

Master thesis

Design and Implementation of a Personal Automatic Gain Control System

Usually, speech production mechanism becomes different when people speak in a noisy environment compared to if they speak in a quite environment. Such a phenomenon is called the Lombard effect in which people increase their developed vocal effort (pitch, loudness) due to the increase of background noise. However, until now there is no complete understanding of what is the Lombard effect actually is. Some literature define it as a reflexive phenomenon meaning that the talkers increase their vocal effort as soon as they perceive a certain noise level. On the other hand, some studies depict the Lombard effect as a cognitive phenomenon in which the speakers are able to hear themselves by the feedback paths (via bones and air) and they are able to realize how their speech sounds to the listening people in a certain environment (noisy or quite). Accordingly, they decide how much vocal effort they should develop in order to be more intelligible to the listening people. Therefore, according to the second definition, the Lombard effect to some extent is a personal characteristic and some people have nearly no Lombard effect while some others have a very strong one.

Using an in-car communication (ICC) system helps to reduce the Lombard effect and make the conversation more intelligible and comfortable between the communication partners. The Automatic Gain Control (AGC) is the responsible part in such an ICC system to perform gain adjustment and hence reducing the Lombard effect. However, the current AGC generations exploit the first definition of the Lombard effect (the reflexive effect) to map the noise level into a gain curve (the more noise, the more gain and vice versa) in a so-called Noise Dependent Gain Control (NDGC). However, we aim to exploit the second definition of the Lombard effect (the cognitive effect) and investigate the next generation of the AGCs that are more personal dependent.

In the context of this thesis, it is intended to investigate, design and implement a personal adaptive gain control system for an existing ICC system framework in KiRAT. The basic tasks of this thesis includes:

- Creating a database of recordings by performing measurements on some people with ambiance simulation and/or real car driving.
- Estimate the individual Lombard effect adaptively.
- Design and implement an adaptive Personal Gain Control (PGC) system that maps the estimated individual Lombard effect into a gain curve.
- Combine the implemented PGC system with the existing NDGC system.

Requirements

- Good knowledge of C / C ++ programming and MATLAB.
- Good knowledge of digital signal processing.
- Independent work.

Notes

The start date of this thesis only possible at August 2018.

Contact

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