Nasri Chiheb

AVPR Lab: Assignment 1

Automatic nipple detection in breast thermograms

Introduction:

The purpose of the this first assignment is to elaborate a nipple detection in breast thermograms. The algorithm is implemented with MATLAB using mainly the Image processing toolbox library. The algorithm follows three steps described in the article "Automatic nipple detection in breast thermograms" from Mohamed Abdel-Nasser∗, Adel Saleh, Antonio Moreno, Domenec Puig.
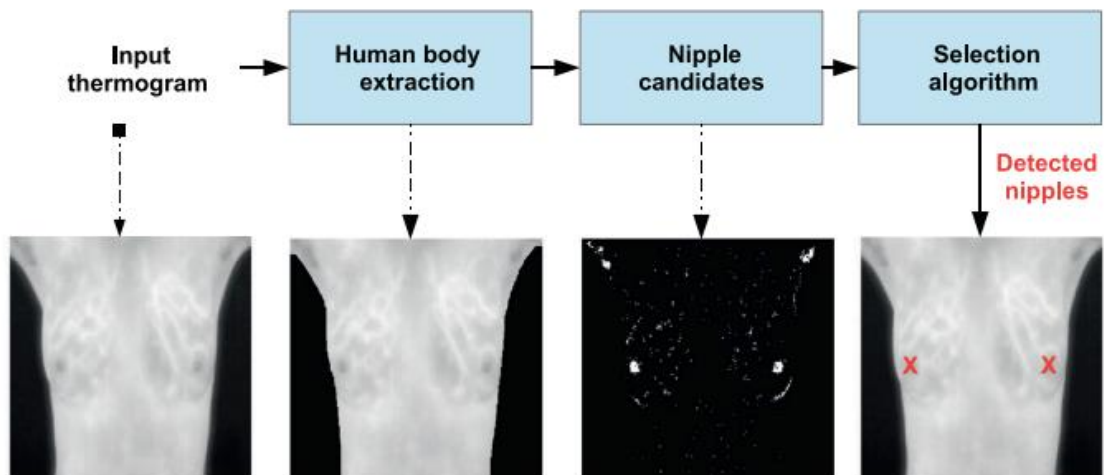
Method description

Fig. 1. Proposed system.

The algorithm follows three steps as we can see from Fig1 extracted from the article. The algorithm needs an input image then follows the human body extraction, Nipple candidates' extraction and selection, selection of nipples. Besides this report the code is included and commented to get furthermore technical details.

