Programming Assignment #2

Due date: November 08 (TUR), 2018, 23:59 pm

Submission: FTP Server Upload

1. Implementation the motion estimation using MAP estimator. Please refer to Konrad paper (further reading) and examples on the page 148 in the text book. The motion field obtained by the Horn-Schunck method in PA#01 can be used as the initial motion field for the MAP estimator. Please implement in a way of step by step as follows. (Notice: use the same video sequence used in the previous PAs)

(a) Set up MAP estimator framework without occlusion and line fields. Implement the framework and estimate the motion vector (i.e., displacement). Analyze the experimental results and estimation errors.

(b) Do the same task of (a) with occlusion field. Similar to (a), analyze the experimental results and show the reduction of estimation errors.

- Hint for occlusion field ($\mathbf{o}(x,y)$)
  - With the initial motion field by Horn-Schunck method, you can find the occluded regions ($\mathbf{o}(x,y)$) where the motion compensated errors (ε^2) are higher than specific threshold (T_0). Refer to the slide on the page 15 of LectureNote#12.
  - After obtaining the occlusion field ($\mathbf{o}(x,y)$), the U_o can be calculated (*assumption: all $V_o^c(\mathbf{o}(x,y)|\boldsymbol{l}, s_{k-1}) = \mathbf{o}(x,y)T_0$).
  - Finally, the total energy function can be calculated by Eq. on the page 12 of LectureNote#12

(c) Do the same task of (a) with line field. Similar to (a), analyze the experimental results and show the reduction of estimation errors.

- Hint for line field ($\boldsymbol{l}(x,y)$)
  - The line filed can be defined in the horizontal and vertical directions
  - The line filed can be obtained by checking the horizontal or vertical edges (i.e., discontinuities). Therefore, horizontal and vertical gradient map are required for line field. The slide on the page 7 of LectureNote#12 shows how to calculate the line field.
  - After obtaining the line field, the line potential can be calculated by using clique potentials on the page 8 of LectureNote#12. The clique potentials have 6 cases according to the structure of the neighboring edges. First, you can check the line field in horizontal and vertical direction. Then, assign the clique potential into each point.
  - Finally, the energy term for line field, U_d can be calculated by V_d^c. Refer to the 14 page of LectureNote#12.

(d) Do the same task of (a) with occlusion field and line field. Similar to (a), analyze the experimental results and show the reduction of estimation errors.

- Hint
  - The total energy function you have to minimize is given on the page 19 of LectureNote#12.

(e) Comment on the prior probabilities (for motion field, line field, and occlusion field) you used and compare them with those from Konrad and Dubois.

 # FTP Server Information (FTP Server: 210.107.130.66)

- Please make a "*.zip" file that includes program source code and report.
- Then, submit to the folder ("**07_PA_submission**") in the FTP server (Ex: "PA#1_HongGilDong.zip").
  - Do not write your student ID
- C/C++, MATLAB, or openCV are allowed (but the core algorithm should be written by yourself).

 # Following files can be downloaded in the course web page (ftp:// 210.107.130.66/06_PA/).

- Video file: "Calendar_CIF30.yuv"
- YUV viewer: "YUV viewer.exe"

 # Evaluation policy: Report (50%) and Source code (50%)