

Linguistic Template Extraction for Recognizing Reader-Emotion and Emotional Resonance Writing Assistance

Yung-Chun Chang^{1,2}, Cen-Chieh Chen^{1,3}, Yu-Lun Hsieh^{1,3}, Chien Chin Chen² and Wen-Lian Hsu¹

¹ Institute of Information Science, Academia Sinica, Taipei, Taiwan

² Department of Information Management, National Taiwan University, Taipei, Taiwan

³ Department of Computer Science National Chengchi University, Taipei, Taiwan

¹ {changyc, can, morphe, hsu}@iis.sinica.edu.tw, ² patonchen@ntu.edu.tw



Abstract

In this paper, we propose a flexible principle-based approach (**PBA**) for reader-emotion classification and writing assistance. PBA is a highly automated process that learns emotion templates from raw texts to characterize an emotion and is comprehensible for humans. These templates are adopted to predict reader-emotion, and may further assist in emotional resonance writing. Results demonstrate that PBA can effectively detect reader-emotions by exploiting the syntactic structures and semantic associations in the context, thus outperforming well-known statistical text classification methods and the state-of-the-art reader-emotion classification method. Moreover, writers are able to create more emotional resonance in articles under the assistance of the generated emotion templates. These templates have been proven to be highly interpretable, which is an attribute that is difficult to accomplish in traditional statistical methods.

Extracting Emotion Templates

We employ a **three-layered approach** to label those crucial elements in the text and then extract templates. Crucial elements include:

1. Keywords ranked by LLR.
2. Semantic class label of NEs.
3. E-HowNet sense. [1]

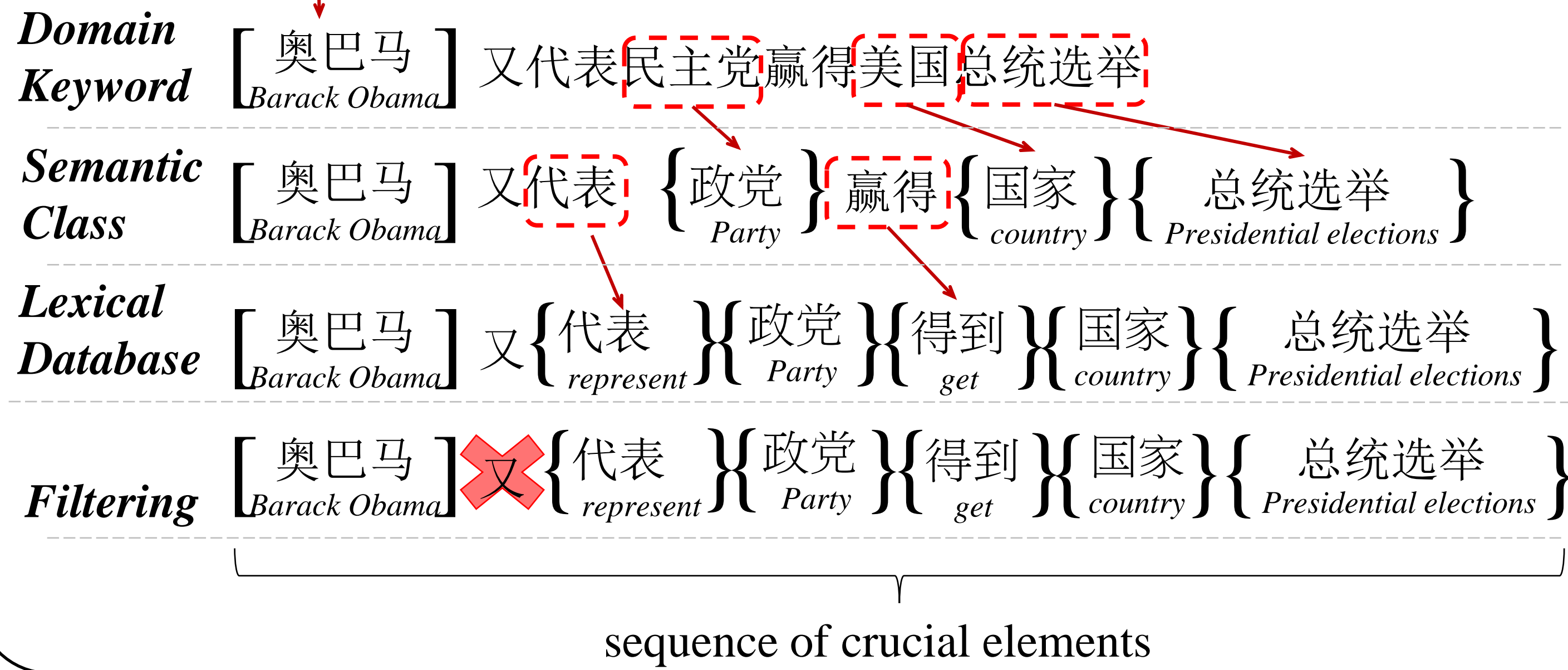
Dimension Reduction: These elements are generalized using the dominating set algorithm [2] to find the top 20% representative templates. Then, we preserve the top 100 templates from approximately 55,000 sequences based on the dominating rate.



