IETF 85

Time-Domain Lapped Transforms for Video Coding

draft-egge-videocodec-tdlt-00

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Motivation

- Structurally eliminate blocking artifacts
- Improve coding gain
  - Both smooth and textured areas
Prefilter and Postfilter

- Apply a *prefilter* in the encoder
  - A linear transform that straddles block edges
  - Removes correlation across edge

- Inverse applied in the decoder

- After prefilter, same structure as traditional codecs
Lapped Transforms: Prefilter

- Prefilter makes things blocky

\[ \Rightarrow \]

- Postfilter removes blocking artifacts
  - Like loop filter but *invertible*
  - And simpler: no conditional logic to control filter strength
Basis Functions

Analysis Filter

Synthesis Filter
Regularized Transforms

DC Before Regularization

DC After Regularization

• Represents linear gradients with just DC
## Coding Gain

<table>
<thead>
<tr>
<th></th>
<th>DCT</th>
<th>LT</th>
<th>LT (w/ reg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 point</td>
<td>7.5701 dB</td>
<td>8.6349 dB</td>
<td>8.6060 dB</td>
</tr>
<tr>
<td>8 point</td>
<td>8.8259 dB</td>
<td>9.6005 dB</td>
<td>9.5687 dB</td>
</tr>
<tr>
<td>16 point</td>
<td>9.4555 dB</td>
<td>9.9057 dB</td>
<td>9.8116 dB</td>
</tr>
</tbody>
</table>
Future Work

- Pixels from neighboring blocks not available for intra prediction
- Block matching algorithms must be modified to *not* produce blocking artifacts
  - Overlapped Block Motion Compensation
- Multiple transform sizes