Active Shape Models

Lab 2

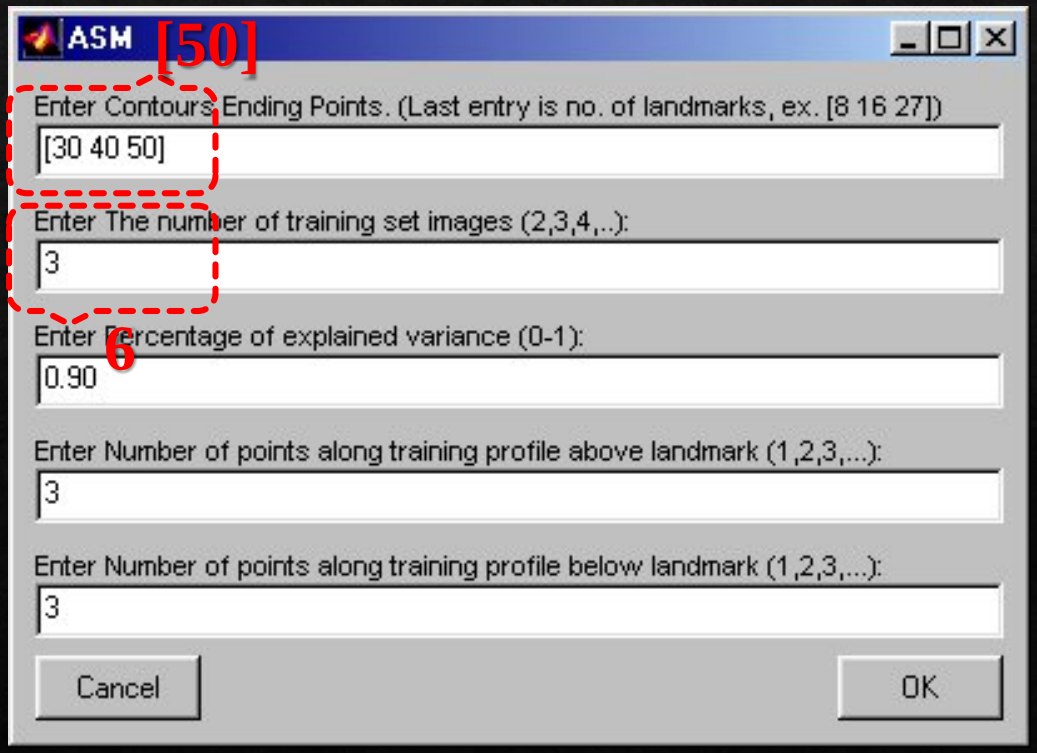
(Most materials are from http://www.cs.sfu.ca/~hamarneh/software/asm/)

Getting started

- To start the ASM program:
  1. Copy the file asm.zip to your working directory.
  2. Unpack the archive. A main directory named asm will be created.
  3. Start Matlab
  4. Go in the ASM directory and type asm
- The ASM program is divided into three main stages:
  1. Training
  2. Trying weights
  3. Searching for a shape in an image
- Your task is now to go through these steps and apply the ASM model to some image data.

Stage 1: Training

- To enter parameters
  - When you select training, the following dialogue below will be displayed.



Stage 1: Training

- Some comments:
  - You specify how many contours you want, and how many landmarks each contour should have in the field ”Enter Contour Ending Points”.
  - You specify the number of training images in the second field.
  - In the two lower fields, you specify how many points above and below each landmark that should be used for training. Note that the optimal choice depends on how the image looks like around the object shape.

Stage 1: Training

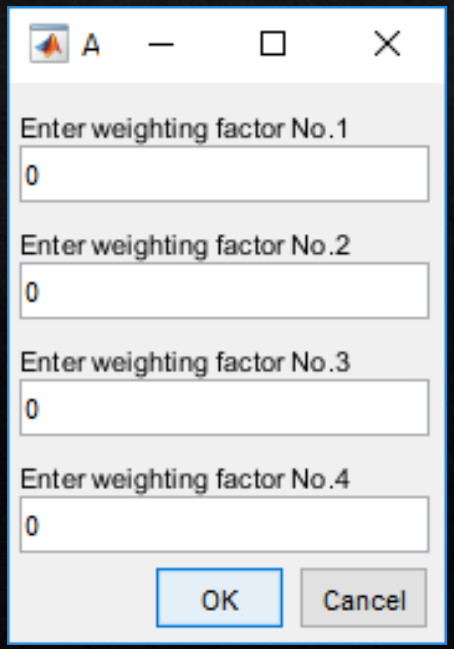
- Selecting landmarks
  - After you have selected your parameters and clicked OK, a file selection box is displayed and you should select an image (a bmp file). The image will be displayed and you then use the mouse to enter landmark.
  - Click the left mouse button to place a landmark.
  - Move the mouse near a landmark and press the space bar to remove a landmark.
- After you have entered the number of landmarks you specified, you will be prompted to select the next training image.

