MARCH 01 2023

Fearless Steps APOLLO: Challenges in keyword spotting and topic detection for naturalistic audio streams

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J. Acoust. Soc. Am. 153, A173 (2023)

https://doi.org/10.1121/10.0018566

Fearless Steps (FS) APOLLO is a + 50,000 hr audio resource established by CRSS-UTDallas capturing all communications between NASA-MCC personnel, backroom staff, and Astronauts across manned Apollo Missions. Such a massive audio resource without metadata/unlabeled corpus provides limited benefit for communities outside Speech-and-Language Technology (SLT). Supplementing this audio with rich metadata developed using robust automated mechanisms to transcribe and highlight naturalistic communications can facilitate open research opportunities for SLT, speech sciences, education, and historical archival communities. In this study, we focus on customizing keyword spotting (KWS) and topic

detection systems as an initial step towards conversational understanding. Extensive research in automatic speech recognition (ASR), speech activity, and speaker diarization using manually transcribed 125 h FS Challenge corpus has demonstrated the need for robust domain-specific model development. A major challenge in training KWS systems and topic detection models is the availability of word-level annotations. Forced alignment schemes evaluated using state-of-the-art ASR show significant degradation in segmentation performance. This study explores challenges in extracting accurate keyword segments using existing sentence-level transcriptions and proposes domain-specific KWS-based solutions to detect conversational topics in audio streams. [Work Sponsored by NSF via Grant No. 2016725 and EU’s Horizon 2021 R&I Program under MSC Grant No. 101062614.]
