

OpenCV Project:

**Expression Recognition  
and  
A Webcam Based Face Tracking Game**

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# Presentation Outline

- Introduction
- Significance
- Expression recognition
- What we learned
- OpenCV report card
- Future Work
- Demonstration



Expression Recognition Training Images

# Introduction

- Created a webcam based face-tracking game
  - video image
  - Face recognition classifiers came with OpenCV via XML

*and*

- Trained Adaboost to recognize facial expressions
  - still image
  - no OpenCV ready-to-use classifiers for expression recognition\*\*\*

# Significance

- OpenCV is worth exploring and is free and reasonably documented
- Tracking is potentially an alternative computer interaction technique, as well as a requirement for many VE applications
- Expression recognition is very interesting and could possibly be used for interaction techniques



Natural "Angry" Expression

# Expression Recognition: Complexities

- There are 6 basic expressions, or are there?
- Expression images individualistic and hard to fake
- Expressions scientifically studied since 1860's

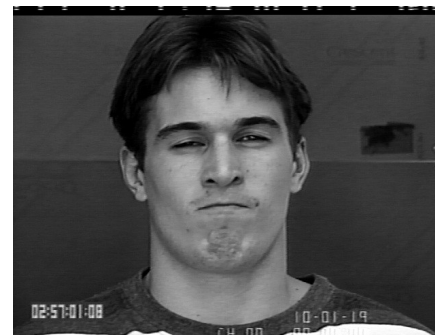
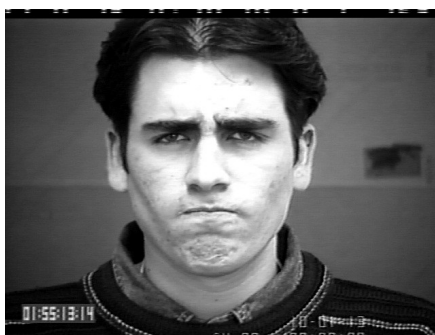
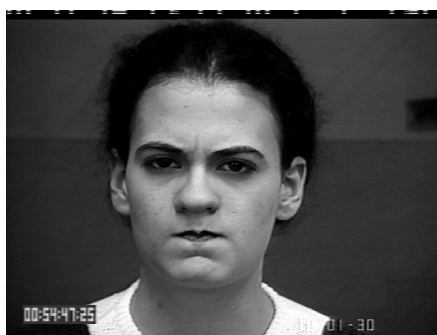
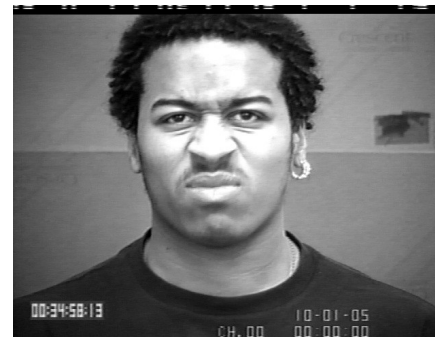
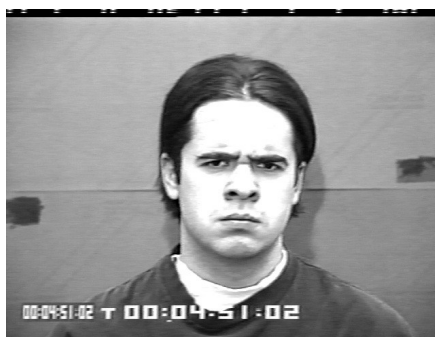


Computer mistakenly recognizes (left) angry, (center) happy, and (right) happy

Is he angry?