Stage 1: Training

- Saving the results
  - After you have trained on the last image, the training data will be aligned and the ASM model will be computed. You then have the option to save your result. If you choose to save your data, the ASM model will be saved and you can in subsequent session load the data and you don’t have to retrain the model.

Stage 2: Trying weights

- After training, or after you have loaded a saved file, you can look at the modes of variation in your model. To do this, select Try weights and the dialogue below will be displayed. You can then enter different weighting factors and the deformed shape will be displayed.

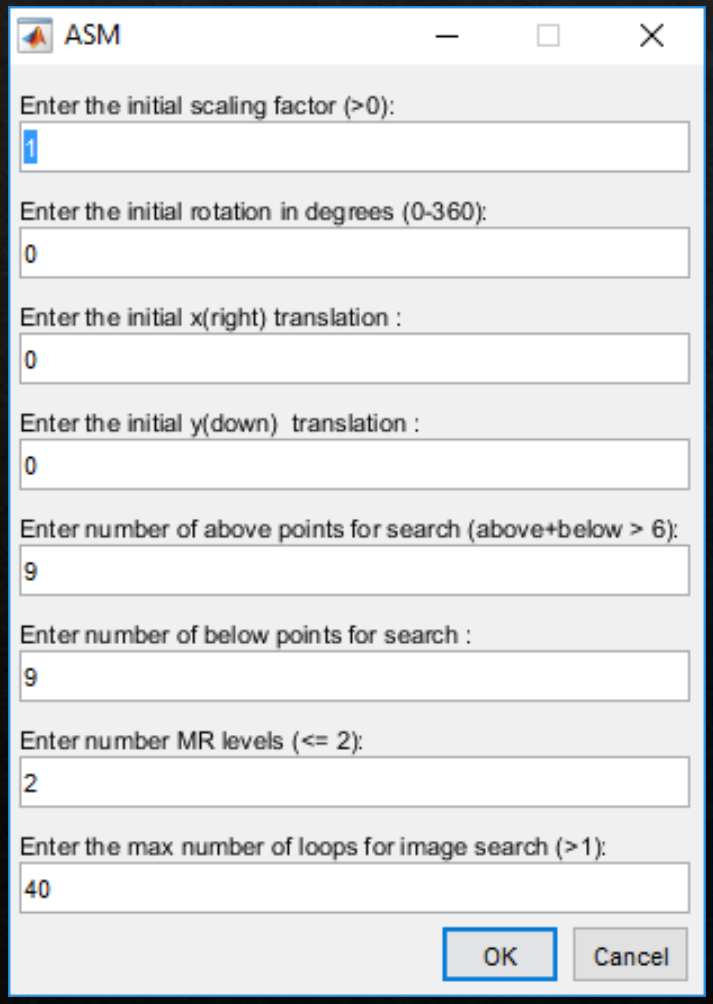


Stage 2: Trying weights

- Note
  - The weighting factors are given in arbitrary numbers. You can for example try to enter +70 and then -70.
  - In this example, four weighting factors can be entered. When you train the model on some new data, you may get more or less weighting factors.

Stage 3: Searching for a shape in an image

- In this stage, you can use the ASM model to search for a shape in an image. You will be prompted to select an image and after that, the dialogue below will be displayed.



Stage 3: Searching for a shape in an image

- Select parameters and click OK. The image will then be displayed and the contour of the searched shape will be outlined. If the initial position is not close enough, answer no when prompted and adjust the parameters in the dialogue.
- Note: *MR levels* means multi resolution levels. If you select 5, you will start the optimization at a very low resolution. This may cause the contour to drift away from its position close to the boundary. For most applications 2 MR levels work fine.

