Unveiling innovation dynamics in a web experiment with LEGO® bricks.

Giulio Tani, Pietro Gravino, Cesare Bianchi and Vittorio Loreto

September 7, 2017   *Kreyon Conference 2017*

Introduction

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- Is running since 2015 ...and you con play it at the entrance if you want
- Its aim is to unveil the dynamics of innovations in a controlled environment
- Is a game because is in games that probably we can exploit our creativity at our best

From experiment to game

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and back to experiment

- Compositions
  - fundamental elements of this study
  - show emulation or innovation by users

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and back to experiment

- Compositions
  - fundamental elements of this study
  - show emulation or innovation by users
- Guesses
  - give us feedback about the compositions
  - may be interesting by themselves

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Definitions

We defined a distance function between composition combining 9 different sub-distances:

$$d_{ij} = \sum_k \alpha^{(k)} d_{ij}^{(k)}$$

Definitions

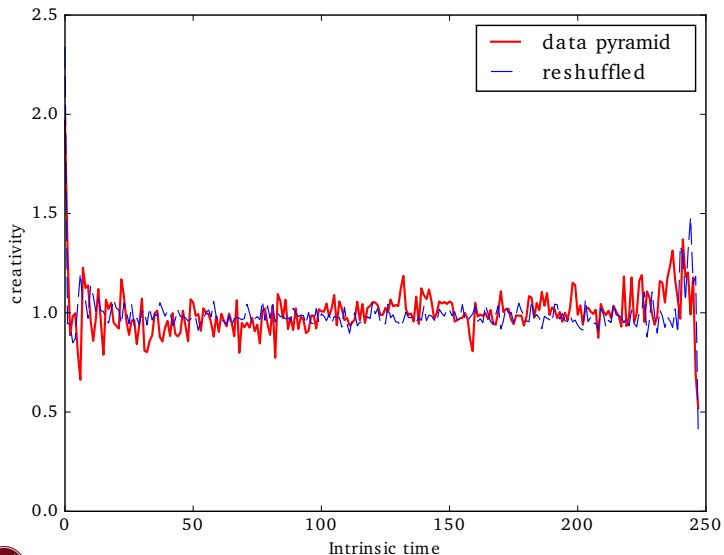We defined a distance function between composition combining 9 different sub-distances:

$$d_{ij} = \sum_k \alpha^{(k)} d_{ij}^{(k)}$$

As creativity is variably defined as a combination of newness and usefulness, from this distance we got definitions of the originality and value of the compositions:
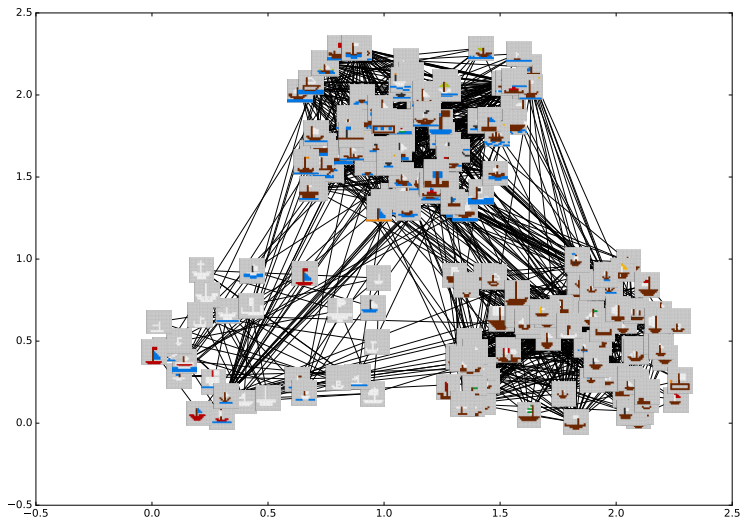
$$O_i = \sum_{j<i} d_{ij} \qquad V_i = \left[\sum_{j>i} d_{ij} \right]^{-1}$$
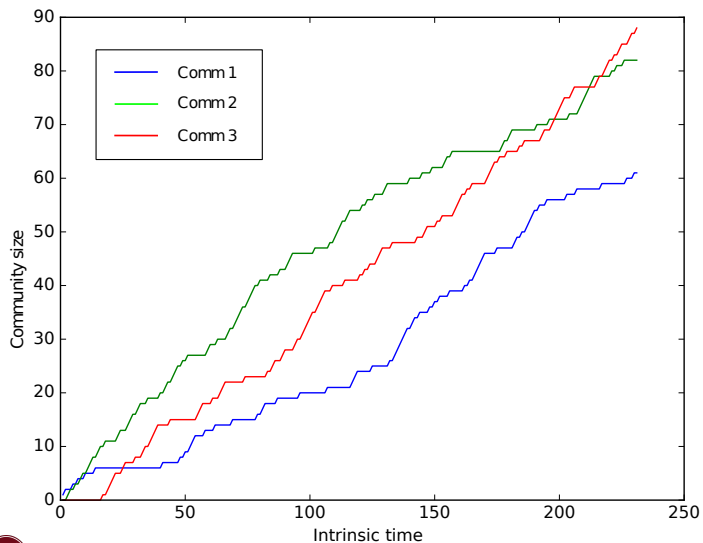
Communities

