

Folder Structure

- Zip folder contains 15 files and a folder.
- 10 of the “.pgm” files are input fingerprint images to MATLAB.
- “RidgeOrientation.m” file is matlab code for computing orientation field.
- “drawOrientation.m” file is supporting matlab code for display output image.
- “PointCare.m” is matlab code to find singularities. (INCOMPLETE)
- Report is present in “Report.pdf”
- 10 “.jpg” files are output images of computed orientation field(present in Output Images folder).
- “PaperToComputeOrientation.pdf” is reference paper to compute orientation(page 4 and 5).

Instructions to Run Matlab Code (Tested on Matlab 2011a)

- Orientation Field Computation
 1. Open “RidgeOrientation.m” file in Matlab and run the code.
 2. There will be a popup to change directory.
 3. Click on “change directory” button.
 4. A new window will be launched to accept the input fingerprint image.
 5. Click on File Types and select “All files”
 6. Now, select fingerprint image to test.
 7. Matlab will generate a window showing generated orientation field.
 8. Similarly test remaining fingerprint images

Algorithm to Compute Orientation Field

1. Divide the input image into blocks (10*10).
2. Compute the gradient(G_x and G_y) in x and y direction using sobel filters.
3. Calculate orientation (θ_{gb}) as below. (Reference paper is present in the zip file)

$$\begin{aligned}\overline{G}_{sy}(x, y) &= \sum_{i=-\omega/2}^{\omega/2} \sum_{j=-\omega/2}^{\omega/2} 2G_x(x+i, y+j)G_y(x+i, y+j) \\ \overline{G}_{sx}(x, y) &= \sum_{i=-\omega/2}^{\omega/2} \sum_{j=-\omega/2}^{\omega/2} (G_x(x+i, y+j)^2 - G_y(x+i, y+j)^2) \\ \overline{\phi}(x, y) &= \frac{1}{2} \tan^{-1} \frac{\overline{G}_{sy}(x, y)}{\overline{G}_{sx}(x, y)} \\ \theta_{gb}(x, y) &= \overline{\phi}(x, y) + k\pi\end{aligned}$$

where:

$$k = \begin{cases} \frac{1}{2} & \text{when } (\overline{\phi}(x, y) < 0 \wedge \overline{G}_{sy}(x, y) < 0) \vee (\overline{\phi}(x, y) \geq 0 \wedge \overline{G}_{sy}(x, y) > 0) \\ 1 & \text{when } \overline{\phi}(x, y) < 0 \wedge \overline{G}_{sy}(x, y) \geq 0 \\ 0 & \text{when } \overline{\phi}(x, y) \geq 0 \wedge \overline{G}_{sy}(x, y) \leq 0 \end{cases}$$

Results

Input Fingerprint Image	Orientation Field overlaying on Original Image
	
	
	





