Click-n-Caricaturize

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**Introduction**

An image is worth a thousand words. Modern digital image acquiring technology, primarily digital camera, is one of the most significant inventions of the last century, and has transformed the lifestyle of everybody. Photographs, esp. digital photographs are sharable memories. It is always fun to capture the most remarkable and exciting moments in one’s life, to relish the moments of happiness. Photographs provide a means of sharing and remember those moments again and again. Adding an element of fun would enhance the relish that can be derived from remembering these memories.

Caricature is a likeness of a person with exaggeration of prominent features for pictorial ridicule. Exaggeration is overemphasis of truth, while distortion is denial of the truth. Artist have the ability to capture the uniquely prominent features in a face and enhancing it. We wish to replicate the effect in an automated manner. The report presents some history of caricatures and some previous approaches in the field followed by our proposed approach for solving the problem. Finally we set a timeline for achieving the each of the sub-goals.

**History of caricatization**

Wikipedia claims, some of the earliest caricatures are found in the works of Leonardo da Vinci, who actively sought people with deformities to use as models. The point was to offer an impression of the original which was more striking than a portrait. Diodemmar Casem one of the great early practitioners, was favored by the members of the papal court for his ability to depict the essence of a person in 'three or four strokes. In fact, the word "caricature" comes from the Italian *caricare*, "to load", thus the caricaturist's aim is to invest his image with as much meaning as possible. In a lecture titled *The History and Art of Caricature* (September 2007, Queen Mary 2 Lecture theatre), the British caricaturist Ted Harrison said that the caricaturist can choose to either mock or wound the subject with an effective caricature.

Previous work towards automation in the field has had a variety of approaches. Earlier approaches used template matching and color processing along with HMM. Also 3D caricatures have been proposed, in which a 3D model is created using multiple image from multiple poses, followed by 3D feature distortion. The 3D model is then rendered back to 2D for display. Another interesting approach, used by Microsoft Research-Asia, was to use professional caricature artist to generate real-life caricatures. These caricatures were used as primitive learning models to be used for automation.

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**Technical tools to be used:**

1. Viola-Jones for face detection.
2. Edge detection, Geometric constraint for facial feature detection.
3. Image warping for image distortion.

**Developmental process:**

With a high degree of operation level parallelism, as shown in the process flow chart, will be used to speed up Caricaturization. The entire embedded application can be segregated in 14 steps. Viola-Jones is the best process for the face-detection due to the considerable speed up gained. Rectangular features using integral images can be evaluated in constant time. Using initial user input based estimate for face-detection, the process can be further sped-up. But if the estimate is incorrect, then it might take almost twice as long due to the circular search pattern. The integral image is calculated, while face-estimate is acquired. Finally, higher level cascading classifiers are relaxed if the features within estimate region are good. This will successfully further sped-up the process.

1. Capture Image
2. Generate integral image
3. Request face estimate
4. Adaboost based feature selection and evaluation
5. Cascading Classifiers within each sub-window
6. Generate “detected-face” sub-image.
7. Request facial feature estimation and correction.
8. Evaluate control points within facial features
9. Compare detected face with normal face
10. Estimate degree of distortion for each facial features
11. Apply distortion to original image.
12. Translate from image to cartoon space
13. Smoothening, and finishing touches.
14. Sharing generated image with facebook, twitpic, flicker and email.
Due to the need for frequent testing, evaluating correctness of implementation, the initial code will be implemented in openCV, and for speedy prototyping, on a PC. Step 4, 5 and 8, 10 are the fundamental steps. Step 14 is secondary, but if time permits will be implemented. Once the development on openCV is complete satisfactorily, the code will be ported to the C/C++ NDK based openCV android platform. The Android integration will be improved thereon, as per need.

It is expected that due to frequent UI interactions, it will be possible for the entire calculations to be done within reasonable time on an embedded platform.

**Applications:**

1. Creating virtual “avatar”.
2. Creating memorable pictures.

**Milestones**

Steps 1-3 have been completed on the Android. Step 4 is being developed and tested. Timeline for further development is as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>Nov. 10</td>
<td>Face Detection</td>
</tr>
<tr>
<td>Nov. 22</td>
<td>Facial Feature detection</td>
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<tr>
<td>Nov 30</td>
<td>Image warping</td>
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<tr>
<td>Dec 5</td>
<td>Porting code to Android.</td>
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<tr>
<td>Dec 12</td>
<td>Finishing touches and testing.</td>
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</tbody>
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**References**