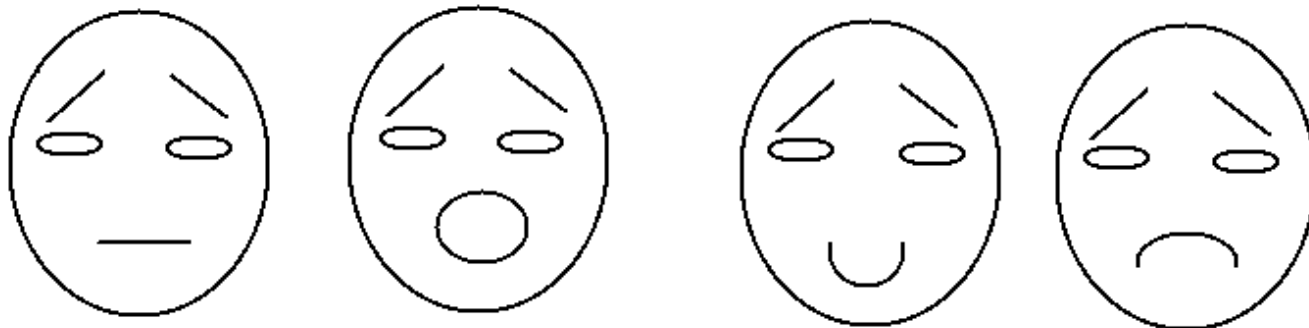


# Angry Positive Examples for Training



# Expression Recognition: Training

- CK+ image database
- Training preparation
  - create positive examples
  - prepare negative examples
- Training
- Performance test





## The Training of Happy, Anger and Surprise

Facial expression	Positive examples	Negative examples	Training stages	Training time (hour)	Finish
Happy	8400	400	16	30	Exit before reach false alarm
Anger	6400	945	15	36	Reach false alarm and exit
Surprise	7800	3118	20	90 so far	Reach false alarm and exit

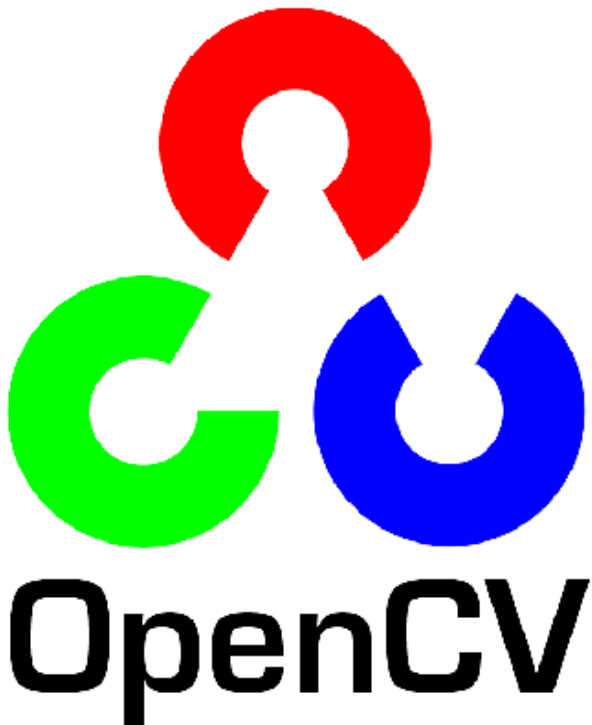
# What We Learned

- The haar-like feature can be used for facial expression detection
- Quality of training images is crucial
- No ready-to-use classifiers in OpenCV for expression recognition
- Image / video processing becomes quite easy with the help of OpenCV libraries.
- Giving the poster and game demonstration were very worthwhile

# OpenCV Report Card B+ p 1/2

## The Good

- Free and good documentation
- Good for image processing and basic object tracking
- Can convert a **single** JPG to a vector graph file with multiple distortions
- +500 image functions and it worked easily with the webcam



## The Bad

- No support for transparency channel in an image
- No functionality to convert **multiple** images into a VEC file with multiple distortions
- No functionality to merge VEC files
- Missing a crucial source file, “*\_cvhaartraining.cpp*” - could not modify the original code of *haartraining* model



# Ideas for Future Work

- Improve training image database
- Improve the performance of cascade for facial expressions
- Try a combined method of Adaboost and geometric detection to improve the accuracy of facial expression detection
- Apply face tracking to 3-d desktop VE system or other computer interaction alternatives

# Demonstration

- New improved game as demonstrated at MICWIC
- Expression recognition cascade for
  - Anger (high accuracy)
  - Happy (low accuracy)
  - Surprise (very high accuracy)

