

Line shift coding is a steganography method that permits to encoding of bits of information into a document by shifting its lines up or down. This method presents good robustness and resistance to errors - the document can be scanned or printed several times without the loss of ability to decrypt the hidden message. A major disadvantage of this method is its information capacity. Having the encoded capacity of only one bit per shifted line sounds like very little. In addition to that not every line is carrying information (obviously). As was demonstrated by Ciptaningtyas et al. (2018) in the conference article "Text Steganography on Sundanese Script using Improved Line Shift Coding" the maximum information capacity for an improved line shift coding technique achieved during the experiments was 2,69 bits/KB of the text. It is worth noting that this article used an improved version of this method. The typical - state-of-the-art method, uses the even line shifting strategy - all odd lines stay the same and only the even lines of the document are used to encode the information. The article achieved an improvement of on average 1.39 (bits / KB) by using only the first and the fifth lines as a control group, and all the other lines had a bit of information encoded. Of course, in this method, the length of the bits of the message and number of lines used to shift should be as close as possible as this value increases the information capacity of the experiment - which in itself bears a problem as it requires a large portion of documents with different sizes prepared in advance. Also, the documents should probably have as even-lengthed lines as possible (as shorter lines may be more prone to errors in decoding – TO VERIFY!!). TODO: opisać dokładnie algorytm z artykułu Ciptaningtyas et al. (2018)

#### Word shift coding

Word shift coding described by Fitra Chairil Akbar and Latuconsina (2020) in article Steganography on

Text using Word-Shift Coding and Centroid Methods is a method very similar to line shift coding, but

this time we are encoding information by shifting pairs of words. In that way, an information capacity is

significantly increased because each gap between words can be edited to encode a message. On top of

containing benefits of previous coding method, word shifting is less recognizable for human eye especially

for text with large amount of word, where irregular spacing between a pair of words is less eye-catching

than difference in line spacing.

Similar to line shift coding, it can be used in almost every text for encoding so method is not bound by

specific type of text data. Additionally, word shift can be used on image of the text whereas line shift

coding is not adjustable to images.

The main disadvantage of this method is the same as for line shift coding where if one person is aware

of distances algorithm, they can compare the current text with the algorithm and find hidden information

by differences between original and modified texts thus breaking encoding method without the hassle.

Another con of word shifting is the performance of the method. Compared to moving whole lines we

have to make significantly more changes to text by shifting words. Word count may be even 20 times

bigger or more than line count and taking into consideration that method is not fully secure, the computing

cost may be too big for small texts to be worth using.

Feature coding

Feature coding is the most advanced method when compared to line and word shift coding.

Method uses

special characteristics of letters/symbols to encode a hidden message by modifying specific features. It

is especially efficient when less common languages are used in text. An example how can it be used

was made by Shirali-Shahreza and Shirali-Shahreza (2006) in A New Approach to Persian/Arabic

Text Steganography article when both men used feature coding to modify letters used in Persian/Arabic alphabet.

Compared to other methods, feature coding allows for hiding even more information behind text due

to working on letters directly. Additionally, it benefits from the structure of symbols itself to conceal

message encoding. Pairing it with more localized language, it is essentially hard to recognize that original

text has been tampered with thus making this method secure.

Although feature coding is a powerful tool for hiding an information, encoding performance varies

based on scenario in which it is used. A throughout tests were made by Utama and Din (2022) in

the form of article titled Performance Review of Feature-Based Method in Implementation Text

Steganography Approach to check the effectiveness of the method and results show that effectiveness,

robustness and performance highly depends on language and scenario in which it is used. It poses a risk

that feature coding may be situational and not be the best solution for all cases. The complexity of the method may also be a double-edged sword during encoding/decoding procedure.

Feature coding given the possibility to modify symbols in discreet and creative way thus giving an uncountable amount of ways in which a message can be coded, but it also pose a risk of destroying a hidden message when wrong modifications are made to features in a small number of cases.

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