A clause C_n in an article:

Obama, representing the Democratic Party, won the U.S. Presidential election again

奥巴马又代表民主党赢得美国总统选举

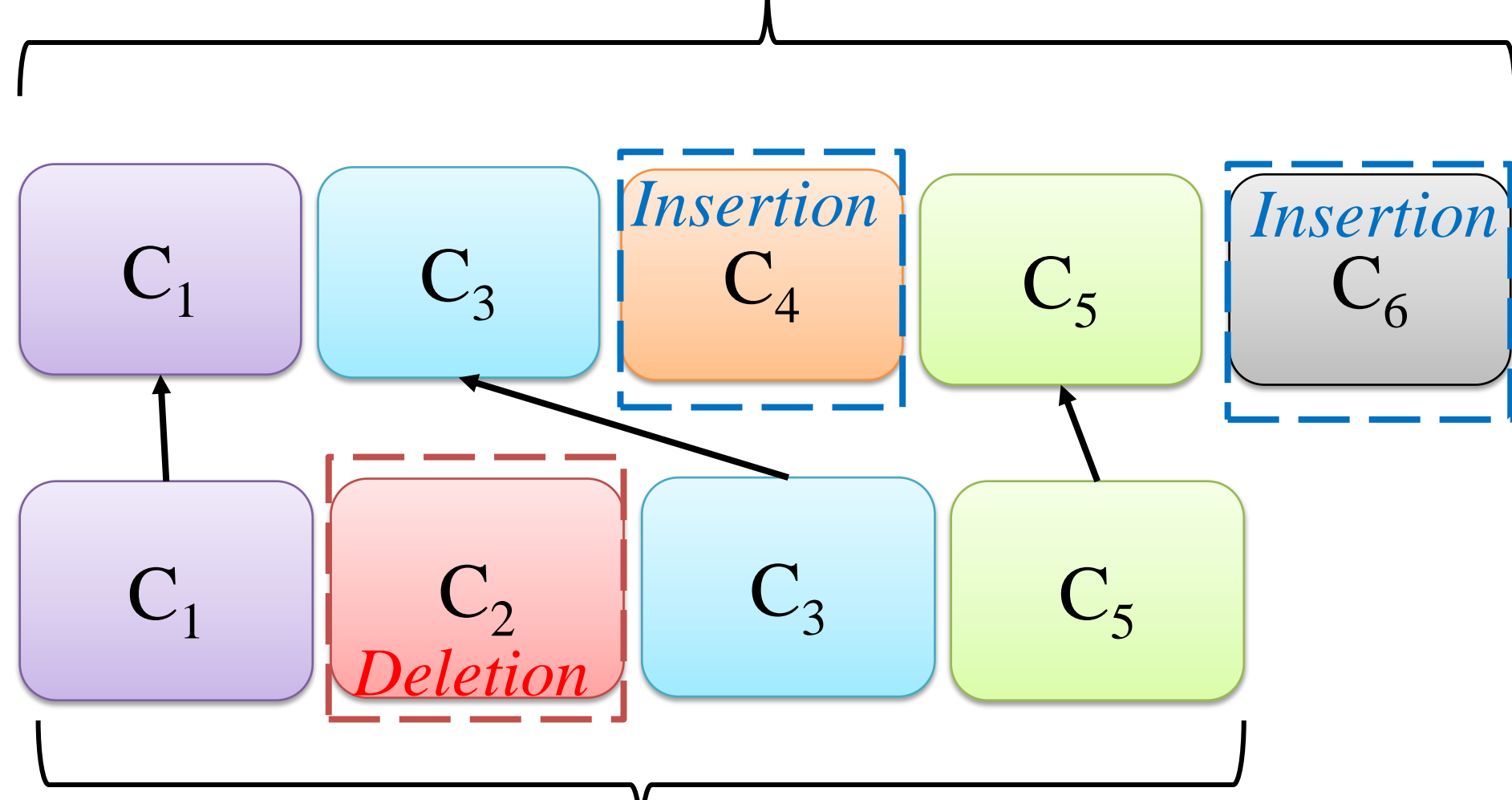


Template Matching for Inference

PBA uses an alignment algorithm [3] to measure the similarity between templates and texts. It **enables a single template to match multiple semantically related expressions** with appropriate scores.