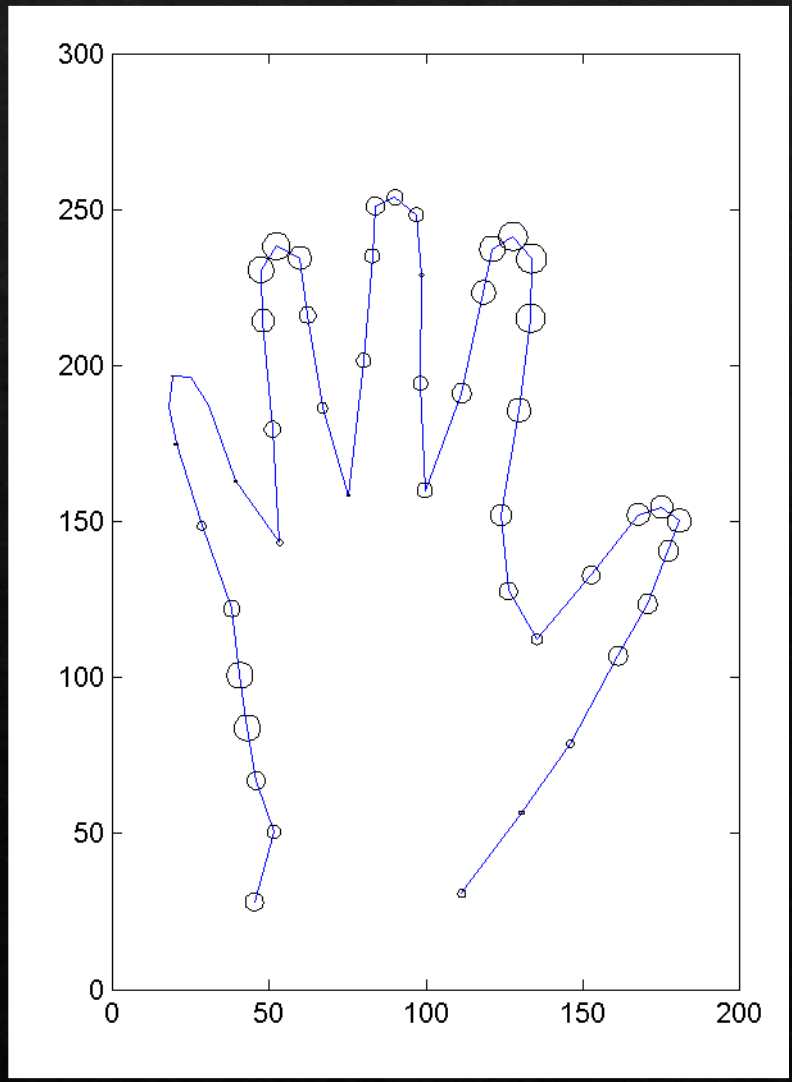
Assignment

- The dataset you will work with are 7 binary images of right hands from doctoral students at the CBA. All images (hand1.bmp,…, hand7.bmp) are located in the directory **asm/images.**

Assignment

- Your task:
  1. Train the ASM. To get familiar with the program, you may wish to start with a small structure such as one finger so you just have to enter a few landmarks. Once you are familiar with the interface etc. train the ASM using more landmarks. Try to segment the whole hand.

     Note: It is very important that you should place the landmarks in about the same position in all images. A sketch on a piece of paper can help you to plan the positioning.



Assignment

- Your task:
  2. Save the result to a file.
  3. Try weights. Explore the variations of the training set.
  4. Try the third stage and try to search for the trained shape in a new image. Since the model was trained on only a few examples, you can select one of the images in the training set. Alternatively, you can train the ASM on 6 images and then apply the model to the 7th one.

Assignment

- As an additional, non-mandatory assignment, you have also, if you have been bored with the binary case, three sets of greyscale images available for testing:
  1. head1.bmp,… head6.bmp. These are MRI-images representing axial slices at the level of the cerebellum.
  2. corp1.bmp,… corp6.bmp. A close-up of a structure of the brain, the corpus calosum in the sagittal plane

Report

- Describe what is done during the three stages. That is, relate what is done to the theory about ASMs and describe shortly what is computed etc. during the stages. Give also a short description of what you did, problems you saw, and include an image of the result. Answer the following question:
  1. Trying weights: How each mode affects the hand shape by adjusting its value (refer to weight factors in Page 8)? Please also take a screenshot of resulting image to illustrate;
- Submit your report to TA
  - A word file (“ID_name_lab2.doc”)
  - 1350588-1452737: js_lab@163.com
  - 1452741-1452844: 0628yulu@tongji.edu.cn