Distributed video coding using turbo codes

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Distributed Video Coding Using Turbo codes

Introduction

Distributed Video Coding (DVC) is a new paradigm for video compression, based on Slepian and Wolf's and Wyner and Ziv's information-theoretic results. The DVC refers to the coding of two (or more) dependent random sequences with separate encoders, but decoding with the same joint decoder. The turbo coder is the main focus of this project.
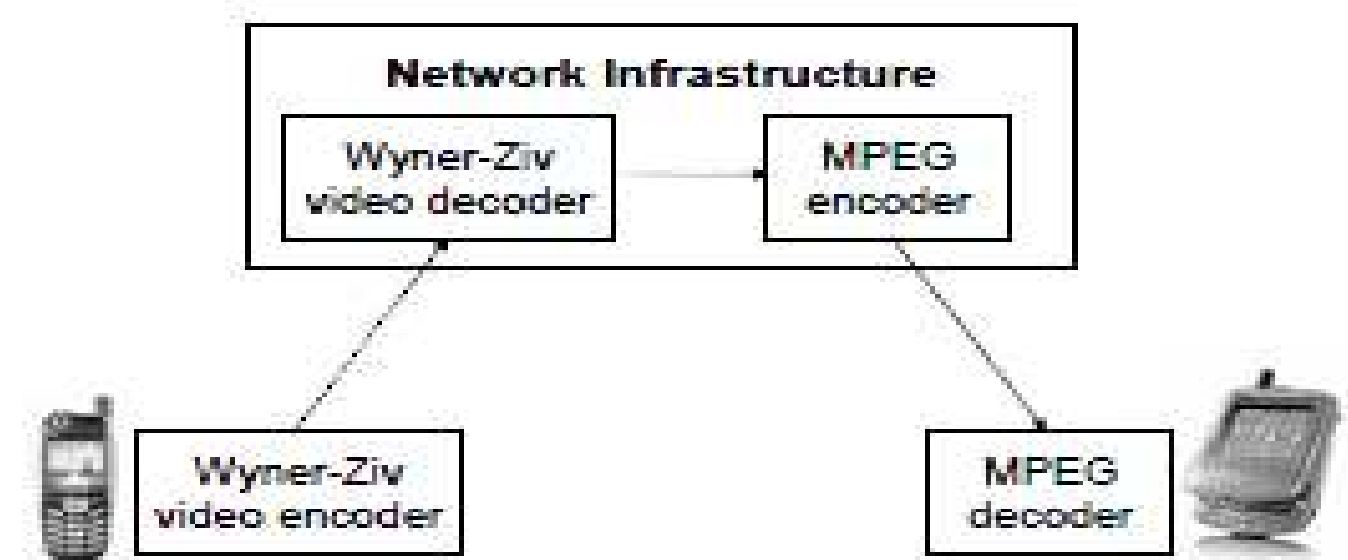
May exploit the mutual dependence

X and Y are statically dependent
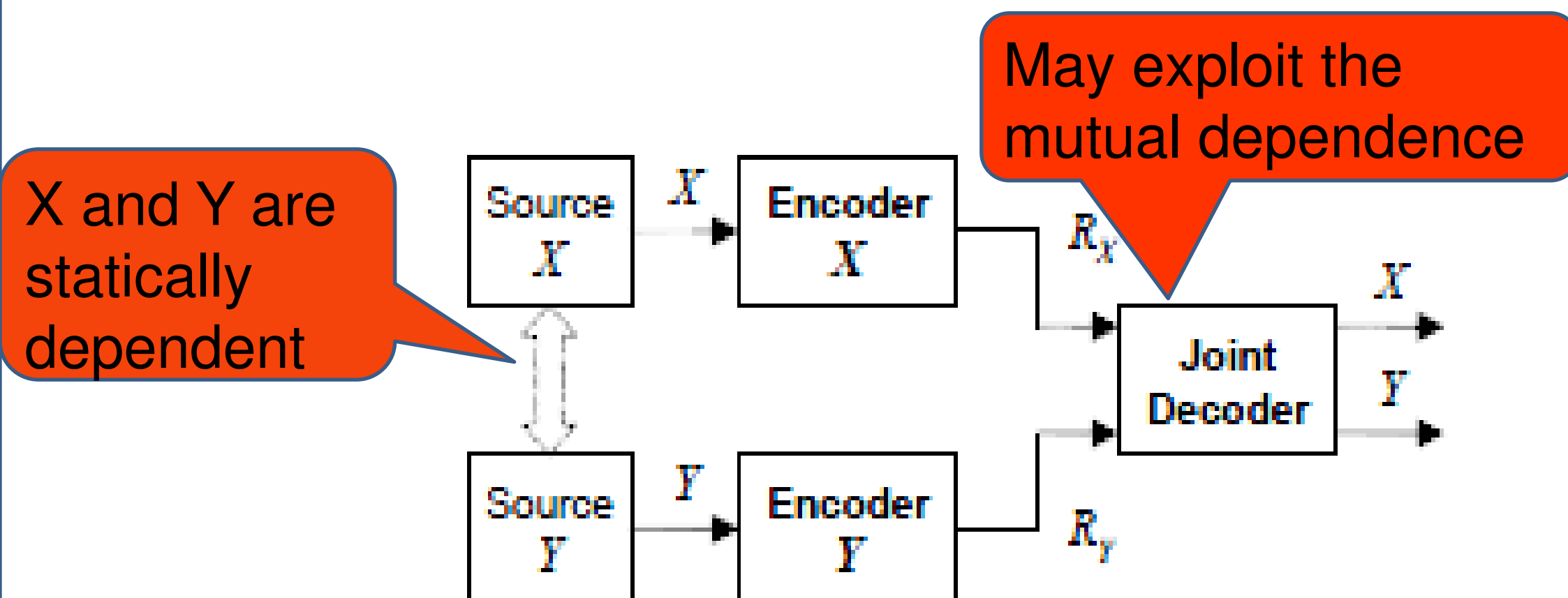
Potential Application

