Synchronization in the Presence of Noise (Abstract)

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Most fault models for channels deal with substitution-type errors only, that is, errors that arise from the substitution of symbols by other symbols. For such a fault model, block codes for error detection and error correction are well suited, as the synchronization is provided for free. For a fault model which, aside from substitution errors, also includes insertion and deletion errors – an SID-channel –, block codes do not achieve the synchronization in general. On the other hand, modern information transmission media are far more realistically modelled by SID-channels than by substitution-only channels.

We report on work regarding the error-detection and error-correction capabilties of variable-length codes for SID-channels. In particular, we consider the notions of decoding delay and synchronization delay and their interconnection for codes used on such channels. The well-known results for noiseless channels turn out to be rather simple corollaries of our results. We consider the three essentially different cases of finite, one-sided infinite and bi-infinite messages. Moreover, time permitting, we discuss the connection to homophonic codes.

To identify the synchronization properties more closely, we present examples and part of the theory of solid codes, a class of codes that is particularly capable of detecting synchronization errors reliably.

Outlines of some of the ideas presented – without much detail there – can be found in the chapter *Codes* by the authors in the *Handbook of Formal Languages, Vol. 1, edited by G. Rozenberg and A. Salomaa, Springer-Verlag, Berlin, 1997, 511–607.*

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