Appendix A: Texture samples



Appendix B: Synthesis and relighting results from the five methods for 23 textures. Arrows indicate illumination directions ($\tau = 60^{\circ}$ and $\tau = 120^{\circ}$).







Sample	31 Method	Gradient Method	PTM Method	<i>Eigen3</i> Method	Eigen6 Method
2 aam					2
aam					5
acc					2
S acc				5	
acd					
acd					

Sample	31 Method	Gradient Method	PTM Method	Eigen3 Method	Eigen6 Method
aai					2
aai		5		\$	\$
	∕X				



















Appendix C: Rank data of the five synthesis approaches

Texture	Rank of Methods				
Label	31	Gradient	PTM	Eigen 3	Eigen6
	1	3	2	5	4
	5	3	4	1	2
	5	2	4	1	3
	4	3	5	1	2
aai	4	3	5	1	2
uuj	4	2	5	1	3
	1	5	2	4	3
	5	3	4	1	2
	4	1	5	2	3
	5	1	4	3	2
	4	3	5	1	2
	5	2	4	1	3
	4	5	3	1	2
	4	5	2	3	1
225	5	2	4	3	1
440	5	2	4	3	1
	4	1	5	2	3
	4	3	5	1	2
	4	5	2	1	3
	5	4	1	2	3
	1	2	5	4	3
	5	4	3	1	2
	5	1	4	2	3
	4	1	3	5	2
ace	5	3	4	1	2
	4	1	5	3	2
	4	2	1	5	3
	5	1. 5	4	3	1. 5
	5	2	3	1	4
	5	2	1	4	3
	5	2	4	3	1
	4	2	5	1	3
	5	1	4	2	3
	4	3	2	1	5
add	5	1	4	2	3
	5	2	4	1	3
	4	2	5	3	1
	4	1	5	3	2
	4	1	5	2	3
	4	5	1	2	3

Texture	Rank of Methods				
Label	3/	Gradient	PTM	Eigen 3	Eigen6
	5	3	4	2	1
	4	1	5	2	3
	5	4	1	2	3
	4	1	5	2	3
adc	5	2	4	1	3
auc	5	1	4	2	3
	5	3	4	2	1
	5	3	4	2	1
	3	1	5	2	4
	4	5	2	3	1
	5	1	4	2	3
	5	4	1	3	2
	4	1	5	3	2
	5	2	4	1	3
aai	5	3	4	1	2
uui	5	3	4	1	2
	5	3	4	2	1
	5	1	4	3	2
	5	3	4	2	1
	4	2	3	1	5
	5	1	3	2	4
	5	2	3	1	4
	5	1	3	4	2
	5	3	4	2	1
acd	5	1	3	2	4
	4	5	3	2	1
	4	3	1	5	2
	5	2	1	4	3
	5	4	1	3	2
	1	4	2	3	5
	2	5	1	4	3
	5	2	1	3	4
	4	1	3	2	5
	5	1	4	2	3
aar	5	4	3	1	2
	3	4	5	2	1
	5	3	4	1	2
	3	2	1	5	4
	1	5	2	3	4
	2	4	1	3	5

Texture	Rank of Methods				
Label	31	Gradient	ΡTΜ	Eigen 3	Eigen6
	4	1	3	2	5
	5	1	2	4	3
	4	3	1	2	5
	5	1	4	3	2
ach	5	2	4	3	1
	5	4	3	2	1
	5	3	2	4	1
	5	4	3	2	1
	5	1	4	3	2
	5	1	2	4	3
	5	1	2	4	3
	5	3	4	1	2
	5	3	1	2	4
	5	3	4	1	2
aci	5	3	4	2	1
	5	3	4	2	1
	5	2	4	3	1
	5	2	4	3	1
	4	5	3	1	3
	5	4	1	2	3
	2	1	4	5	3
	5	1	4	3	2
	4	1	2	3	5
	5	2	1	4	3
abi	4	3	5	2	1
	3	4	5	2	1
	2	1	3	5	4
	1	2	3	4	5
	3	5	1	4	3
	3	4	2	5	1

Note: 1-best; 5-worst.

