Using Forms for Information Embedding in Electrophotographic Documents

Maria V. Ortiz Segovia
George T.-C. Chiu
Jan P. Allebach

Goals
- Embed information at the printer mechanism level in document forms (such as borders or frames) of electrophotographic documents using laser beam intensity modulation
- Provide a content-independent embedding tool for extrinsic signature embedding
- Increase embedding capacity through the use of error-correcting coding techniques

Extrinsic Signature Embedding
- Generate extrinsic signature by modulating the amplitude of the laser beam intensity
- Signature could carry information such as the printer reference number or a timestamp
- Embedded information does not affect perceived document quality, but is still detectable from the scanned document

Embedding Signal Design
- Adjust codeword parameters waveform, amplitude, frequency, length
- Amplitude of embedding signal is bounded by edge raggedness
- Frequency and codeword length are bounded by the printer mechanism

Communications systems approach
- Message carrier: embedding signal
- Communication channel: document form
- Coding methods:
  - Reed Solomon
  - Convolutional code
  - Block encoder
  - Systematic
  - Error correcting capacity 3
  - Code rate 0.6
  - Sequential encoder
  - Non-systematic
  - Error correcting capacity 2
  - Code rate 0.5

Remarks
- There exists a trade-off between edge raggedness caused by the embedding signal amplitude and the detection rates
- The embedding capacity increases when coding strategies are used
- The error rate is reduced by using error-correcting code schemes