
INSIGHT

Template-Based Multi-Solution Approach for Data-to-Text Generation

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AGENDA

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1. Introduction

Introduction

- Natural Language Generation
- Why text?
- Why automatize?
- Why triples?

Problem Definition

$t = \langle subject, predicate, object \rangle$

Input data: $\{t_1, t_2, \ldots, t_n\}$

Output: $[w_1, w_2, \ldots, w_l]$

- adequate
- grammatically correct
- fluent

c

2. Related Work

Modular + Template

1. **LOD-DEF (DUMA; KLEIN, 2013)**:
    a. Templates of texts;
    b. RDF graphs with max depth 1;
2. **Lemon (CIMIANO et al., 2013)**:
    a. Templates of parse trees;
    b. Domain-specific rules;
3. **Template Translation (GATTI et al., 2018)**:
    a. Translate templates from Dutch to English;

Integrated + Neural

1. **Word vs Character (JAGFELD et al., 2018)**:
    a. Base symbol: word x character
2. **Inverse KL Divergence (ZHU et al., 2019)**:
    a. Different training objective
3. **Deep Graph Encoders (MARCHEGGIANI; PEREZ-BELTRACHINI, 2018) e GTR-LSTM (DISTIAWAN et al., 2018)**:
    a. Graph encoders
4. **Low-Resourced Text Generation (ZANG; WAN, 2019)**:
    a. Reinforcement Learning

Modular + Neural

1. **Neural pipeline vs end-to-end (FERREIRA et al., 2019):**
    a. Neural Networks with modular x end-to-end architectures
2. **Step-by-Step (MORYOSSEF et al., 2019):**
    a. Modular architecture (statistical + neural)

c

3. Solution

Template

Structure

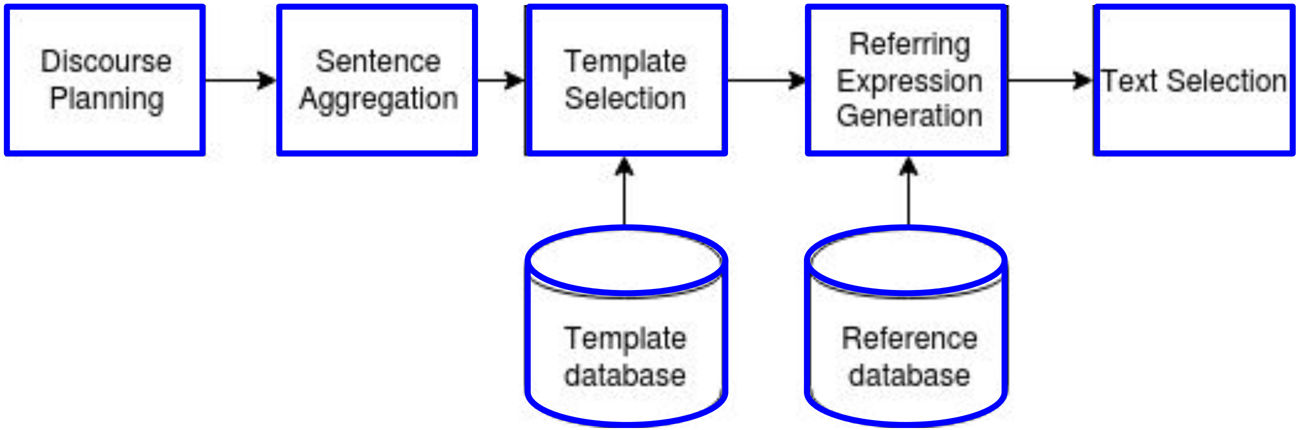
$$\langle s = [\langle \mathbf{slot\_1},\ \mathit{birthDate},\ \mathbf{slot\_2}\rangle,\ \langle \mathbf{slot\_1},\ \mathit{birthPlace},\ \mathbf{slot\_3}\rangle,\ \langle \mathbf{slot\_3},\ \mathit{capital},\ \mathbf{slot\_4}\rangle],$$

$$[\langle \mathit{Barack\_Obama},\ \mathit{birthDate},\ 1961\text{-}8\text{-}4\rangle,\ \langle \mathit{Barack\_Obama},\ \mathit{birthPlace},\ \mathit{Hawaii}\rangle,\ \langle \mathit{Hawaii},\ \mathit{capital},\ \mathit{Honolulu}\rangle]$$