• DVC exploits the source statistics in the encoder, and, hence the encoder can be very simple at the expense of a more complex decoder. This can be used in the new generations of mobile video cameras.
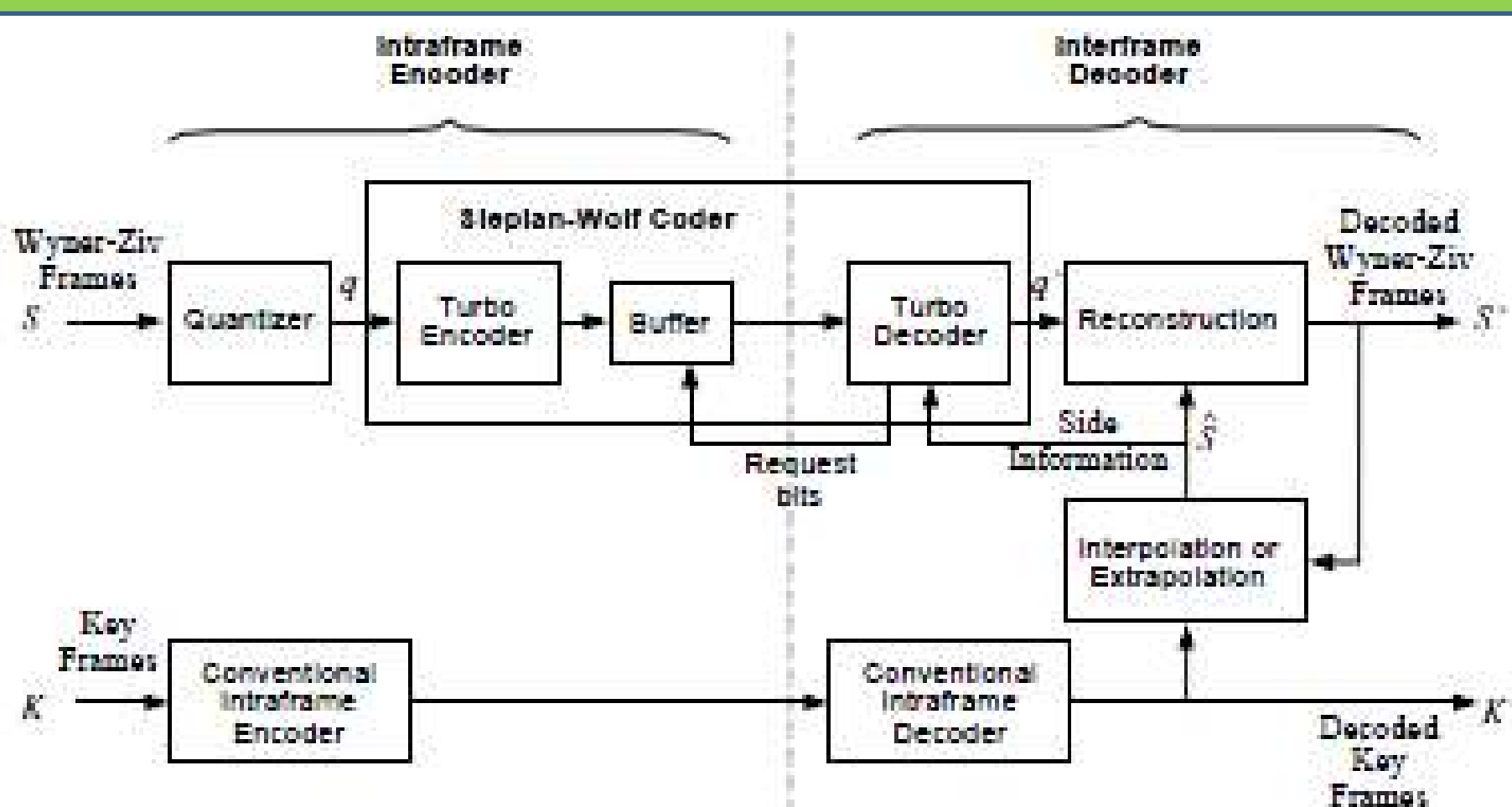• An example:
This is a model of transcoding architecture for wireless video.

1. The fixed part contains the most complicated part (decoder of DVC and encoder of MPEG encoder)
2. The mobile cameraphone captures MPEG decoder and DVC encoder which are very simple.

Video Codec

Low-complexity encoder and corresponding decoder

• Compression: Each turbo encoder is commonly made up of 2 rate ½ recursive systematic convolutional encoders. Each convolutional can be implemented using number of XOR gates and shift registers. Thus the compression of data is a relatively fast and simple precedure.
• Decompression:
1. Motion interpolation is performed to get a predicted key frames
2. The turbo decoder is implemented using 2 SISO MAP decoder
3. Two turbo decoders will be used, the interaction between the 2 decoders is repeated several times and it results in a interactive decoding process. Successful decoding occurs when both decoders return same sequence

Analysis

Advantage of this codec

1. Fast and simple
2. Can be improved by only improving the decoder

Disadvantage of this codec

1. Decoder is a slow and complicated process.
2. Not useful for real time video streaming.

Possible Improvements

1. Higher ration of compression can be achieved by puncturing the parity bits.
2. Can further reduce the complexity of the encoder. But in order to achieve, motion interpolation has to be more accurate.
3. We can obtain a more reliable side information through a more depth study on the virtual channel.

Project Title: New Methodology for Video Compression and Delivery
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