Appendix D: List of publications by the author

Capture and synthesis of 3D surface texture

Junyu Dong and Mike Chantler

Abstract

This paper presents and compares six novel approaches for capturing, synthesising and relighting real 3D surface textures. Unlike 2D texture synthesis these techniques allow the captured textures to be relit using illumination conditions, and viewing angles, that differ from those of original. Our approaches each comprise two stages: synthesis and relighting. Synthesis can be applied either before or after relighting. The relighting stage is implemented in three different ways: using image-based, gradient-based, and height-based approaches. Thus there are a total of six different ways in which we may combine these functions. We present a representative set of results selected from our experiments with 30 textures. The best images are obtained when image-based or gradient-based relighting is used after synthesis.

Published in the Proceeding of the 2nd International Workshop on Texture Analysis & Synthesis. 1 June 2002, Copenhagen, Denmark, pp.41-45.

Capture and synthesis of 3D surface texture

Junyu Dong and Mike Chantler

Abstract

We present and compare five approaches for capturing, synthesising and relighting real 3D surface textures. Unlike 2D texture synthesis techniques they allow the captured textures to be relit using illumination conditions that differ from those of the original. We adapted a texture quilting method due to Efros and combined this with five different relighting representations, comprising: a set of three photometric images; surface gradient and albedo maps; polynomial texture maps; and two eigen based representations using 3 and 6 base images.

We used twelve real textures to perform quantitative tests on the relighting methods in isolation. We developed a qualitative test for the assessment of the complete synthesis systems. Ten observers were asked to rank the images obtained from the five methods using five real textures. Statistical tests were applied to the rankings.

The six-base-image eigen method produced the best quantitative relighting results and in particular was better able to cope with specular surfaces. However, in the qualitative tests there were no significant performance differences detected between it and the other two top performers. Our conclusion is therefore that the cheaper gradient and three-base-image eigen methods should be used in preference, especially where the surfaces are Lambertian or near Lambertian.

Submitted to International Journal of Computer Vision: special issue on texture analysis and synthesis, November, 2002.

Comparison of five 3D surface texture synthesis methods

Junyu Dong and Mike Chantler

Abstract

We present and compare five approaches for synthesizing and relighting real 3D surface textures. We adapted Efros's texture quilting method and combined it with five different relighting representations, comprising: a set of three photometric images; surface gradient and albedo maps; polynomial texture maps; and two eigen based representations using 3 and 6 base images. We used twelve real textures to perform quantitative tests on the relighting methods. We develop a systematic qualitative test for the assessment of the complete synthesis systems. Our conclusion is that the cheaper gradient and three-base-image eigen methods should be used in preference to the other methods, especially where the surfaces are Lambertian or near Lambertian.

Published in the Proceeding of the 3rd International Workshop on Texture Analysis & Synthesis. 17 October 2003, Nice, France.

Estimating Parameters of Illumination models for the synthesis of 3D surface texture

Junyu Dong Andrew Spence Mike Chantler

This paper proposed a method to estimate the parameters of an illumination model and then use these parameters for the synthesis of specular surface textures. We used the relationship between surface gradient maps in frequency domain as a constraint for the separation of diffuse and specular components. During the estimation, we always keep errors between the real images and reconstructed images as small as possible. The estimated parameters form sample surface representation maps, which are then used as inputs for the synthesis of large representation maps. The synthesised representations are finally relit using the illumination model to produce new images under arbitrary illumination directions.

Research memoriam 2003/03, Department of Computer Science, Heriot-Watt University, Edinburgh,UK.

