Modeling and simulation of H.26L Encoder

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Problem Statement

- Exploit inherent parallelism of existing implementation
- Achieve higher Speed up by distributing the computation in different processors
- Improve scalability and flexibility
H.26L Encoder

- Intra
- MC
- ME
- Buffer
- Filter
- DCTQ
- Q’DCT
- Entropy

Process Flow:
1. Video inputs into ME.
2. ME processes data and outputs to Buffer.
3. Buffer outputs data to Filter.
4. Filter processes data and outputs to DCTQ.
5. DCTQ processes data and outputs to Q’DCT.
6. Q’DCT processes data and outputs to Entropy.
7. Entropy processes data and outputs the Bitstream.
Our Approach

- Identify Computation Intensive blocks
- Exploit image slicing in H.26L
- Modeling in Ptolemy
  - Synchronous Dataflow (SDF) for simulation
  - Code Generation Domain (CGC) for implementation
Our solution

SLICE LEVEL PARALLELISM

Image Source \rightarrow Segmentation

Slice 0 \rightarrow Slice 1 \rightarrow Slice 2 \rightarrow Slice 3 \rightarrow Slice 4 \rightarrow Slice 5 \rightarrow Slice 6 \rightarrow Composition
Software Implementation

- Transport C code to SDF model in Ptolemy
- Migrate SDF domain to CGC domain
- Test Under Multi Processor Conditions
- Generate Gantt Chart
Screen Shot
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Codec</td>
<td>141.1 sec</td>
</tr>
<tr>
<td>SDF Model</td>
<td>133.13 sec</td>
</tr>
<tr>
<td>CGC</td>
<td>74.14 sec</td>
</tr>
</tbody>
</table>

Image Size (176 * 144), 99 Macroblocks (16*16)
Each Slice = 11 blocks  Total No. Slices = 9
Conclusion

- **Our approach**
  - Linear SpeedUp with the Number of Processors
  - InterProcessor Communication is close to zero

- **Future Work**
  - Block Level parallelism in Transform calculations, MV computation and Entropy Coding (UVLC – Universal Variable Length Coding)
  - Migration of the above model in other Code Generation domains