

Affect Segmentation and Recognition by Fusion of Facial Features and Body Gesture

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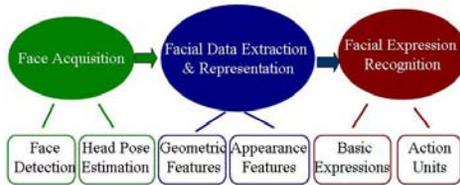
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DHS Summer Research Team Program for MSI

Motivation

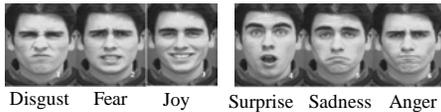
- Lie detection
- Person identification
- Image retrieval and video indexing
- Pain assessment



Approach



Six Basic Expressions



FABO Database

- Different ethnic background and ages
- Both body and face cameras

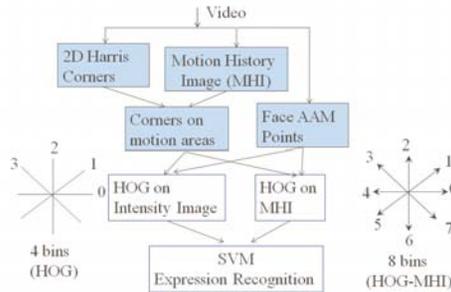
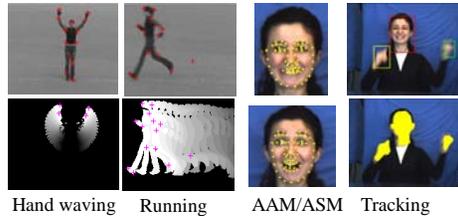


Multi-Modal Affect Recognition

- Face + Voice
- Face + Gesture (summer research)

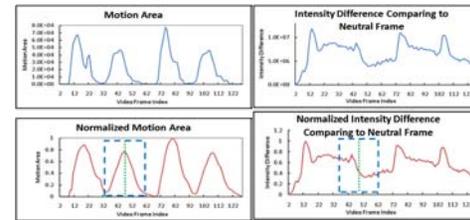
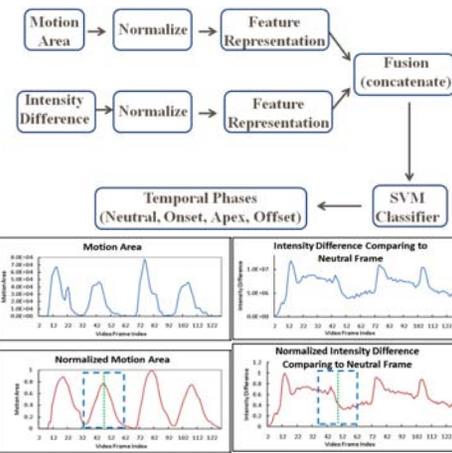
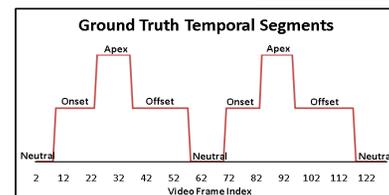
Feature Extraction

- Interest points --- Harris corners
- Motion History Image (MHI)
- Face Active Appearance/Shape Model (AAM/ASM)
- Skin color detection
- Hand tracking
- Feature representation



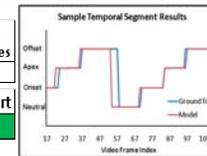
Temporal Segment

- What is temporal segment
- Approach
- Features
- Result

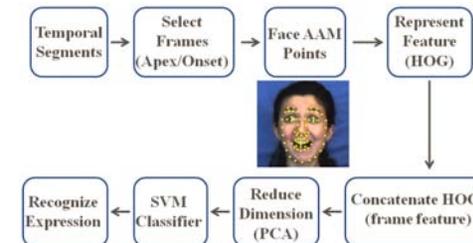


true\model	Neutral	Onset	Apex	Offset
Neutral	2631	121	208	161
Onset	113	2253	324	31
Apex	187	282	4365	251
Offset	171	70	227	2539

	motion area	intensity difference	Both Features
Accuracy (%)	68.5	74.1	83.1
Accuracy (%)	our result	state of the art	
	83.1	80.65	



Expression Recognition



	frame based (%)	video based (%)
Intensity Image HOG	43.6	52.3
MHI HOG	27.6	34.1
Both HOG	41.1	47.8
state of the art	35.22	N/A

Confusion Matrix with Intensity Image HOG only

true\model	Anger	Anxiety	Boredom	Disgust	Fear	Happiness	Surprise	Puzzlement	Sadness	Uncertainty
Anger	583	13	12	22	3	17	0	171	1	22
Anxiety	34	205	9	21	0	5	0	296	6	4
Boredom	74	40	84	17	15	0	4	469	5	4
Disgust	93	2	4	143	2	26	0	79	10	0
Fear	56	2	0	4	30	5	1	41	29	0
Happiness	109	2	0	14	5	379	0	14	1	0
Surprise	1	3	5	1	4	60	69	30	0	2
Puzzlement	209	120	73	100	5	1	0	784	1	15
Sadness	1	9	4	0	0	1	0	106	38	0
Uncertainty	41	0	8	0	1	4	0	19	0	201
accuracy (%)	72.3	30.5	11.8	29.9	18	72.3	39.4	59.6	23.9	72.4



Uncertainty Correctly Classified



Boredom Misclassified as Puzzlement

Future Research

- Multi-modal expression
- Spontaneous expression
- Content and context based expression

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Reference

[1] H. Guenes and M. Piccardi, "Automatic Temporal Segment Detection and Affect Recognition From Face and Body Display", IEEE Transaction on SMCB, Vol.39, NO.1 2009.
[2] Y. Tian, T. Kanade and J. F. Cohn, "Recognizing Action Units for Facial Expression Analysis", IEEE TPAMI, Vol. 23, No. 2, 2001.
[3] S. Chen, Y. Tian, Q. Liu, and D. Metaxas, Segment and Recognize Expression Phase by Fusion of Motion Area and Neutral Divergence Features, IEEE Conference on Automatic Face and Gesture Recognition, 2011