References

- [Ashikhmin2001] Ashikhmin, M. 2001. Synthesizing Natural Textures. In the proceedings of 2001 ACM Symposium on Interactive 3D Graphics, Research Triangle Park, North Carolina March 19-21, pp. 217-226.
- [Ashikhmin2002] Ashikhmin, M. and Shirley, P. 2002. Steerable Illumination Textures. ACM Transactions on Graphics, v.21, no. 1, pp. 1-19.
- [Ashlock1999] Ashlock, D. and Davidson, J. 1999. Texture synthesis with tandem genetic algorithms using nonparametric partially ordered Markov models. Evolutionary Computation, CEC 99. Proceedings of the 1999 Congress on, Volume: 2, 1999 -1163 Vol. 2.
- [Bader1995]Bader, D. A.; JaJa, J. and Chellapa, R. 1995. Scalable
data parallel algorithms for texture synthesis using
Gibbs random fields. IEEE Transactions on Image
Processing. Vol. 4, No.10. pp.1456-1460.
- [Bar-Joseph2001] Bar-Joseph, Z.; El-Yaniv, R.; Lischinski, D. and Werman, M. 2001. Texture mixing and texture movie synthesis using statistical learning. IEEE Transactions on visualization and computer graphics, Vol. 7, No. 2, Apri-June 2001.
- [Basri2001] Basri, R. and Jacobs, D. 2001. Lambertian reflectance and linear subspaces. In Proceedings. Eighth IEEE International Conference on Computer Vision. ICCV 2001. Volume: 2, 2001. Page(s): 383–390.
- [Belhumeur1997] Bellhumer, P. N.; Hespanha, J. and Kriegman, D. 1997. Eigenfaces vs. fisherfaces: Recognition using class specific linear projection. IEEE Transactions on Pattern Analysis and Machine Intelligence, Special Issue on Face Recognition, 17(7):711--720.
- [Blinn, 1978]Blinn, J. F. 1978. Computer Display of Curved
Surfaces. Ph.D. Thesis, University of Utah.
- [Bolin1998] Bolin, M. R. and Meyer, G. W. 1999. A perceptually based adaptive sampling algorithm. Proceedings of

SIGGRAPH 98, 299-309.

[Burschka2003]	Burschka, D.; Cobzas, D.; Dodds, Z.; Hager, G.; Jagersand, M. and Yerex, K. 2003. IEEE Virtual Reality 2003 tutorial 1: Recent Methods for Image- based Modelling and Rendering. March 2003.
[Campisi2002]	Campisi, P. and Scarano, G. 2002. A multiresolution approach for texture synthesis using the circular harmonics functions. IEEE Transactions on Image Processing, Vol. 11, No. 1.
[Chen1995]	Chen, S. E. 1995. QuickTime VR—An image-based approach to virtual environment navigation. In Proceedings of Computer Graphics, Ann. Conf. Eries, SIGGRAPH, August 1995, pp29-38.
[Cohen2003]	Cohen, M. F.; Shade, J.; Hiller, S. and Deussen, O. 2003. Wang Tiles for Image and Texture Generation. SIGGRAPH2003.
[Coleman1982]	Coleman, E. N. and Jain, R. 1982. Obtaining 3- dimensional shape of textured and specular surfaces using a four-source photometry. Computer graphics and image processing, 18:309-328.
[Cook1982]	Cook, R. L. and Torrance, K. E. 1982. A Reflectance Model for Computer Graphics. ACM Transactions on Graphics (TOG). Volume 1, Issue 1. Pages: 7 – 24.
[Copeland2001]	Copeland, A. C.; Ravichandran, G. and Trivedi, M. M. 2001 Texture synthesis using gray-level co-occurrence models: algorithms, experimental analysis, and psychophysical support, Opt. Eng. 40, pp. 2655.

- [Cross1983] Cross, G. R. and Jain, A. K. 1983. Markov random fields texture models. IEEE, PAMI, 5, pp. 25-39.
- [Dana1999a] Dana, K. J.; Van Ginneken, B.; Nayar, S. K. and Koenderink, J. J. 1999. Reflectance and Texture of Real-World Surfaces. ACM Transactions on Graphics, Vol. 18, No. 1, Pages 1-34.
- [Dana1999b] Dana, K.J. and Nayar, S. K. 1999. 3D Textured Surface

