Glottal Inversion

Lasse Lybeck
Robert Sirviö

March 28, 2014

1 Introduction

2 Materials and Methods

2.1 The inversion method

2.1.1 Tikhonov reguralization

The classical Tikhonov regularized solution for $m = Af + \varepsilon$ defined in (ref here) is usually denoted by the vector $T_\alpha(m) \in \mathbb{R}^n$ that minimizes

$$\|AT_\alpha(m) - m\|^2 + \alpha \|T_\alpha(m)\|^2 \Leftrightarrow$$
$$T_\alpha(m) = \underset{z \in \mathbb{R}^n}{\operatorname{argmin}} \left\{ \|Az - m\|^2 + \alpha \|z\|^2 \right\},$$

where $\alpha > 0$ is called a regularization parameter. The resulting $T_\alpha(m)$ can be understood as a compromise between two conditions, namely

I. $T_\alpha(m)$ should give a small residual $AT_\alpha(m) - m$.

II. $\|T_\alpha(m)\|_2$ should be small.

The α parameter is used in order to tune to balance between the two conditions above.

In generalized Tikhonov regularization some prior knowledge is assumed to be known. In some cases f might be known to be smooth. This information can be incorporated into the regularization by choosing

$$T_\alpha(m) = \underset{z \in \mathbb{R}^n}{\operatorname{argmin}} \left\{ \|Az - m\|^2 + \alpha \|Lz\|^2 \right\}, \tag{1}$$

where L is a discretized differential operator. In our model proposed in [ref here] we know the glottal impulse to be zero in an interval [mera kama hit när modellen är skriven]

2.1.2 The conjugate gradient method

3 Results

4 Discussion

References

[1] Mueller, Jennifer L. & Siltanen Samuli *Linear and Nonlinear Inverse Problems with Practical Applications.*
SIAM, 1:st edition, 2012