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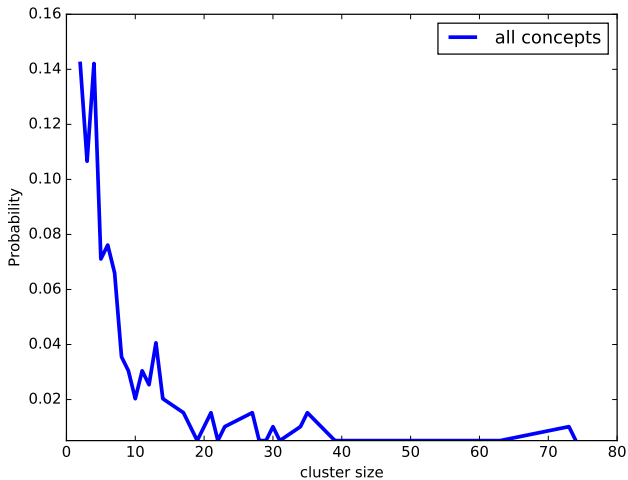Giulio Tani, Pietro Gravino, Cesare Bianchi and Vittorio Loreto

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Errors

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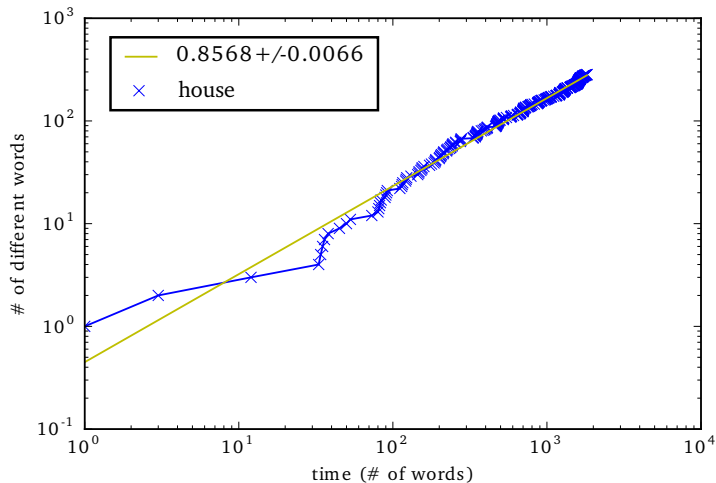## Errors

