A Framework of Changing Image Emotion Using Emotion Prediction

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HUAWEI

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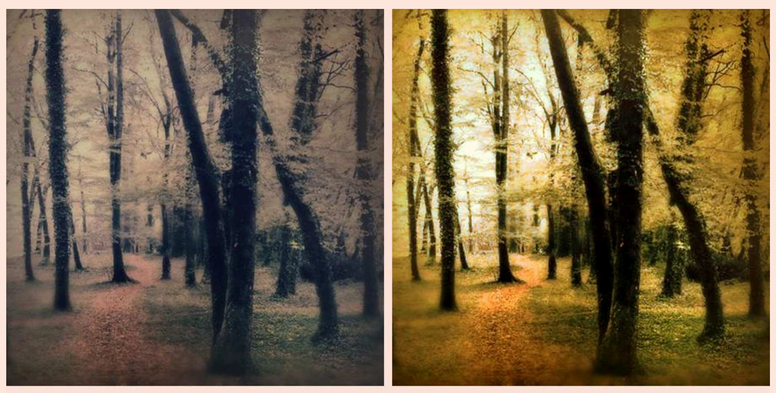
Task

Given an input image and an emotion keyword, modify the low-level features of the input image such that the output image better represents the emotion keyword.



(a) input image (b) output image

more joy

(14/15 subjects agree)

Contributions

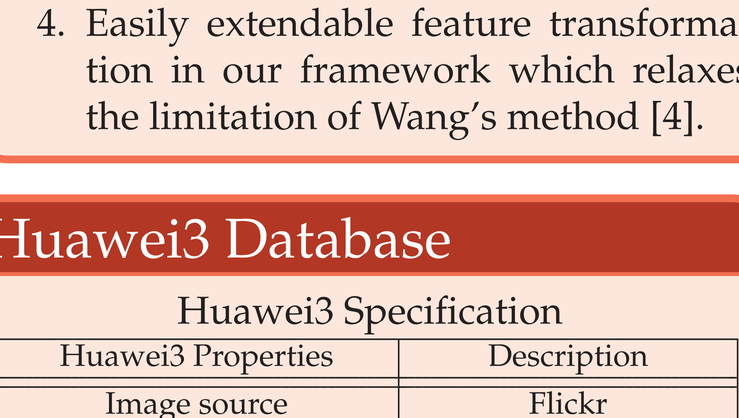
1. Propose a new image database, Huawei3, which solves the issues of previous databases.
2. Model correlation between emotion categories.
3. Propose a new framework for changing image emotions.
4. Easily extendable feature transformation in our framework which relaxes the limitation of Wang's method [4].

Huawei3 Database

Huawei3 Specification

Huawei3 Properties	Description
Image source	Flickr
Image size	about VGA (keep aspect ratio)
Total # of images	3000
# of categories	6 (joy, sadness, fear, non fear, disgust, non disgust)
# of dimensions in emotion space	3 (joy–sadness, fear–non fear, disgust–non disgust)
# of images per category	500
Label provided per image	binary label in one of the three dimensions

Example Images from Huawei3 with Their Categories :