	Modelling. Nayar WIAGMOR Workshop CVPR '99
[Daniel1990]	Daniel, W.W. 1990. Applied nonparametric statistics, 2^{nd} ed. PWS-LENT Publishing Company. Boston.
[De Benet1997]	De Benet, J.S. 1997. Multiresolution sampling procedure for analysis and synthesis of texture images. In Computer Graphics Proceedings, SIGGRAPH 97. ACM. pp.361.
[Debevec2000]	Debevec, P.; Hawkins, T.; Tchou, C.; Duiker, H.; Sarokin, W. and Sagar, M. 2000. Acquiring the reflectance field of a human face. Computer Graphics (SIGGRAPH2000 proceedings), July 2000, pp. 145- 156.
[Dong2002a]	Dong, J. and Chantler, M. 2002. Capture and synthesis of 3D surface texture. Proceeding of the 2nd International Workshop on Texture Analysis & Synthesis. 1 June 2002, Copenhagen, Denmark, pp.41- 45.
[Dong2002b]	Dong, J. and Chantler, M. 2002. Capture and synthesis of 3D surface texture. Submitted to International Journal of Computer Vision: special issue on texture analysis and synthesis. November 2002.
[Dong2003a]	Dong, J. and Chantler, M. 2003. Comparison of five 3D surface texture synthesis methods. Proceeding of the 3 rd International Workshop on Texture Analysis & Synthesis. 17 October 2003, Nice, France.
[Dong2003b]	Dong, J.; Spence, A. and Chantler, M. 2003. Estimating Parameters of Illumination models for the synthesis of 3D surface texture. Research memoriam 2003/03, Department of Computer Science, Heriot-Watt University, Edinburgh, UK.
[Drbohlav2002]	Drbohlav, O. and Sára, R. 2002. Specularities Reduce Ambiguity of Uncalibrated Photometric Stereo. Proceedings of 7th European Conference on Computer Vision, Copenhagen, Denmark, May 28-31, 2002, pp. 46-62.
[Efros1999]	Efros, A. A. and Leung, T. K. 1999. Texture synthesis

	by non-parametric sampling. In Proceedings of the Seventh IEEE International Conference on Computer Vision. IEEE Comput. Soc. Part vol.2, pp.1033-8.
[Efros2001]	Efros, A. A. and Freeman, W. T. 2001. Image Quilting for Texture Synthesis and Transfer. In Proceedings of the 28 th annual conference on Computer graphics and interactive techniques, Pages: 341 - 346 Los Angeles, California
[Eom1998]	Eom, K. B. 1998 2-D Moving Average models for texture synthesis and analysis. IEEE Transactions on Image Processing, Vol. 7, No12, pp.1741-1746.
[Epstein1995]	Epstein, R.; Hallinan, P.W.; Yuille, A.L. 1995. 5 ± 2 eigenimages suffice: an empirical investigation of low- dimensional lighting models. In Proceedings of the Workshop on Physics-Based Modeling in Computer Vision. Page(s): 108.
[Frankot1988]	Frankot, R. T. and Chellapa, R. 1988. A method for enforcing integrability in shape from shading algorithms. IEEE transactions on pattern analysis and machine intelligence, 10(4),:439-451, July 1988.
[Garber1981]	Garber, D. D. 1981. Computational models for texture analysis and texture synthesis. PhD thesis, University of Southern California, Image Processing Institute.
[Georghiades1999]	Georghiades, A. S.; Belhumeur, P. N. and Kriegman D. J. 1999. Illumination-Based Image Synthesis: Creating Novel Images of Human Faces Under Differing Pose and Lighting. In Proc. Workshop on Multi-View Modeling and Analysis of Visual Scenes pp. 47-54.
[Gortler1996]	Gortler, S. J.; Grzeszczuk, R.; Szeliski, R. and Cohen, M. F. 1996. The lumigraph. In Proc. Computer Graphics, Ann. Conf. Series, SIGGRAPH, August 1996. Pp.43-54.
[Gousseau2002]	Gousseau Y. 2002. Texture synthesis through level sets. Proceedings of the 2^{nd} international workshop on texture analysis and synthesis. pp. 53-58, Copenhagen, Denmark.

