

Chapter 7

CONCLUSION



Objective

To brief the summary of this thesis and future scope.

In many occasions, people want to know the future older looks of a child for different reasons such as searching for missing children, age separated face recognition *etc.* In this work we have developed a morphing based technique to automatically produce synthesized age progressed face images for a child's face image. For this purpose the child's face image is given as input along with the age of the child. A model target image along with indicated age should also be given as input. The two images are morphed to produce a series of face images of the child at different older ages.

We have proposed a semiautomatic method for localizing landmark points on a face image. The positions of left eye, right eye and mouth midpoint need to be marked manually. Then a total of 68 landmark points are automatically marked by the method. For this purpose facial landmark points templates are created and stored for different age groups by manually locating the landmark points on age prototype images, which are obtained by averaging several face images belonging to each age group such as 1 – 5, 6 – 10, . . . , 66 – 70. Landmark points on a given image are marked by fitting an age appropriate template on it. In order to do this the template face should be enlarged or shrunk horizontally and vertically so that the eye positions and mouth midpoint of the template and given image match. The templates need to store only the normalized coordinates of the landmark points.

We also proposed a triangle wise mapping method for image warping. To get the pixels values of target triangle from the pixel values of the source triangle, both the triangles are recursively sub divided until no more sub division can be

performed in at least one of the triangles. Termination condition is computed based on in-radius of the triangle. After termination, pixel values indicated by in-centres of the two triangles will be mapped from source to target. Different situations that may arise after termination are handled appropriately. A Triangle is subdivided by joining the three middle points of the three sides of the triangle.

Using this proposed framework we have shown various results predicting future face images for any child face image. The results are found to be acceptable.

The main advantage of the proposed approach is that no model is needed for the aging process. It is based on examples. But, large number of examples are not needed. Aged progressed images are created using image morphing.

Another advantage of our work is a selective warping method is proposed. The regions that take part in warping process can be specified in the source image as well as the target image. Some regions may remain un-warped.

The major limitations of this approach are as follows. The outputs are dependent upon the selected target image, which should be a familial image matching the gender. If familial image is not available it has to select a best match age-specific image from a dataset. If it is known that the child has some person specific permanent deformation on the face, then finding an older target image may be difficult. Ages of the child image as well as the target image should be indicated. Landmark points marking process is not fully automatic. Three landmark points need to be manually marked, which are left eye, right eye and mid point of mouth.

7.1 Directions for Future Works

Possible future works are indicated below.

- Fully automatic methods for localizing major landmark points can be developed. At present three landmark points - two eye centers and mouth mid point are to be marked manually. Methods can be developed to mark these landmark points also automatically. Thus the landmark point detection method will become fully automatic.
- Age estimation for a given face image based on the landmark points. This will eliminate the input of age value along with the face image.
- Automatic gender detection can also be considered. This will help to search

gender specific model images from the dataset in case familial image is not available. This will also ease the verification process of output image.

- Fully reversible warping method can be developed. At present complete original source image can not be obtained from the transformed warped image.