# Controllable Text Simplification with Lexical Constraint Loss

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## Controllable Text Simplification

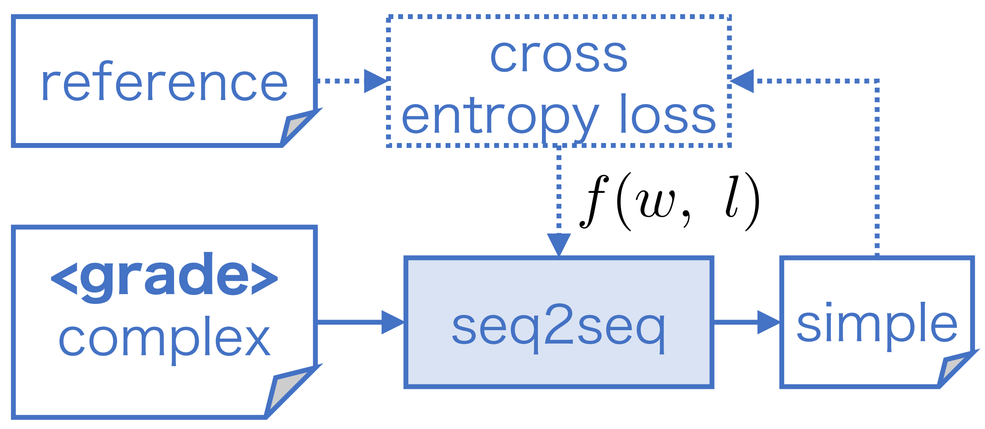
- Text simplification is a task of rewriting complex text into simpler form for each English learners.
- The transformation of Text simplification allows omission and replacement.

| Grade | Examples |
|---|---|
| Source | According to the Pentagon , 152 female troops have been killed while serving in Iraq . |
| 7 | The Pentagon says 152 female troops have been killed while serving in Iraq . |
| 5 | The military says 152 female have died . |

- Many works have not considered the grade level. We would like to control the grade level.
- Scarton and Specia (2018) attached special token **<grade>** indicating grade of target sentence for the first time as controllable text simplification.

## Proposed Method

- Controlling word grade as well as sentence grade.
- Weighing a training loss considering words that frequently appear in sentences of specific grade.
- Weight $f(w,l)$ corresponds to relevance of word $w$ at grade level $l$.
- $f(w,l)$ is Positive PMI: $f(w,l) = \max\left(\log\frac{P(w,l)}{P(w)P(l)}, 0\right)$.




## Results

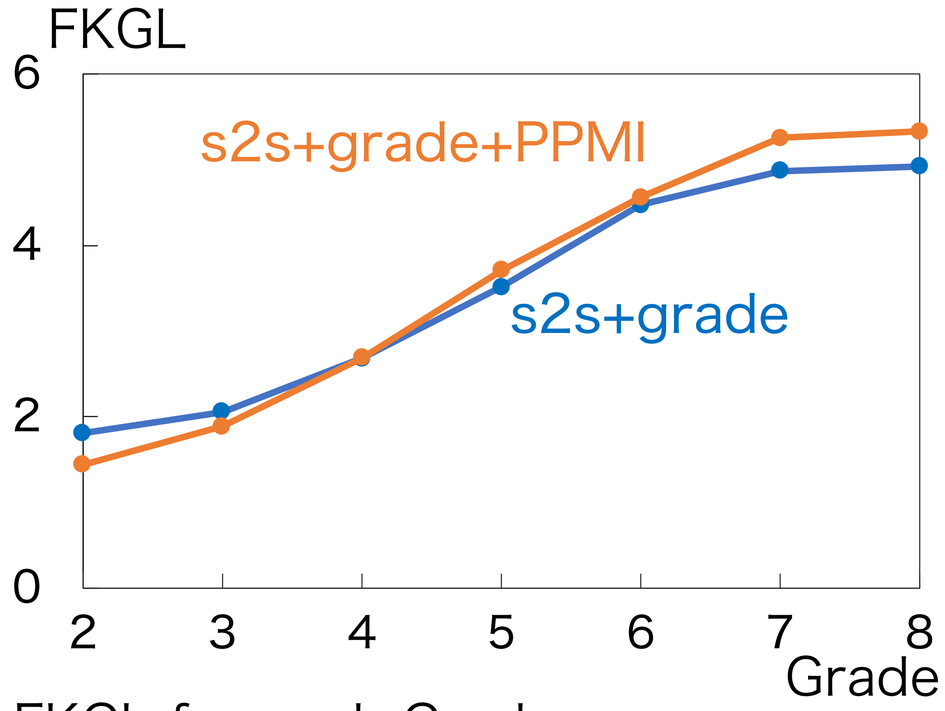
| | BLEU | SARI | $BLEU_{ST}$ | $MAE_{LEN}$ | MPMI |
|---|---|---|---|---|---|
| Source | 21.37 | 2.82 | 100.0 | 10.73 | 0.08 |
| Reference | 100.0 | 70.13 | 18.30 | 0.00 | 0.23 |
| s2s | 20.43 | 28.21 | 37.60 | 4.38 | 0.12 |
| +grade | 20.82 | 29.44 | 31.96 | 3.77 | 0.15 |
| +grade+PPMI | **21.86** | **29.59** | **31.38** | **3.69** | **0.19** |

Results on Newsela Dataset.

**$BLEU_{ST}$** computes a BLEU score by taking source and output. Model with low $BLEU_{ST}$ rewrites more.
**$MAE_{LEN}$** is MAE of sentence length. Model with low $MAE_{LEN}$ outputs sentences with appropriate length.
**MPMI** evaluates to how outputs words difficulty match with the target grade. Model with high MPMI outputs appropriate words.

| Grade | Examples |
|---|---|
| Src | In its original incarnation during the ‘ 60s , African-American ” freedom songs ” aimed to motivate protesters to march into harm ’s way and , on a broader scale , spread news of the struggle to a mainstream audience. |
| 7 | **s2s+grade:** In the1960s , African-American ” freedom songs are aimed to motivate protesters to march into harm ’s way . **s2s+grade+PPMI:** In its original people in the1960s , African-American ” freedom songs are aimed to inspire protesters to march into harm ’s way . |
| 4 | **s2s+grade:** In the1960s , African-American ” freedom songs are aimed to motivate protesters to march into harm ’s way . **s2s+grade+PPMI:** African-American ” freedom songs are aimed to inspire protesters to march into harm ’s way . |

Output example. s2s+grade+PPMI successfully replaced some words and omitted the phrases.




FKGL for each Grade.
s2s+grade+PPMI output simpler sentence for simpler target grade, and vice versa.

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