[Gullón2002]	Gullón, C. 2002. Height recovery of rough surfaces from intensity images. PhD thesis, School of Engineering and Physical Sciences, Heriot-Watt University.
[Harrison2001]	Harrison, P. 2001. A non-hiearachical procedure for re- synthesis of complex textures. In WSCG'2001, pages 190-197, Plzen, Czech Republic.
[He1991]	He, X. D.; Torrance, K.E.; Sillion, F. X. and Greenberg, D. P. 1991. A comprehensive physical model for light reflection. Proceedings of SIGGRAPH 1991, pp. 175-185.
[Heeger1995]	Heeger, D.J. and Bergen, J.R. 1995. Pyramid-based texture analysis/synthesis. In Proceedings International Conference on Image Processing (Cat. No.95CB35819). IEEE Comput. Soc. Press. Part vol.3, pp.648-51.
[Hertzmann2001]	Hertzmann, A.; Jacobs, C. E.; Oliver, N.; Curless, B. and Salesin, D. H. 2001. Image analogies. Proceedings of the 28th annual conference on Computer graphics and interactive techniques Pages: 327 – 340.
[Hochberg1987]	Hochberg, Y. and Tamhane, A. C. Multiple Comparison Procedures, 1987, Wiley.
[Horn1989]	Horn, B. and Brooks, M. 1989. Shape from Shading. MIT Press, Cambridge, MA.
[Huang1984]	Edited by Huang, T. S. Image reconstruction from incomplete observations. Published by Jai, 1984.
[Ikeuchi1991]	Ikeuchi, K. and Sato, K. 1991. Determining reflectance properties of an object using range and brightness images Pattern Analysis and Machine Intelligence, IEEE Transactions on, Volume: 13 Issue: 11, Nov. 1991. Page(s): 1139–1153.
[Iversen1994]	Iversen, H. and Lonnestad, T. 1994. An evaluation of stochastic models for analysis and synthesis of gray-scale texture. Pattern Recogniton Letters 15 (1994) pp. 575-585.

[Jacovitti1998]	Jacovitti, G.; Neri, A. and Scarano G. 1998 Texture synthesis-by-analysis with hard-limited Gaussian process. IEEE Transactions on Image Processing, Vol 7, No.11, pp. 1615-1621.
[Julesz1962]	Julesz, B. 1962. Visual patter discrimination. IRE Transaction on Information Theory. IT-8:84-92, 1962.
[Kang1997]	Kang S. B. 1997. A survey of image-based rendering techniques. Technical Report. Cambridge Research Laboratory, CRL 97/4. August 1997.
[Kaplan2000]	Kaplan, C. S. and Salesin, D. H. 2000. Escherization. Proceedings of the 27 th annual conference on Computer graphics and interactive techniques Pages: Pages: 499 – 510 Year of Publication: 2000 ISBN:1-58113-208-5
[Kautz2000]	Kautz, J. and Seidel HP. 2000. Towards Interactive Bump Mapping with Anisotropic Shift-Variant BRDFs. Proc. of Eurographics/SIGGRAPH Workshop on Graphics Hardware.
[Kay1995]	Kay, G. and Caelli, T. 1995. Estimating the parameters of an illumination model using photometric stereo. Graphical models and image processing, Vol. 57, No. 5, September.
[Klette1996]	Klette, R. and Deguchi, K. 1996. Height data from gradient fields. Proceedings of machine vision: applications, architectures and system integration V, SPIE, 2908:204-215.
[Koenderink1996]	Koenderink, J. J.; van Doorn, A. J.; Dana, K. J. and Nayar, S. 1999. Bidirectional reflection distribution function of thoroughly pitted surfaces International Journal Computer Vision, vol. 31, pp. 129144.
[Kokaram2002]	Kokaram, A. 2002. Parametric texture synthesis for filling holes in pictures. In Proceedings of International Conference on Image Processing. 2002., Volume:1, Page(s): 325 –328.
[Koudelka2001]	Koudelka, M. L.; Belhumeur, P. N.; Magda, S. and Kriegman, D. J. 2001. Image-based modeling and rendering of surfaces with arbitrary BRDFs. Computer

Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on, Volume: 1, 8-14. Page(s): I-568 -I-575 vol.1. [Kwatra2003] Kwatra, V.; Schodl, A.; Essa, I.; Turk, G. and Bobick, A. 2003. Graphcut textures: image and video synthesis using graph cuts. SIGGRAPH2003. [Lafortune1997] Lafortune, E. P. F.; Foo, S.-C.; Torrance, K. E. and Greenberg, D. P. 1997. Non-linear approximation of reflectance functions. International Conference on Computer Graphics and Interactive Techniques. Proceedings of the 24th annual conference on Computer graphics and interactive techniques. Pages: 117 – 126. 1997 [Leung2001] Leung, T. and Malik, J. 2001. Representing and Recognizing the Visual Appearance of Materials Using Three-dimensional Textons. International journal of Computer Vision, Vol 43, Number 1, pp 7-27. [Levoy1996] Levoy, M. and Hanrahan, P. 1996. Light field rendering. In Proc. Computer Graphics, Ann. Conf. Series, SIGGRAPH, August 1996, pp. 31-42. [Liang2001] Liang, L.; Liu, C.; Xu, Y.; Guo, B. and Shum, H. 2001. Real-time texture synthesis by patch-based sampling. ACM Transactions on Graphics, Vol. 20, No. 3, July 2001, pp. 127-150. [Lin1999] Lin, S. and Lee, S. W. 1999. Estimation of diffuse and specular appearance. Computer Vision, 1999. The Proceedings of the Seventh IEEE International Conference on, Volume: 2, 20-27 Sept. 1999. Page(s): 855 -860 vol.2. [Lin2001] Lin, Z.; Wong, T. T. and Shum, H. Y. 2001 Relighting with the reflected irradiance field: representation, sampling and reconstruction. Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on, Volume: 1, 2001. Page(s): I-561 -I-567 vol.1 [Liu2001] Liu, X.; Yu, Y. and Shum, H.Y. 2001. Synthesizing

Bidirectional Texture Functions for Real-World Surface.

In Proceedings of the 28th annual conference on Computer graphics and interactive techniques, Pages: 97 – 106. Los Angeles, California.

- [Lu1995] Lu, J. and Little, J. 1995. Reflectance function estimation and shape recovery from image sequence of a rotating object. Computer Vision, 1995. Proceedings, Fifth International Conference on, 20-23 June 1995. Page(s): 80–86.
- [Malzbender2001] Malzbender, T.; Gelb D. and Wolters, H. 2001. Polynomial Texture Maps, In Proceedings of the 28th annual conference on Computer graphics and interactive techniques, Pages: 519 – 528. Los Angeles, California.
- [Matusik2002] Matusik, W.; Pfister, H.; Ngan, A.; Beardsley, P.; Ziegler, R. and McMillan, L. 2002. Image-based 3D photography using opacity hull. ACM Transactions on Graphics (TOG), Proceedings of the 29th annual conference on Computer graphics and interactive techniques July 2002, Volume 21, Issue 3. pp.427-437.
- [McAllister2002] McAllister, D. K.; Lastra, A. and Heidrich, W. 2002. *Efficient Rendering of Spatial Bi-directional Reflectance Distribution Functions*, Graphics Hardware 2002, Eurographics / SIGGRAPH Workshop Proceedings (Saarbrucken, Germany) September.
- [McGunnigle1998] McGunnigle G. 1998. The classification of textured surfaces under varying illuminant directions. PhD thesis, Department of Computing and Electrical Engineering, Heriot-Watt University.
- [McGunnigle2001] McGunnigle, G. and Chantler, M. 2001. Segmentation of rough surfaces using reflectance. Proceedings of British machine vision conference, pp. 323-332, 10-13 September, Manchester, UK.
- [McMillan1999] McMillan, L. and Gortler S. 1999. Image-based rendering: A new interface between computer vision and computer graphics.ACM SIGGRAPH Computer Graphics, Volume 33 Issue 4. Pages: 61 – 64. ISSN:0097-8930.
- [Nayar1990] Nayar, S. K., Ikeuchi, K. and Kanade, T. 1990. Determining Shape and Reflectance of Hybrid Surfaces

by Photometric Sampling, IEEE Journal of Robotics and Automation, Vol. 6, No. 4, pp. 418-431, August 1990.

