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# Interactive Narration Requires Interaction and Emotion

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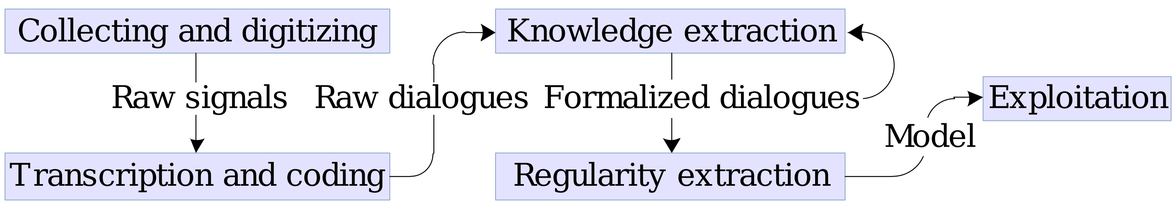
Abstract
This work shows how interaction is essential for storytelling with a child. A corpus of narrative dialogues between parents and their children was coded with a mentalist grid. The results of two modelling methods were analysed by an expert in parent-child dialogue analysis. The extraction of dialogue patterns reveals regularities explaining the character's emotion. Results showed that the most efficient models contain at least one request for attention and/or emotion.

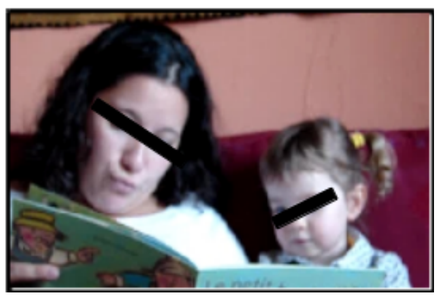
## Proposed method




## Corpus of narative dialogues

In this study, thirty dialogues between children and parents (ages: 3, 4 and 5) were recorded during emotional story telling situations. These records have been transcribed and coded with a mentalist grid to capture information about the mental states (beliefs, emotions, ...) contained by the various utterances.

Parent-Children story telling

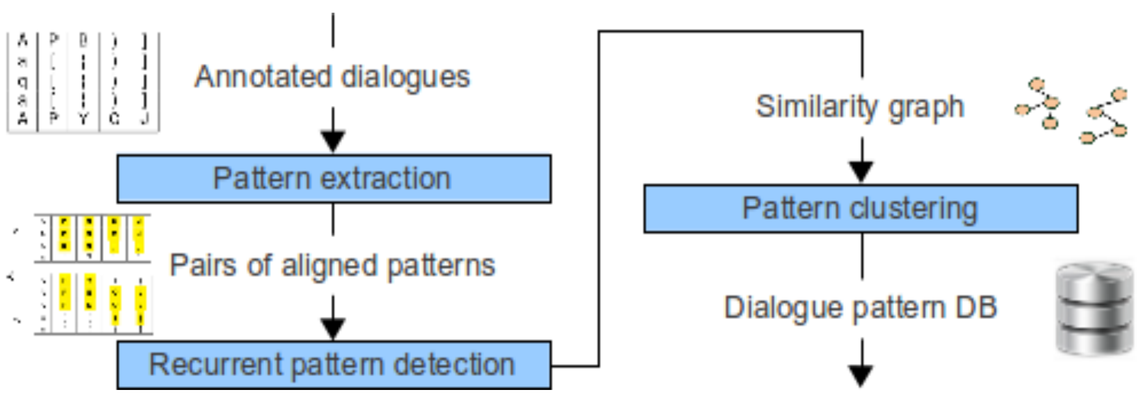


Corpus of transcripted and annotated dialogues

| Line | Speaker | Utterance | Annotations | | | | |
|---|---|---|---|---|---|---|---|
| 25 | P | Don't worry | A | P | E | - | - |
| 26 | P | So they hide | A | P | B | - | - |
| 27 | P | They are looking for | A | - | F | - | - |
| 28 | P | who could have taken away the crown | Q | - | F | - | - |
| 29 | C | It's in ! The crown is inside the box ! | A | - | F | - | - |
| 30 | P | So they are suspecting a lot of people, Cornelius, Celeste, the old lady | A | P | Y | C | J |
| 31 | P | Who could have stolen the crown? | Q | - | F | - | - |
| 32 | C | The crown, it's in! | A | - | F | - | - |
| 33 | P | Do you believe it? | Q | H | K | - | - |
| 34 | C | Yes | A | - | F | - | - |
| 35 | P | But Babar doesn't know that it's in | A | P | N | O | J |
| 36 | P | So he says that the crown is a bomb | A | P | N | C | J |
| 37 | P | or I don't know what else | A | R | N | - | - |

## Regularity extraction for dialogue modeling

To collect significant dialogue patterns from the annotated dialogues, we applied a regularity extraction step based on matrix alignment using dynamic programming followed by a clustering step using machine learning heuristics to group and select the recurrent dialogue patterns. The clustering process is applied on a similarity graph computed during the matrix alignment.