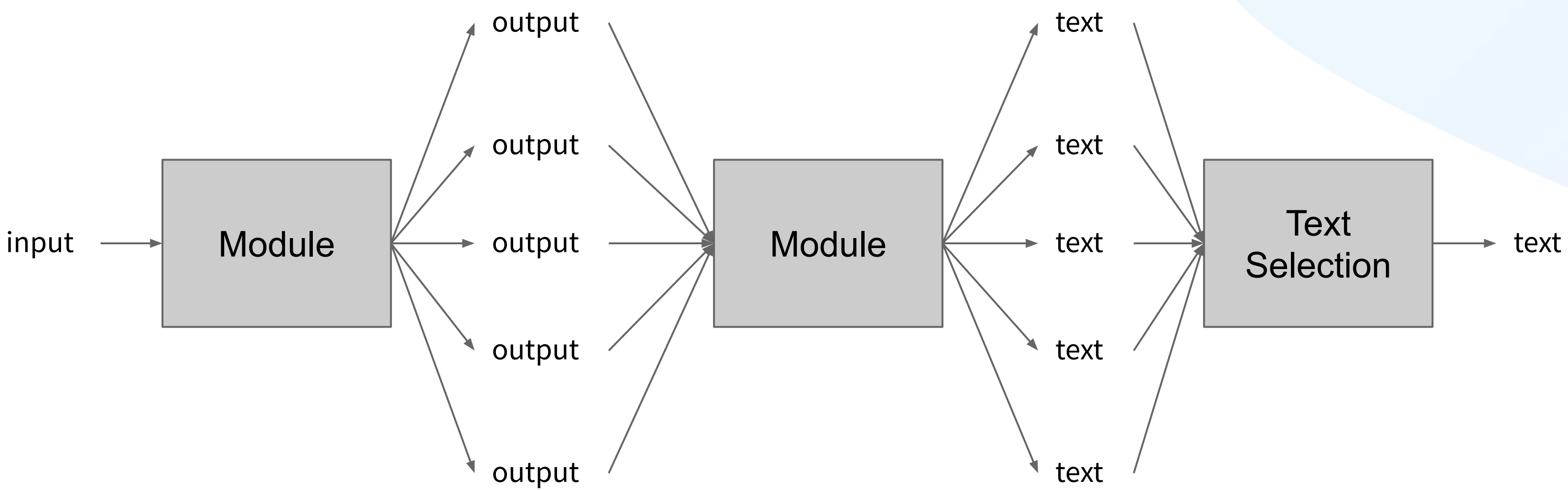
$$Z = \text{“}\mathbf{slot\_1}\ \mathit{was\ born\ in}\ \mathbf{slot\_4},\ \mathbf{slot\_3},\ \mathit{on}\ \mathbf{slot\_2}.\text{”}\rangle$$

Text

Modular Architecture



Multi-Solution



N-gram models

- N-gram models are used as heuristics in each module
- They estimate a probability of a sequence using the **chain rule** and the **Markov assumption**

$$P(w_1 w_2 \ldots w_n) \approx \prod_i P(w_i \mid w_{i-k} \ldots w_{i-1})$$

c

4. Experiments and Results

Setup

- **WebNLG 2017 shared task** {train, dev, test} (COLIN et al., 2016);
- Template and reference database extracted from the enhanced version (Ferreira et al. 2018);
- **Grid-Search** to determine the N-gram models order and the amount of output for each module
  - train -> dev (BLEU)
- **Final evaluation**
  - (train + dev) -> test
  - **methods**: BLEU, METEOR, TER and manual inspection

Automatic evaluation

Approach	**BLEU**	**METEOR**	**TER**
adaptcentre	60.59	0.45	0.38
deepnlg-e2ernn	58.36	0.42	0.40
template-pipe-multi	57.87	0.43	0.37
seq2seq-wc-word	55.82	0.41	0.40
gcn	55.35	0.39	0.40
template-pipe-single	55.27	0.42	0.40
BIU-Chimera-v1	53.20	0.44	0.47
upf-forge	40.88	0.41	0.56

Manual Inspection

- “the main ingredient in batagor are fried fish dumpling with tofu and vegetables ***inpeanut*** sauce .”
- “the language spoken in texas is english and one of the languages is english”
- “california gemstone benitoite .”

5. Conclusion

Conclusion

- We proposed and evaluated a template-based multi-solution approach
- The results obtained are competitive when compared to state-of-the-art methods

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Thank you!

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