16 More wireless microphones are available in a room

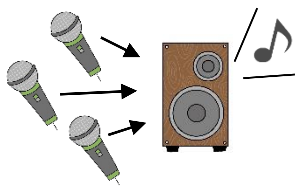
BRAVE: Bit-error-robust low-delay audio and voice encoding

Abstract

We have developed a bit-error-robust speech-and-audio codec working in low-delay conditions. Inter-device audio transmission, such as in microphones, requires strict real-time processing. It is a challenge to enhance the compression efficiency in such conditions, which enables us to use more microphones at once in a room. Sometimes, this kind of inter-device transmission encounter errors occurring in the encoded data, and codecs have to deal with them to avoid severe decoding errors. Especially in low-delay conditions, it is hard to protect codes with additional information keeping the bitrates. Therefore, we proposed a bit rearrangement technique, which makes lower the impact of the errors compressing data efficiently. Using this technique, the developed codec BRAVE can compress speech and audio data in a very short time and is robust for bit errors. It is thus expected to be useful also for other use cases such as the Internet of things (IoT).

Speech and audio codec BRAVE

We developed a speech-and-audio coding scheme for real-time inter-device audio transmission like wireless microphones



Input: 48-kHz 16-bit monaural
Bitrate: 96 kbps (About half of the conventional one)
Algorithmic delay: 1.5–3.0 ms

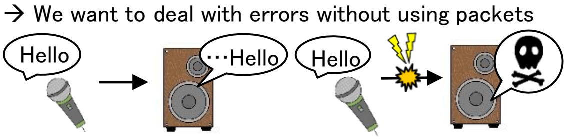
Lower bitrates allow us to use more microphones at once

Technical difficulty

Errors may happen in the codes during transmission

- Many codecs protect codes by using packets
- Packets need frame-wise headers
- Headers weigh too much in low-delay conditions

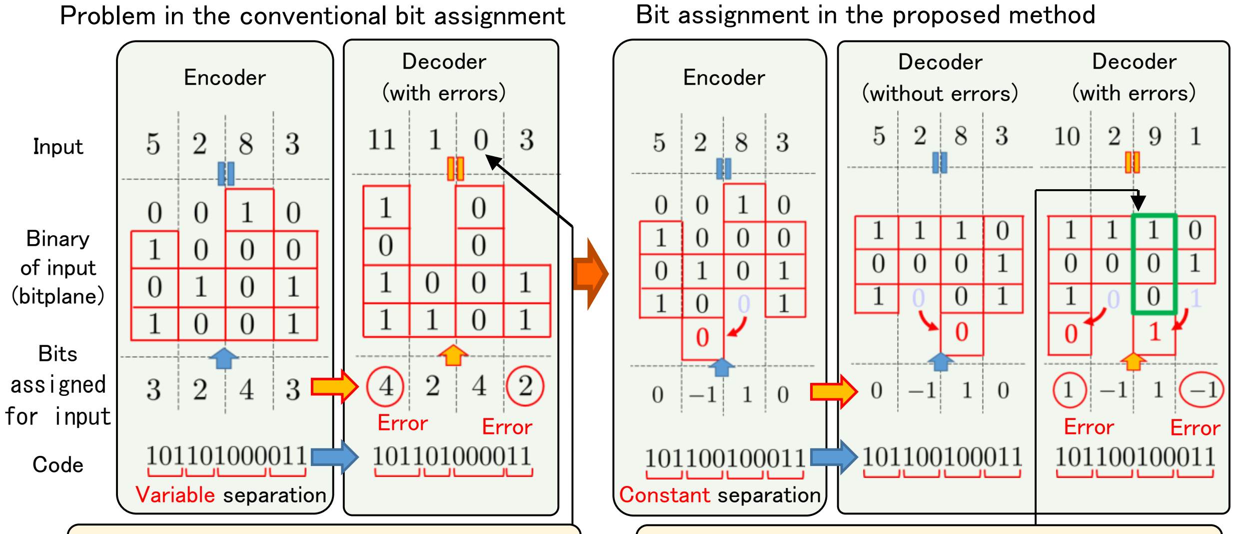
→ We want to deal with errors without using packets



Short-time processing　　Suppressing error effects

Proposal: Bitplane rearrangement

Avoiding serious impacts on the sound quality



Errors may cause serious noise wherever in a time frame they occur

Most significant bits where bit assignments are true are guaranteed even when errors occur in the frame

References

[1] R. Sugiura, Y. Kamamoto, T. Moriya, "Spectral-envelope-based least significant bit management for low-delay bit-error-robust speech coding," *Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2018.

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