- [Nayar1991] Nayar, S. K.; Ikeuchi, K. and Kanade, T. 1991. Surface Reflection: Physical and Geometrical Perspectives. IEEE Transactions on Pattern Analysis and Machine Intelligence. Vol. 13, No. 7, pp. 611-634.
- [Nayar1996] Nayar, S. K.; Fang, X. and Boult, T. E. 1996. Separation of Reflection Components Using Color and Polarization. International Journal of Computer Vision, 1996.
- [Nealen2003] Nealen, A. and Alexa, M. 2003. Hybrid Texture Synthesis. Eurographics Symposium on Rendering 2003.
- [Nicodemus1977] Nicodemus, F. E.; Richmond, J.C. and Hsai, J. J. 1977. Geometrical considerations and nomenclature for reflectance. U.S. Dept. of Commerce, Natioal Bureau of Standards, October 1977.
- [Nishino2001] Nishino, K.; Sato, Y. and Ikeuchi, K. 2001. Eigen-Texture method: appearance compression and synthesis based on a 3D model. Pattern Analysis and Machine Intelligence, IEEE Transactions on , Volume: 23 Issue: 11, Page(s): 1257–1265.
- [Oren1994] Oren, M. and Nayar, S. K. 1994. Generalization of Lambert's Reflectance Model, Proceedings of ACM SIGGRAPH 94, Orlando, July 1994.
- [Paget1998] Paget, R. and Longstaff I. D. 1998. Texture synthesis via a noncausal nonparametric multiscale Markov random field. IEEE Transactions on Image Processing, Vol. 7, No.6, June 1998.
- [Parada2001] Parada, P. and Ruiz-del-Solar, J. 2001. Texture synthesis using image pyramids and self-organizing maps. Image Analysis and Processing, 2001. Proceedings. 11th International Conference on, 26-28 Sept. 2001. Page(s): 244 –249.

- [Popat1993] Popat, k. and Picard, R. W. 1993. Novel cluster-based probability model for texture synthesis, classification, and compression. In Proc. SPIE visual communications and Image Processing'93, Boston, Nov 3-11.
- [Portilla2000] Portilla, J. and Simoncelli, E.P. 2000. A parametric texture model based on joint statistics of complex wavelet coefficients. International Journal of Computer Vision, volume 40, issue 1, pages 49-71, December.
- [Press1998] Press, W. H.; Flannery, B. P.; Teukolsky, S. A. and Vetterling, W. T. 1998 Numerical Recipes in C. Cambridge University Press.
- [Ramamoorthi2001] Ramamoorthi, R. and Hanrahan, P. 2001. A signalprocessing framework for inverse rendering International Conference on Computer Graphics and Interactive Techniques. Proceedings of the 28th annual conference on Computer graphics and interactive techniques, Pages: 117 – 128, Year of Publication: 2001.ISBN:1-58113-374-X
- [Ramamoorthi2002] Ramamoorthi, R. 2002. Analytic PCA construction for theoretical analysis of lighting variability in images of a Lambertian object. Pattern Analysis and Machine Intelligence, IEEE Transactions on, Volume: 24 Issue: 10, Page(s): 1322 –1333.
- [Ramasubramanian1999] Ramasubramanian, M.; Pattanaik, S. N.; and Greenberg, D. P. Perceptually based physical error metric for realistic image synthesis. Proceedings of SIGGRAPH 99, 73-82.
- [Robb2003]Robb, M.; Spence, A. D.; Chantler, M. J. and Timmins,
M. Real-Time Per-Pixel Rendering of Bump-mapped
Textures Captured using Photometric Stereo. Vision,
Video, and Graphics 2003, Bath, UK. 10-11 July 2003.
- [Rushmeier1997] Rushmeier, H.; Taubin, G. and Gueziec, A. 1997. Applying Shape from Lighting Variation to Bump Map Capture. In Proceedings of the Eighth Eurographics Rendering Workshop, Saint-Etienne, France, pp. 35-44.
- [Rushmeier1998] Rushmeier, H. E. 1998. Global illumination input. Course notes 5-A basic guide to global illumination. 25th

International Conference on Computer Graphics and Interactive Techniques. SIGGRAPH98.