$$Emotion(d_j) = \operatorname{argmax}_{e_i \in E} \sum_{et_n \in ET_{e_i}, ce_m \in CE_{d_j}} \Delta(et_n, ce_m) = \sum_k \sum_l \Delta(et_n \cdot sl_k, ce_m \cdot ce_l)$$

A sequence of crucial elements



$$MS(ce_i) = \begin{cases} LLR_{ce_i}, & \text{if it matches a key word} \\ \lambda \frac{f_{ce_i}}{\sum_{i=1}^m f_{ce_i}}, & \text{otherwise} \end{cases}$$

$$IS(ce_i) = \frac{1}{-\sum_{i=1}^m P(ce_{e_i}) \cdot \log_2(P(ce_{e_i}))}$$

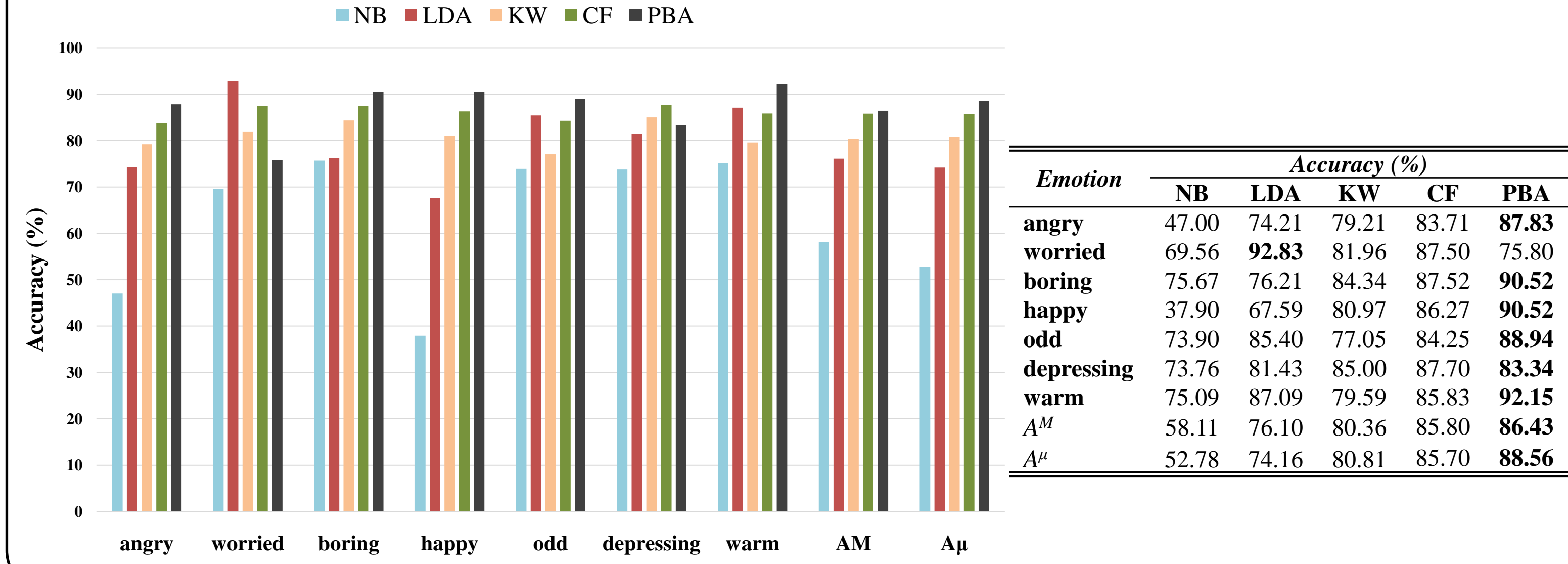
$$DS(ce_i) = \log \frac{f_{ce_i}}{\sum_{i=1}^m f_{ce_i}}$$

A semantic template

Experiment I: Reader's Emotion Classification

We collected a corpus of Chinese news articles from Yahoo! Kimo News, in which each article is given votes from readers with emotion tags: *angry, worried, boring, happy, odd, depressing, warm*.