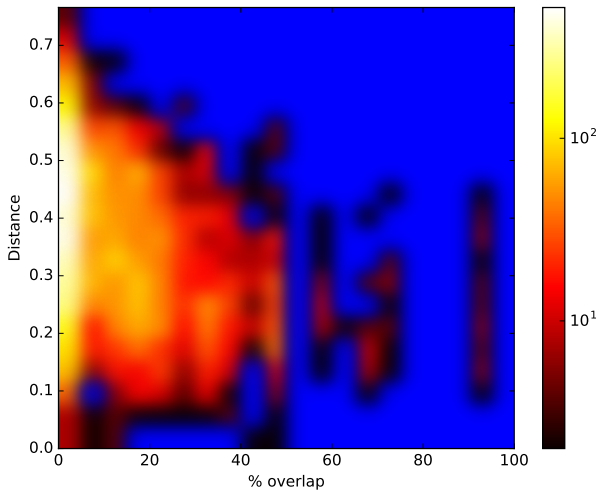Only one of that words is correct, what can we learn from errors?

Are compositions sharing the same set of wrong tags similar to each other?

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Errors
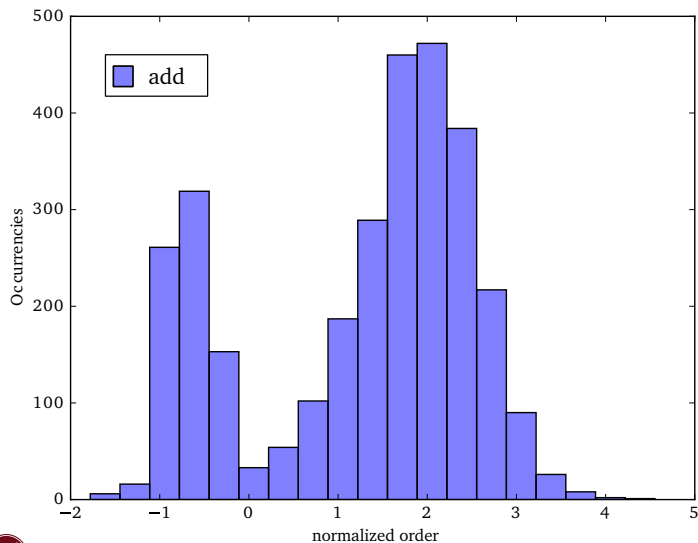

r=−0.36

Strategies

Is there something we can learn from how the compositions are created?

Can we find different strategies looking at the disorder in the actions (adding, changing or removing bricks) made while creating the composition?

Strategies

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Strategies

Some relationships with this strategies are evident and we're investigating in that direction right now.

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Thank you!

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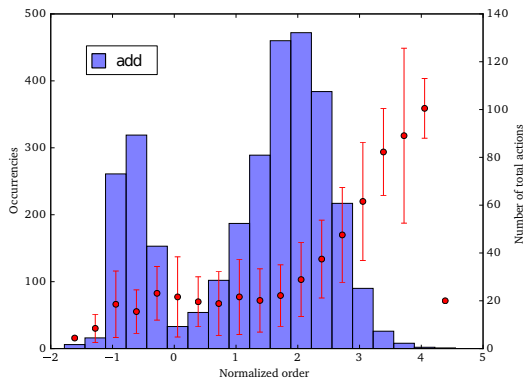
Distance function

The distance function is made by 9 different metrics:

1. The distribution of the bricks used, bri;
2. The distribution of the colours used, col;
3. The relative difference in the number of pixels, npix;
4. The distance between the centres of mass, avg;
5. The similarity under reflection, ref;
6. The similarity under rotation, rot;
7. The relative difference between the radius of the compositions, res;
8. The distance between the proportions, prop.
9. The point matching distance between the two compositions, diff.