## Clustering methods applied to dialogue patterns

| | | Number of clusters found | | | | | |
|---|---|---|---|---|---|---|---|
| | | 5 | 20 | 50 | 80 | 116 | 150 |
| Single-Link | (Florek et al., 1951) | 41 | 97 | 183 | 270 | 320 | 360 |
| CHAMELEON | (Karypis et al., 1999) | 458 | 605 | **628** | - | - | - |
| ROCK | (Guha et al., 2000) | 520 | 600 | 621 | 626 | 629 | 630 |
| Unormalized spectral clustering | (Von Luxburg, 2007) | 277 | **658** | 563 | 155 | 194 | 226 |
| Shi and Malik spectral clustering | (Von Luxburg, 2007) | 524 | 615 | **628** | **631** | **631** | **632** |
| Jordan and Weiss spectral clustering | (Von Luxburg, 2007) | **555** | 616 | **628** | **630** | **631** | **632** |
| Affinity propagation | (Frey and Dueck, 2007) | - | - | - | - | **632** | - |

## Example of dialogue pattern

| | Dialogue B3 (4 years old) | | | | | Dialogue C8 (5 years old) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | x | x | x | x | A | x | x | x | x |
| 1 | A | P | E | C | J | A | P | x | C | J |
| 2 | Q | x | x | x | x | A | x | x | x | x |
| 3 | A | x | x | x | x | A | x | x | x | x |
| 4 | A | x | x | x | x | A | x | x | x | x |
| 5 | A | x | x | x | x | A | x | x | x | x |
| 6 | A | P | x | C | J | A | P | x | C | J |
| 7 | A | P | E | x | x | Q | P | E | x | X |
| 8 | Q | x | x | x | x | D | x | x | x | X |
| 9 | A | x | x | x | x | A | P | E | x | x |

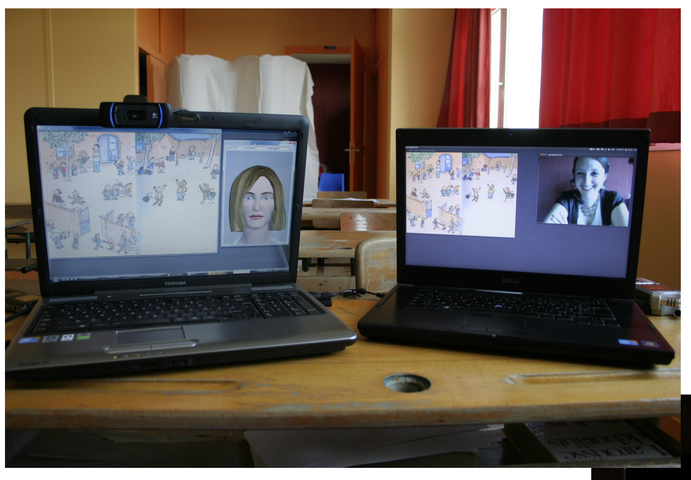
## Prediction of interaction

| 3 years old | | | 4 years old | | | 5 years old | | |
|---|---|---|---|---|---|---|---|---|
| efficiency | model | support | efficiency | model | support | efficiency | model | support |
| 3.2 | **E-Q** | 10,4% | 2.1 | **D-Q** | 14,9% | 1.9 | **Q** | 35,4% |
| 3.4 | **D-Q** | 16,8% | 2.2 | **E-Q** | 7,5% | 2.2 | **E-E** | 9,1% |
| 3.5 | **J-Q** | 9,6% | 2.2 | **Q-Q** | 12,7% | 2.6 | **J-D** | 8,1% |
| 3.5 | **D-Q-Q** | 9,6% | 2.6 | **D-E** | 10,4% | 2.7 | **E-D** | 6,1% |
| 3.5 | **E-J** | 8,8% | 2.8 | **D-D** | 11,2% | 3.1 | **J-E** | 8,1% |
| 4.3 | **D-E** | 12,8% | 3.5 | **J** | 14,9% | 3.4 | **V** | 13,1% |
| 4.3 | **D-J** | 8,0% | 3.8 | **B** | 7,5% | 3.7 | **D-E** | 7,1% |
| 5.4 | **B** | 10,4% | 4.0 | **E-E** | 7,5% | 3.8 | **J-J** | 6,1% |
| 5.6 | **V** | 13,6% | 4.1 | **E-D** | 6,7% | 4.1 | **E-J** | 7,1% |
| | | | 4.3 | **V** | 6,7% | | | |

The previous table highlights the important following facts :

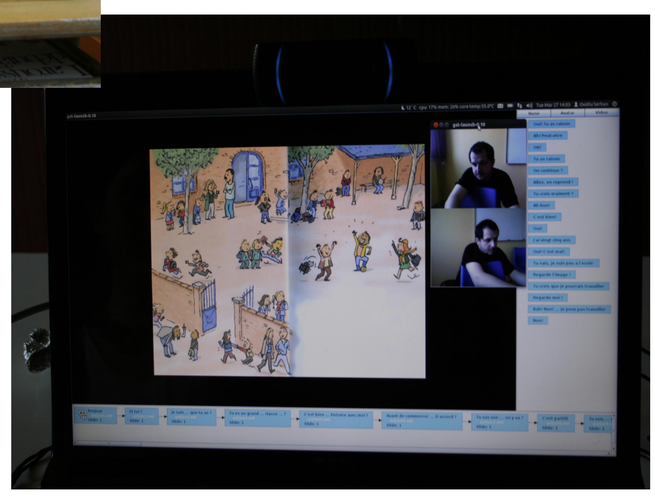
1) regardless of the age, sequences with justifications were frequently associated with various indexes (emotion, request for attention or question). In this context, the child's interaction came after 3.1 to 4.3 sentences after the model;
2) the quickness of the interaction decreased with the age, from 3.2 to 1.9 sentences;
3) the number of sequences with emotion is merely equivalent for all ages. The older the child is, the more different the sequences of emotion are. Complex sequences (emotion and justification: J-E or E-J) appear only with the oldest children;
4) except with request for attention, the most efficient models (in red in Table 4) always contained emotion (E-Q or E-E).

## Evaluation: avatar impact on children interaction



Interaction with avatar or in a visio-conference mode is similar in term of semantics, but the modalities used are different.

We plan to integrate the dialogue patterns we extracted into an ECA for a final evaluation.



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