Module: Computer Vision - Session 4

Computer Vision

Dr. Sunita Dhavale, DIAT

Online Training & Certification Course on Artificial Intelligence & Machine Learning

Defence Institute of Advanced Technology (DU), Pune.

Computer Vision

Dr Sunita Dhavale

Edge Detection Techniques

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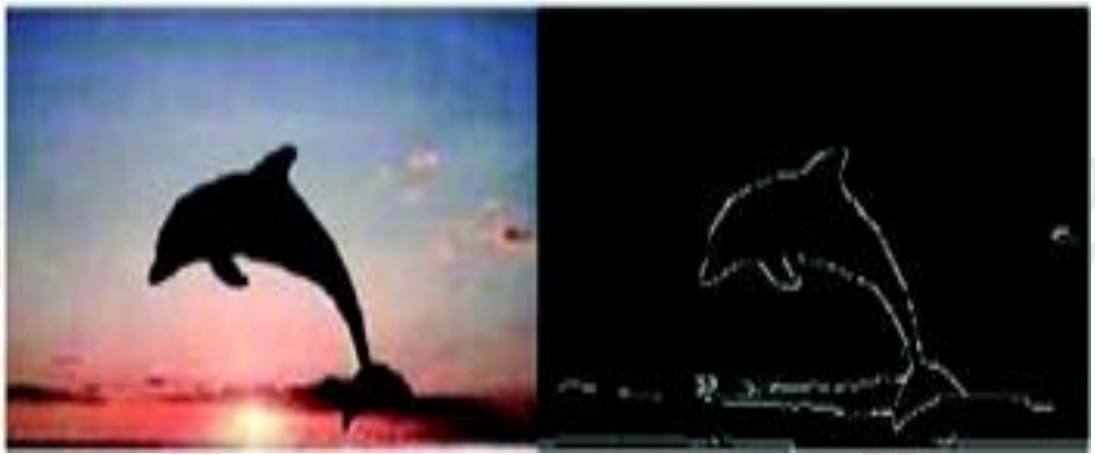
Defence Institute of Advanced Technology (DU), Pune.

Outline of Presentation

- Introduction
- Roberts Cross Edge Detector
- Sobel Edge Detector
- Laplacian Edge Detector
- Canny edge detection algorithm

Introduction



Roberts Cross Edge Detector

+1	0
0	-1

Gx

0	+1
-1	0

Gy

Sobel Edge Detector

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy

Roberts Edge Detection

Sobel Edge Detection

Laplacian Edge Detector

0	−1	0
−1	4	−1
0	−1	0

−1	−1	−1
−1	8	−1
−1	−1	−1

0	1	1	2	2	2	1	1	0
1	2	4	5	5	5	4	2	1
1	4	5	3	0	3	5	4	1
2	5	3	-12	-24	-12	3	5	2
2	5	0	-24	-40	-24	0	5	2
2	5	3	-12	-24	-12	3	5	2
1	4	5	3	0	3	5	4	1
1	2	4	5	5	5	4	2	1
0	1	1	2	2	2	1	1	0

Canny Edge Detector

- image is smoothed by Gaussian convolution
- first derivative operator
- Edges give rise to ridges in the gradient magnitude image.
- *non-maximal suppression*
- The tracking process exhibits hysteresis controlled by two thresholds: *T1* and *T2*, with *T1* > *T2*. Tracking can only begin at a point on a ridge higher than *T1*.
- Tracking then continues in both directions out from that point until the height of the ridge falls below *T2*. This hysteresis helps to ensure that noisy edges are not broken up into multiple edge fragments.

Reference Material

- 1. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.
- 2. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.
- 3. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
- 4. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
- 5. Sunita Dhavale, “Advanced Image-Based Spam Detection and Filtering Techniques”, Book Published by CyberTech: An Imprint of MKP Technologies, Hershey, PA, USA IGI Global, March 2017, ISBN13: 9781683180135|ISBN10: 1683180135|EISBN13: 9781683180142|DOI: 10.4018/978-1-68318-013-5.
- 6. Gonzalez and R. Woods Digital Image Processing, Addison-Wesley Publishing Company, 1992, p 442.

<<Epilogue>>

- We will meet in next scheduled lecture.
- Try to implement the algorithms in python.
- Feel free to ask your questions.
- Email: sunitadhavale@diat.ac.in

Thank You!