Word Boundary Detection Accuracy in ASR-Guided Flow-Matching TTS vs Duration-Predictor Architectures for Zero-Shot Cross-Lingual

Assignee Research

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Abstract

Flow-matching-based text-to-speech (TTS) models have shown high-quality speech synthesis. However, most current flow-matching-based TTS models still rely on reference transcripts corresponding to the audio prompt for synthesis. This dependency prevents cross-lingual voice cloning when audio prompt transcripts are unavailable, particularly for unseen languages. The key challenges for flow-matching-based TTS models to remove audio prompt transcripts are identifying word boundaries during training and determining appropriate duration during inference. In this paper, we introduce Cross-Lingual F5-

1 Introduction

This paper examines: Cross-Lingual F5-TTS: Towards Language-Agnostic Voice Cloning and Speech Synthesis. Research question: How does the word boundary detection accuracy of ASR-guided flow-matching TTS models compare to duration-predictor-based architectures like FastSpeech2 in zero-shot cross-lingual voice cloning tasks?.

2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.5/10.

3 Results

14 papers retrieved. 19 claims extracted; 18 independently verified. Quality review score: 8.5/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
The Emilia dataset contains approximately 95K hours of English and Chinese audio data after filtering.	✓	0.21
A balanced subset of 500 hours each from the Chinese and English portions of Emilia was used to train the speaking rate	✓	0.22
MMS forced alignment tooling was applied to extract word boundaries for the Emilia dataset.	✓	0.19
Specialized preprocessing procedures were implemented to skip anomalous tokens and exclude them from word boundary extra	✓	0.20
The baseline model is F5-TTS-Base, which employs a diffusion transformer (DiT) architecture with 22 layers, 16 attention	✓	0.29
The model was trained for 1.2M updates on eight NVIDIA A100 GPUs with a per-GPU batch size of 38,400 audio frames.	✓	0.36
The AdamW optimizer was used with a learning rate that linearly warms up to 7.5 $\times$ 10-5 over the first 20k updates, follo	✓	0.25
The speaking rate predictor utilizes a transformer-based architecture with 6 layers, 8 attention heads, and 512 dimensio	✓	0.23
Training for the speaking rate predictor was conducted on four A100 GPUs for 50k updates with a per-GPU batch size of 38	✓	0.33
The learning rate for the speaking rate predictor was warmed up to 2.5 $\times$ 10-4 over the first 7.5k updates and then linea	✓	0.21
For the Gaussian Cross-Entropy loss, the standard deviation σ was set to 1.0.	×	0.14
For inference, Euler ODE solver with 32 function evaluations (NFE = 32), CFG strength 2.0, sway sampling coefficient -1.	✓	0.23
The evaluation used Seed-TTS-eval and LibriSpeech-PC test-clean as the test set.	✓	0.17
A multilingual cross-lingual test set with 473 samples of 3-8 second audio prompts from FLEURS was built, covering four	✓	0.23
Word Error Rate (WER) was used to measure the intelligibility of synthesized speech, employing Whisper-large-V3 and Para	✓	0.20
Flow-Matching-based models have achieved remarkable performance in TTS tasks.	✓	0.17
E2-TTS and F5-TTS eliminate additional components such as phoneme duration predictors and complex text encoders, maintai	✓	0.31
The Flow Matching framework aims to learn a time-dependent vector field vt that matches the probability path pt between	✓	0.33

References

- http://arxiv.org/abs/2509.14579v4
- http://arxiv.org/abs/2506.15415v1
- http://arxiv.org/abs/2404.14700v4