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Distance function

The weights of this nine metrics were optimised in order to maximise the difference between intra-topic and extra-topic distance distributions:

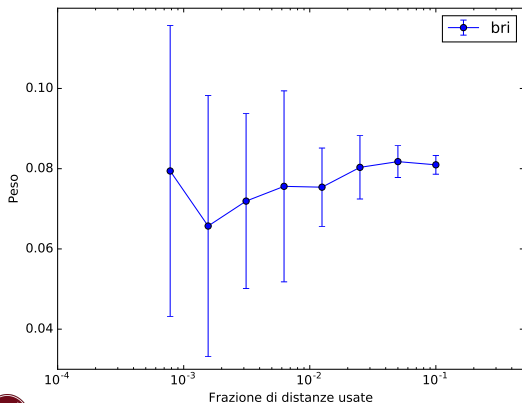Giulio Tani, Pietro Gravino, Cesare Bianchi and Vittorio Loreto   *September 7, 2017*
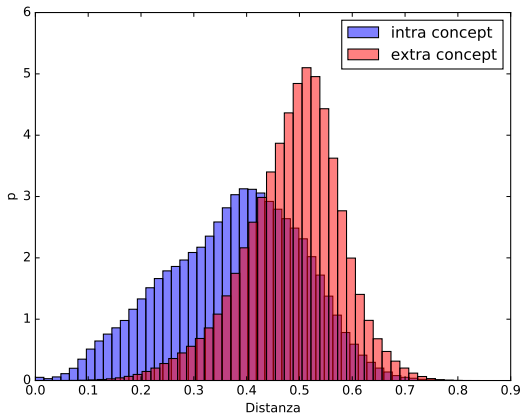
Distance function

The weights of this nine metrics were optimised in order to maximise the difference between intra-topic and extra-topic distance distributions optimising over increasingly large subsets of distances and looking for convergence:

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Disorder

To evaluate the disorder in time series three different definitions were used:

- The entropy as defined in Tria *et al.* 2014

1/2 * log(2)   1/2 * log(2)

1/2 * log(2) !!!!!!

Disorder

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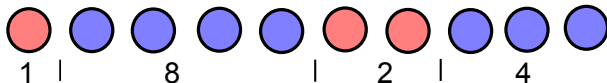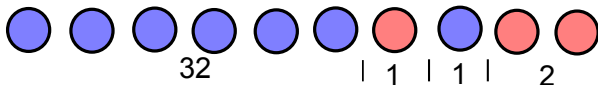- The entropy as defined in Tria *et al.* 2014
- The disorder as the number of changes of label

3

3
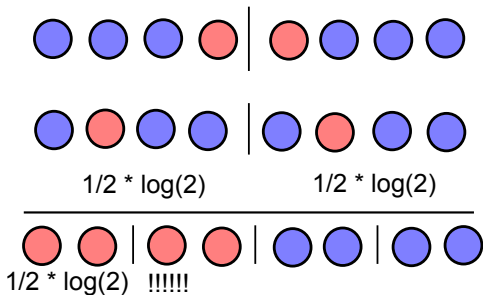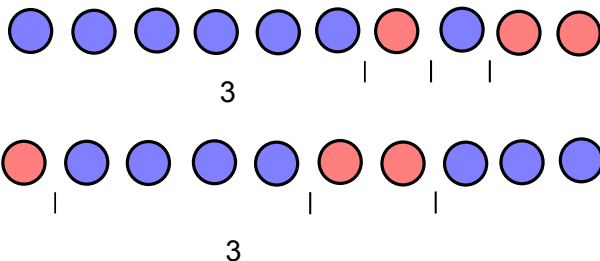
Disorder

To evaluate the disorder in time series three different definitions were used:

- The entropy as defined in Tria *et al.* 2014
- The disorder as the number of changes of label
- The disorder defined starting from the sum of the exponential of the length of contiguous series of labels

32

1 1 2

1 8 2 4

36 > 15

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Disorder

Because everyone of them had some issues we used all (after correcting the bias they had due to series length and fraction of labelled items) requiring a qualitative agreement from all the three of them.

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