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Visual Anonymity

Automated Human Face Blurring For Privacy-Preserving Digital Videos

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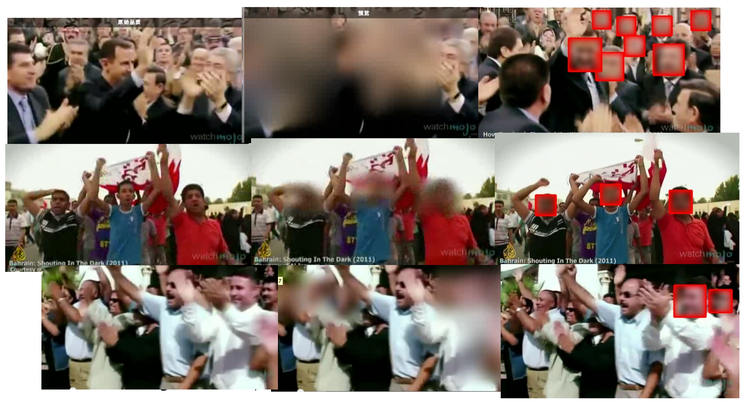
Identity Protection



In July 18, 2012, Youtube® launched a new tool to blur all human faces before uploading videos to protect identity of protesters in the Arab Spring movement. However, from above examples, clearly the tool is not perfect.

There are many more applications of face blurring for privacy protection.

•Safety: e.g. Minors in a public video
•Privacy: By-standers in a public incident,
•HIPPA Law: (Health Insurance Portability and Accountability Act) e.g. human subject in a research use video clips.

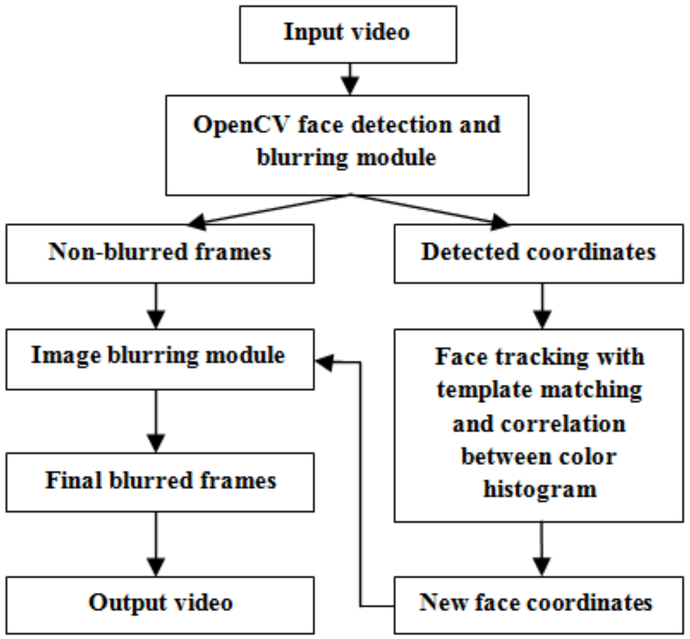
Visual Anonymity project

Deliverable: An enhanced face blurring tool

•Real time face detection and blurring: Blurring face on-line or off-line.
•Improved state of the art face blurring algorithm by using sequential bayesian estimation principle.
•Run on mobile devices (smart phone, tablet) as an APP; allow selective blurring to track and blur the faces selected by user.

Learning objectives:

•Learn basics of computer vision and machine learning theory and algorithms
•Learn APPs development on Android mobile platforms
•Learn to use OpenCV computer vision package



Approaches

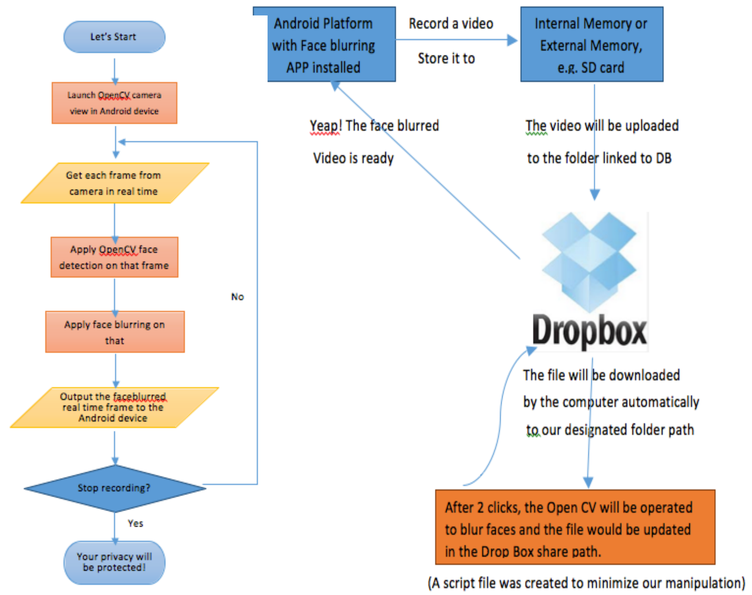
•Use OpenCV (www.opencv.org) implementation of the AdaBoost face detection algorithm
•Improved this version based on face tracking method with template matching using correlation between color histogram and intensity.
•Blur the detected facial rectangular region

Face Detection Performance

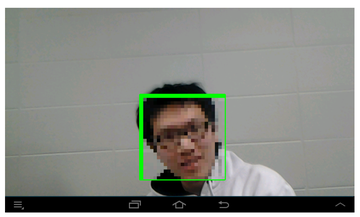
	Total faces	TP	FN	FP	PPV	Sensitivity
Video1	760	547 591 683	213 169 77	66 102 633	0.89 0.85 0.52	0.72 0.78 0.90
Video2	2898	2467 2858 2883	431 40 15	1842 1955 3541	0.57 0.59 0.45	0.85 0.99 0.99
Video3	5084	2814 4123 5038	2270 961 46	133 430 6447	0.95 0.90 0.44	0.55 0.81 0.95
Video4	1986	1901 1986 1977	85 0 9	311 986 5438	0.86 0.67 0.27	0.96 1.0 0.99

Fig. 5. Each cell has performance of baseline followed by improved approach followed by Youtube's blurring tool.

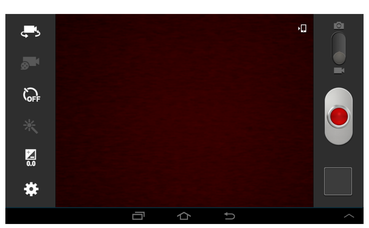
Implementations

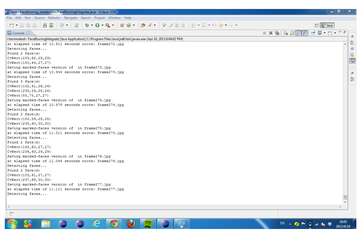


Real Time Implementation



Client-Server Implementation





Future Plan

•Detecting face with an angle: By tracking the same face in a video
•Use skin color to aid the face detection
•Allow interactive correction by a human user