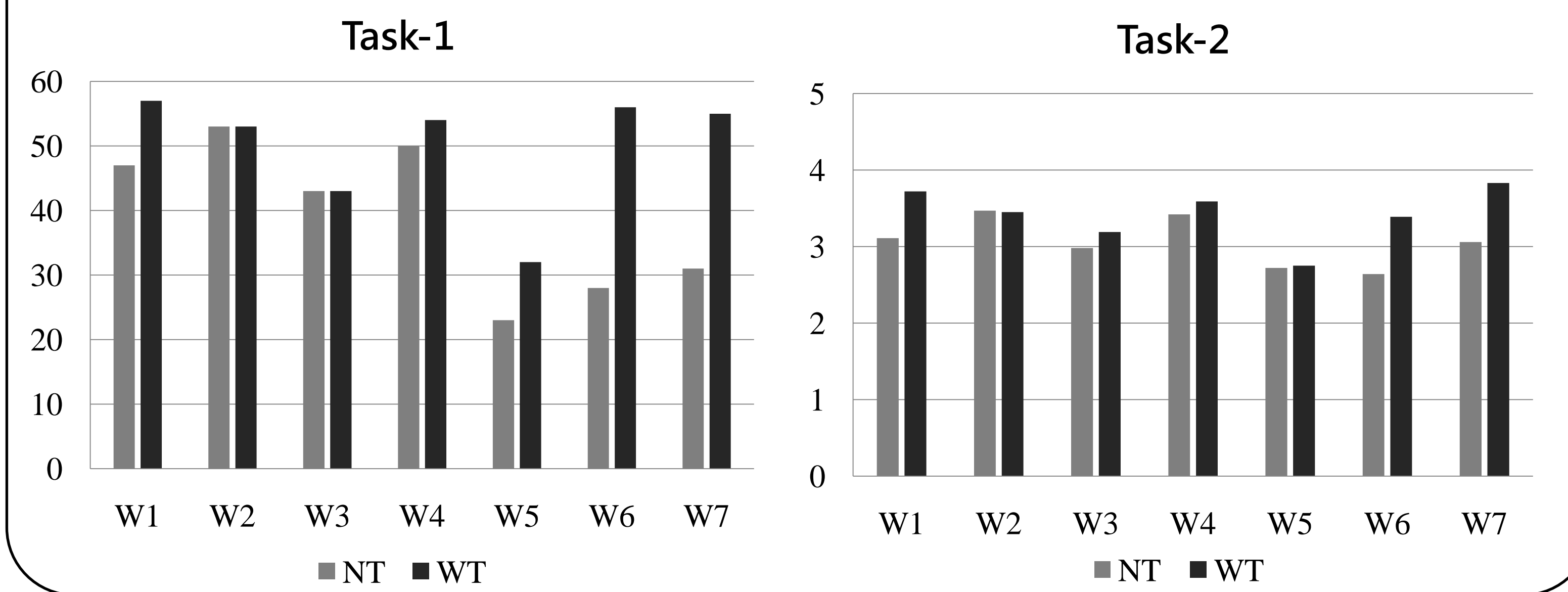
Results: Our system achieves the best overall accuracy.



Experiment II: Emotion Templates Suggestion in Emotional Resonance Writing

Here, we only consider coarse-grained emotion categories (i.e., *positive* and *negative*). We generated 30 and 40 templates for *positive* and *negative* emotions respectively. Seven writers were asked to compose two articles that they think will trigger positive and negative emotions on their own (denoted as NT). Then, we presented these templates to them and asked them to compose two more articles (denoted as WT). The subjects are required to perform two tasks: 1) answer 'positive', 'neutral', or 'negative' 2) give a score according to the 5-point Likert scale for a given emotion.

Results: emotion templates can improve the authors' ability to create more emotional resonance in the readers.



Selected references: [1] K-J Chen, S-L Huang, Y-Y Shih, and Y-J Chen. 2005. Extended-HowNet - a representational framework for concepts. In Proceedings of OntoLex 2005. [2] David S. Johnson. 1974. Approximation algorithms for combinatorial problems. Journal of Computer and System Sciences, 9(3):256-278. [3] S. B. Needleman and C. D. Wunsch. 1970. A general method applicable to the search for similarities in the amino acid sequence of two proteins. Journal of Molecular Biology, 48(3):443-453.

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