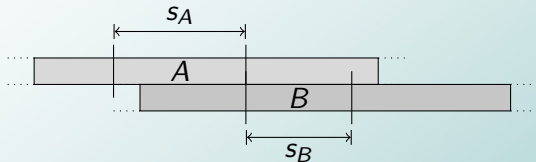


A tiled signal



# The resulting tiled signal algebra

Tiled signal product : simply  $A;B$



related with **inverse semigroup theory**.

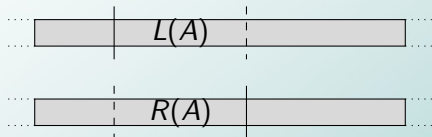
## Inherently multi-scale

The product of two tiled signals  $A;B$  can be understood:

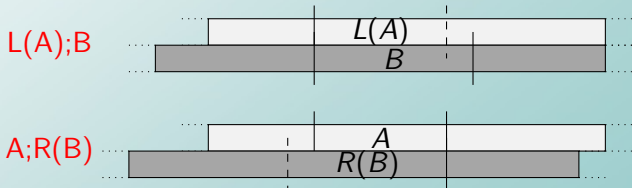
- at **logical time level** : event **A** followed by event **B**
- at **synchronous real time level** : signal **A** synchronized with **B**

## Induced FORK and JOIN operators

The (natural) left and right resync. :  $L(A)$  and  $R(A)$

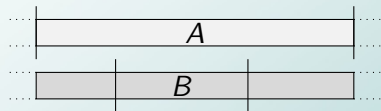


and derived parallel operators :  $\text{FORK}(A,B)$  and  $\text{JOIN}(A,B)$



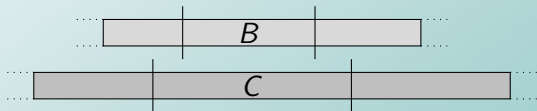
## RESYNC and STRETCH operators

Resync :  $B = \text{RESYNC}(+\alpha, -\beta, A)$



with  $\alpha = 1/4$  and  $\beta = 1/3$

Stretch :  $C = \text{STRECH}(\kappa, B)$



with  $\kappa = 3/2$

# Demo

## Question

Ok, this is all theoretic ! Can we really use it ?

The *libTuile* and *liveTuile* by F. Berthaut : see

[http://hitmuri.net/LiveTuiles/LiveTuiles\\_smc13.mov](http://hitmuri.net/LiveTuiles/LiveTuiles_smc13.mov)



## Conclusion : a multidisciplinary project

- Theory : inverse semigroups *for* computer science ?
- Programming : The  $T$ -calculus ?
- Runtime : dynamic tiling ? conditional ? loops ?
- HMI : representing interactive/conditional tiling ?
- Experiments : from toy game to artistic performance ?



Thank you for your attention !