- First step, the human body extraction consists in the extracting the body from the input image by basically delating the background using mask and other process to clean the image. This is what we call segmentation
- Nipple candidates are determined by adaptative thresholding algorithm using median operator with local neighborhood. All parameters were chosen following the article.
- Nipple selection algorithm follows five rules described in the article. First, we exclude zones without nipples, and small candidates. Then we focus on nipples characteristics (roundness, area, and circularity)
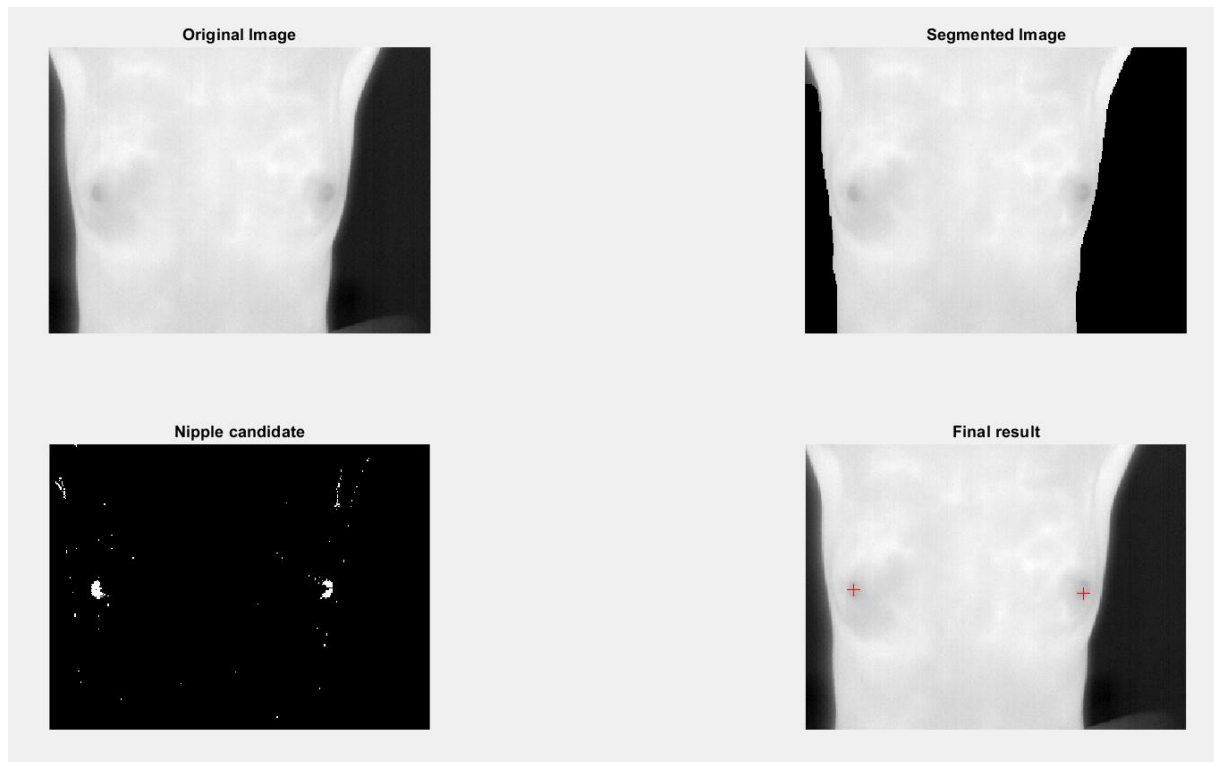
Fig 2: Algorithm steps

How it works:

Prerequisites:

- MATLAB
- Image processing toolbox
- Computer Vision toolbox

How it works:

- Launch nipple_nasri.m
- Select the image to analyze (define the parameter Original_image)
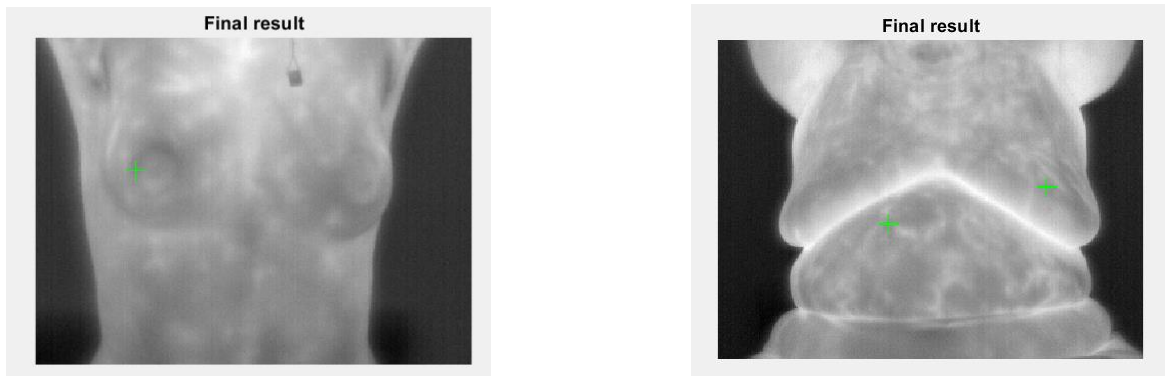- Run the code

Results:

Fig3: Cases of algorithm fail

The algorithm was tested with six images. In four cases the detection was right and accurate. In one of the results only one nipple was detected (Fig3). The last result detected a false positive (Fig3). For a group of six images the algorithm has 67% success taking account that the set is small, and images were chosen.

The algorithm can be optimized and improved. I think we should focus on the parameters. We can, for example, train this algorithm with bigger sets of images and looping until parameters optimization.

Finally, this first activity was interesting. I already had experiences with MATLAB, but it was first time with images. Also, the method of working is quite new for me. Indeed, translating the algorithm description from the article into a real algorithm was challenging for me due to its time consumption (reading the doc to get the best function, trying to fit to article's method…). Overall, studying images with MATLAB was a good experience.