EXPERIMENTAL RESEARCH ON THE EFFECTIVENESS OF SPEECH COMPRESSION IN INTERPRETER PERFORMANCE

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Abstract. *This article presents an experimental study on the effectiveness of speech compression techniques in simultaneous interpreting (SI). Speech compres- sion, involving strategies such as omission, paraphrasing, syntactic restruc- turing, and summarization, is examined for its impact on interpreter ac- curacy, fluency, and cognitive load. Using a corpus-based approach with recordings from international conferences, the research compares perfor- mances with and without compression under varying speech rates. Results indicate that compression enhances efficiency in high-speed scenarios but may compromise nuance in complex discourses. The findings contribute to interpreter training and highlight the cognitive mechanisms underlying SI.*

Keywords: *Speech compression, simultaneous interpreting, interpreter performance, cognitive load, experimental research, syntactic restructuring,*
omission, paraphrasing, fluency, accuracy

Introduction. Simultaneous interpreting (SI) is a cognitively demanding task that requires in- terpreters to process and translate spoken language in real time, often under time constraints imposed by rapid speech delivery [3]. Speech compression tech- niques, such as omitting redundant elements, paraphrasing, and syntactic re- structuring, are commonly employed to manage these challenges and maintain output fluency [4]. This study investigates the effectiveness of these techniques through experimental research, focusing on their impact on interpreter perfor- mance metrics like accuracy, coherence, and cognitive load. By analyzing real- world interpreting scenarios, the research aims to determine whether compres- sion is a vital strategy or an overrelied myth, providing insights for training and practice in multilingual communication.

Main part. The concept of speech compression in SI has been explored as both a cogni- tive mechanism and a strategic tool. Chernov posits that compression lever- ages linguistic redundancy to reduce cognitive effort, enabling interpreters to handle fast-paced input [3]. Studies on techniques include syntactic compres- sion (e.g., simplifying sentence structures), lexical substitution, and omission of non-essential details, with effectiveness varying by language pairs and con- texts [1]. Experimental works, such as corpus analyses of conference interpre- tations, show compression rates of 30-38% without significant loss of meaning, though higher rates risk inaccuracy [5]. Cognitive foundations emphasize brain regions handling abbreviated data, while challenges like fatigue and nuance loss are noted

[2]. Recent research questions compression’s universality, suggesting it may not always be necessary in moderate-speed speeches [4].

This experimental study adopts a mixed-methods approach, combining quanti- tative corpus analysis with qualitative interpreter assessments. A sample of 20 professional interpreters (10 English-French, 10 English-Chinese pairs) partici- pated in simulated SI tasks using recordings from United Nations and European Parliament sessions. Speeches were selected with varying delivery rates (100- 180 words per minute) and segmented into compressed and non-compressed conditions. Techniques applied included omission (removing redundancies), para- phrasing (rephrasing for brevity), and syntactic restructuring (simplifying clauses). Performance was measured via accuracy (semantic fidelity scores), fluency (pauses and hesitations), and cognitive load (self-reported via NASA-TLX scale and think- aloud protocols). Data analysis used statistical tools (ANOVA for comparisons) and thematic coding for qualitative insights, ensuring reliability through inter- rater agreement.

Quantitative results revealed that speech compression significantly improved fluency in high-speed conditions ($p < 0.05$), with average pause reductions of 25% when techniques like omission and paraphrasing were employed. Accu- racy remained high (85-90%) at compression rates up to 35%, but dropped to 70% beyond 40%, particularly in semantically dense segments. Cognitive load scores were lower (mean 5.2/10) with compression compared to without (7.1/10), indicating reduced mental effort. Language-pair differences showed English- Chinese interpretations benefiting more from syntactic restructuring due to struc- tural variances. Qualitative data from interviews highlighted strategic use of compression to anticipate input, though overuse led to perceived loss of nuance.

The findings support compression as an effective tool for enhancing interpreter performance in demanding scenarios, aligning with prior studies on cognitive efficiency [3]. However, the risk of information loss at higher compression lev- els echoes concerns in the literature about balancing brevity and fidelity [4].

Table 1: Performance Metrics by Compression Level

Compression Level	Accuracy (%)	Fluency (Pauses/min)	Cognitive Load (Scale 1-10)
Low (0-20%)	92	8.5	6.8
Medium (21-35%)	88	6.2	5.2
High (36-50%)	72	5.1	4.7

Language-specific effectiveness suggests tailored training, such as for tonal lan- guages like Chinese. Limitations include the simulated setting, which may not fully replicate real-time stress; future research could incorporate ASR technol- ogy for augmented compression

[6]. Overall, the study underscores compres- sion’s role in optimizing SI while cautioning against overreliance.

Conclusion. This experimental research demonstrates that speech compression techniques effectively boost interpreter performance by reducing cognitive load and im- proving fluency, particularly under time pressure. However, optimal use re- quires careful calibration to avoid compromising accuracy. These insights ad- vocate for integrated training programs and further investigations into techno- logical aids, ultimately advancing the field of interpretation studies.

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