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IMAGE SEGMENTATION FOR IMPROVED LOSSLESS SCREEN CONTENT COMPRESSION



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Introduction to SCF

- **Soft Context Formation (SCF)**.
- □ Single pixel coding. Pixels are coded in raster scan order in one of three stages.
- □ Probability distribution model, fully adaptive arithmetic coding.



X'– Already encoded pixel X – Current pixel to encode A to F – Neighbours





Introduction to SCF

Stage 1: If the colour of X has already appeared in combination with a *pattern* that is similar to its current one, X is code in Stage 1. **Stage 2**: If the colour of X has already been seen in the image, it can be encoded in Stage 2 based on the *global colour* palette. **Stage 3**: This stage tries to predict the three colour components separately and maintains probability distributions for prediction errors. Using Median Adaptive Predictor (MAP).





Synthetic Screen Content Images (SCI's)

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Fig 3: Examples of Synthetic SCI's





Compound Screen Content Images (SCI's)





in Canada stop banks failing China and Russia in Proposals designed to group talks

Republican wins

More body parts found

Wisconsin vote

stop taxpayers' money being used to bail out Strike 'killed top alfailed banks are to be Qaeda man' European Commission.

Panetta hails



unveiled by the

ndia s	ecurity role
1	US defence secretary Leon Panetta emphasises India's role in providing security for Asia, including Afghanistan, during a Delhi visit.



Reaping the rewards

Indonesia is fast becoming one of the most tech-sawy countries in Asia, and now its farmers are turning to social networking to make the most of their produce.

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Fig 4: Examples of Compound SCI's





Compound SCIs make estimation of proper distributions difficult.
 Segmentation algorithm to detect and extract natural regions.
 Synthetic background and natural segments are coded separately.





SCF Workflows



Segmentation Stages





Segmentation- Block Classification







Segmentation-Initial Bounding Boxes



Fig 5.2: Block classification



Fig 5.3: Inital bounding boxes





Segmentation- Area Threshold



lackson thrives under pressure and embraces the big stage

Fig 5.3: Initial bounding boxes



Fig 5.4: Remove overlap







Segmentation-Bounding box refinements (Overlap)

NBCSports





WATCH NEL NHL NBA SOCCER NASCAR MOTORS GOLF OLY NCAAFB

Fig 5.5a: Remove overlap



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Segmentation- Overlap removal







Segmentation-Bounding box refinements (Border)

age:

fore

age:

fore



Before



Fig 5.5c: Enlarged parts of 3.5b



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Segmentation-Synthetic and Natural Regions

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Fig 5.6: Synthetic background Image

Fig 5.7: Natural segment Image





Evaluation

- Proposed SCF version is compared to HEVC (HM-16.21+SCM-8.8) and previous version of SCF
- □ Investigated a collection of 150 SCI's.
- Compared to HEVC (HM-16.21+SCM-8.8), previous SCF version achieves 11.06% bit rate savings on average
- Proposed segmentation approach improves 1.52% w.r.t previous SCF version
- □ Test sets are available at [10]





Results

	No. of Images	HM-16.21 SCM- 8.8 [1][2]	Previous SCF [3]	Proposed SCF
Test-Set	150	42912198 bytes	39055397 bytes	38470760 bytes
Percentage		111.06%	101.52%	100.00%

Comparison of the compression performances of proposed method (SCF) with HEVC (HM-16.21+SCM-8.8) and previous version of SCF.





Conclusion

- Coding synthetic and natural regions separately helps in better estimation of probability models
- The current version only detects natural segments within synthetic background images
- In future work, we would like to extend our approach to segment synthetic regions from natural background images
- Atleast a third class should be considered representing rendered images that are computer generated but still contain a very high number of colours
- Extend the segmentation algorithm to deal with other shapes than rectangles/squares





Thank you





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