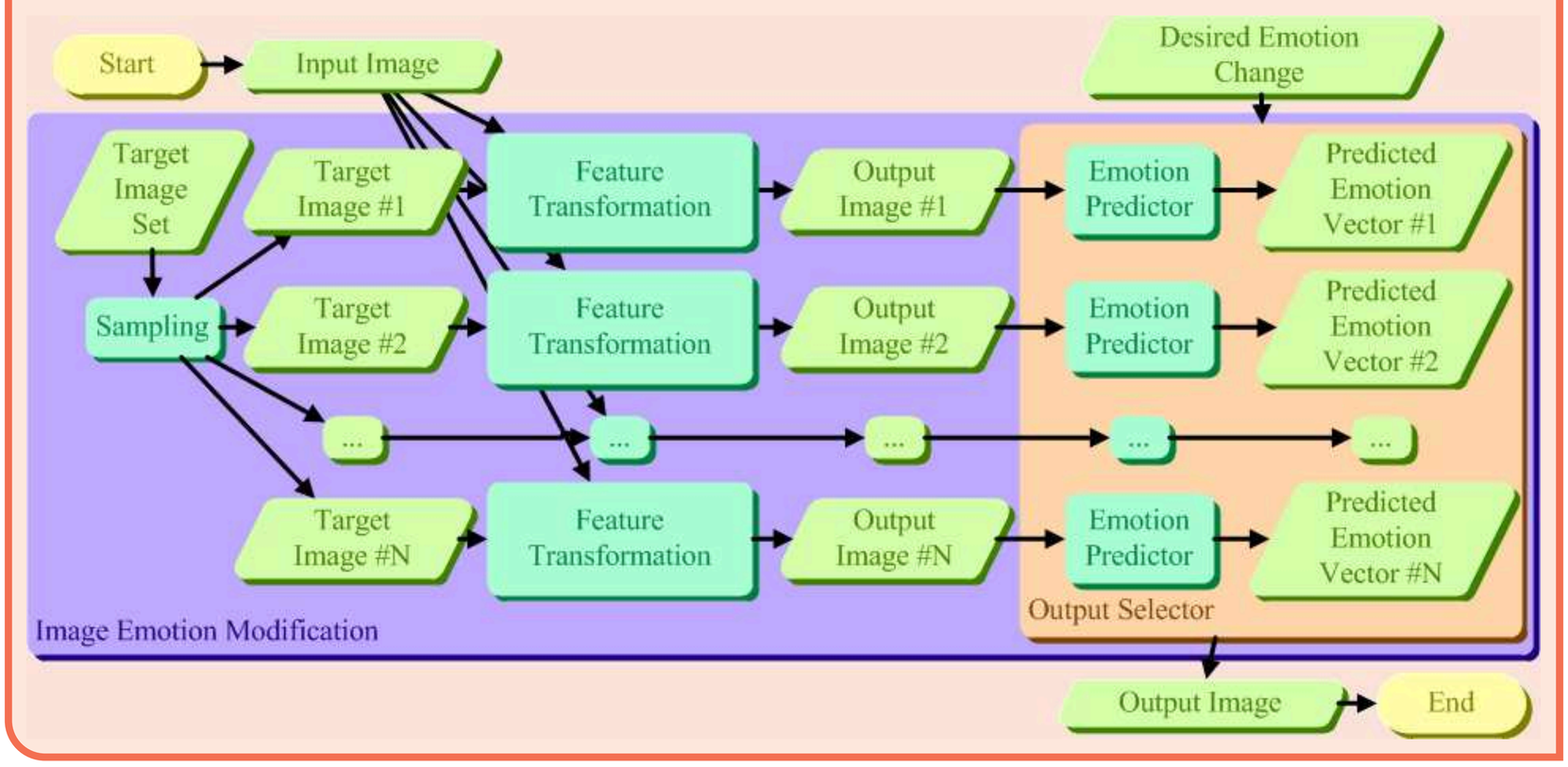
joy non fear non disgust

sadness fear disgust

Features Used for Emotion Predictor

Category	Dimension	Description
Edge	512	cascaded edge histograms in the most / least salient regions
Texture	27	features from gray-level co-occurrence matrix and Tamura features
Color	80	cascaded CIECAM02 color histograms in the most / least salient regions
Saliency	4	the differences of areas / color / edge features in the most / least salient regions
Composition	8	rule of third, diagonal dominance, symmetry, and visual balance
Shape	128	features of the fit ellipses of the segments from color segmentation

Proposed Framework



Emotion Prediction

Emotion Predictor Specification

Properties	Description
Input	an image
Output	a 3-d real-valued vector in emotion space

Emotion Predictor Training

Properties	Description
Feature dimension	759
Method	train an emotion predictor in each of the three dimensions in emotion space
Tool	standard support vector regression in LIBSVM [1]
SVR parameters	learned from 10-fold cross validation on the training set

Emotion Prediction Performance

Evaluation Method	Results (3 emotion dim.)
Mean squared error	0.209, 0.111, 0.215
Binary classification accuracy (threshold 0.5)	0.703, 0.850, 0.663 (comparable to [2, 3, 5])

Future Work

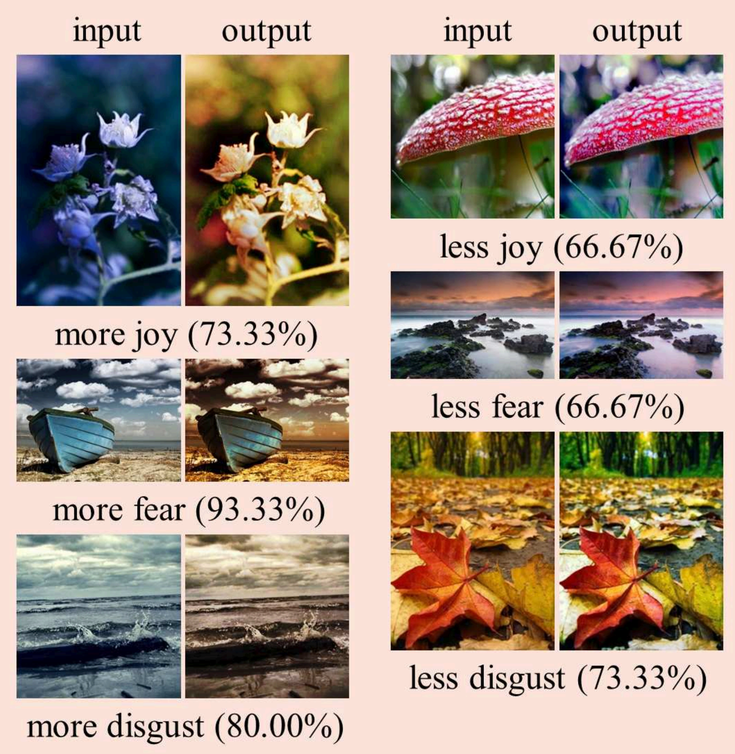
Personalize the framework of changing image emotion such that the output image will evoke desired emotions according to individual feelings.

Changing Image Emotion

Feature transformation: histogram specification in CIE XYZ color space.

Results of **20** input/output pairs (**15** subjects evaluate per pair):

1. In **65%** of all pairs, **>50%** of the subjects agree with our emotion changing.
2. **66.67%** of all evaluations agree with our emotion changing.



direction of changing emotion (% of subjects agree)

Conclusion

1. We change image emotions with our novel framework, showing comparable results with those of previous works in affective image classification.
2. Our framework outperforms previous works in output variety, flexibility of output selecting criteria, and extensibility to other feature transformations.

References

[1] C.-C. Chang and C.-J. Lin. LIBSVM: A Library for Support Vector Machines. In *ACM Transactions on Intelligent Systems and Technology '11*

[2] J. Machajdik and A. Hanbury. Affective Image Classification Using Features Inspired by Psychology and Art Theory. In *ACMMM '10*

[3] M. Solli and R. Lenz. Emotion Related Structures in Large Image Databases. In *ACM Image and Video Retrieval '10*

[4] X. Wang, J. Jia, and L. Cai. Affective Image Adjustment with A Single Word. In *Visual Computer '12*

[5] X. Wang, J. Jia, J. Yin, and L. Cai. Interpretable Aesthetic Features for Affective Image Classification. In *Visual Computer '12*