

# Audio restoration using plug-and-play approach

Michal Švento  
*dept. name of organization (of Aff.)*  
Brno University of Technology  
Brno, Czech Republic  
212584@vut.cz

Ondřej Mokry  
*Signal Processing Laboratory*  
Brno University of Technology  
Brno, Czech Republic  
xmokry12@vut.cz

**Abstract**—This document is a model and instructions for L<sup>A</sup>T<sub>E</sub>X. This and the IEEEtran.cls file define the components of your paper [title, text, heads, etc.]. \*CRITICAL: Do Not Use Symbols, Special Characters, Footnotes, or Math in Paper Title or Abstract.

**Index Terms**—speech enhancement, deep learning, Douglas-Rachford algorithm

## I. INTRODUCTION

Audio enhancement tasks are mostly facing problems like missing or damaged samples, noise or clipping. If we consider speech signal, we should not avoid the intelligibility problems. Each problem has developed its own way of enhancing signal. Nowadays is most proper way to differ algorithms to two categories: conventional (autoregressive models, sparsity-based) and solutions using deep learning.

In conventional methods dominates Jansenn and Ec

Deep learning algorithms have also made their own progress in this area. The most efficient neural network models are autoencoders, recurrent neural networks (RNNs), Generative Adversarial Network (GAN). Speech Enhancement GAN (SEGAN) is first sufficient [1]

In [2] was introduced Plug-and-Play method for image restoration. The idea of hybrid model, combining conventional approach (convex minimization) with deep learning, has shown succesful. Our motivation is to transform this model to audio problems with minor differences. We replace Alternating Direction Multiplier Method (ADMM) with Douglas-Rachford algorithm (DR algorithm). Denoiser will be chosen from state-of-the-art audio denoisers.

## II. PREREQUISITIES

In this section we introduce our task in mathematical view and

### A. Task formulation

We consider column vector  $s \in \mathbb{R}^L$  as our observed single-channel signal of length  $L$ .

Identify applicable funding agency here. If none, delete this.

### B. Douglas-Rachford algorithm

## III. PLUG-AND-PLAY INPAINTING

### A. general algorithm

### B. choice of denoiser

### C. Denoisers

## IV. TESTING DATA AND EVALUATION

## V. CONCLUSION

## ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

## REFERENCES

- [1] S. Pascual, A. Bonafonte, and J. Serra, “SEGAN: Speech Enhancement Generative Adversarial Network,” Tech. Rep., Jun. 2017, arXiv:1703.09452 [cs] type: article. [Online]. Available: <http://arxiv.org/abs/1703.09452>
- [2] S. H. Chan, X. Wang, and O. A. Elgendy, “Plug-and-Play ADMM for Image Restoration: Fixed Point Convergence and Applications,” Tech. Rep., Nov. 2016, arXiv:1605.01710 [cs] type: article. [Online]. Available: <http://arxiv.org/abs/1605.01710>

IEEE conference templates contain guidance text for composing and formatting conference papers. Please ensure that all template text is removed from your conference paper prior to submission to the conference. Failure to remove the template text from your paper may result in your paper not being published.