- [Saito1996] Saito, H.; Omata, K. and Ozawa, S. 1999. Recovery of Shape and Surface Reflectance of Specular Object from Rotation of Light Source, Second International Conference on 3-D Digital Imaging and Modeling (3DIM99), Ottawa, Oct 4-8, 1999, pp.526-535
- [Sato1997] Sato, Y.; Wheeler, M.D. and Ikeuchi, K. 1997. Object shape and reflectance modeling from observation. In Proceedings of the 24th annual conference on Computer graphics and interactive techniques, Pages: 379 – 387
- [Sebe2000] Sebe, N.; Lew, M. S. and Huijsmans, D. P. 2000. Toward improved ranking metrics. Pattern Analysis and Machine Intelligence, IEEE Transactions on, Volume: 22 Issue: 10, Oct. 2000. Page(s): 1132 –1143.
- [Shashua1992] Shashua, A. 1992. Geometry and Photometry in 3D visual Recognition. *PhD thesis, MIT*.
- [Spence2003] Spence, A. D. and Chantler, M. J. 2003. Optimal illumination for three-image photometric stereo acquisition of surface texture. The 3rd International workshop on texture analysis and synthesis. October, 2003, Nice, France.
- [Stavridi1997] Stavridi, M.; van Ginneken, B. and Koenderink, J.J. 1997. Surface bidirectional reflection distribution function and the texture of bricks and tiles. Applied Optics, Vol. 36, No. 16, June.
- [Tong2002] Tong, X.; Zhang, J.; Liu L.; Wang X.; Guo B. and Shum, H.-Y. 2002. Synthesis of bidirectional texture functions on arbitrary surfaces. ACM Transactions on Graphics (TOG). Proc. of the 29th annual conference on Computer graphics and interactive techniques, Volume 21 Issue 3. Pages: 665 – 672.
- [Tonietto2002] Tonietto, L. and Walter, M. 2002. Towards local control for image-based texture synthesis. Computer Graphics and Image Processing, Proceedings. XV Brazilian Symposium on, 7-10 Oct. Page(s): 252 –258.

[Torrance1967]	Torrance, K. E. and Sparrow, E. M. 1967. Theory for off-specular reflection from roughened surfaces. J. Opt. Soc. Am. 57, (Sept. 1967), pp.1105-1114.
[Turk1991]	Turk M. and Pentland, A. 1991. Eigenfaces for recognition. Journal of Cognitive Neuroscience, 3(1):7186.
[Van Nevel1998]	Van Nevel, A. 1998. Texture Synthesis via Matching First and Second Order Statistics of a Wavelet Frame Decomposition. In Proceedings of the 1998 IEEE International Conference on Image Processing (ICIP-98) , Chicago, Illinois. ICIP (1) pp. 72-76.
[Wei2000]	Wei, L. and Levoy, M. Fast texture synthesis using tree- structured vector quantization. In Computer Graphics Proceedings. Annual Conference Series 2000. SIGGRAPH 2000. Conference Proceedings. ACM. pp.479-88.
[Wong2002]	Wong, T.; Fu, C.; Heng P. and Leung, C. 2002. The Plenoptic Illumination Function, IEEE Transactions on Multimedia, Vol. 4, No. 3, September 2002, pp. 361-371.
[Woo1999]	Woo, M.; Neider, J.; Davis, T. and OpenGL Architecture Review Board. 1999. The OpenGL Programming Guide 3rd Edition. The Official Guide to Learning OpenGL Version 1.2.Addison-Wesley Pub Co; 3rd edition (August 6, 1999).
[Woodham1981]	Woodham, R. 1981. Analysing images of curved surfaces. Artificial Intelligence, 17:117-140.
[Xu2001]	Xu, Y.; Zhu, S. C.; Guo, B. and Shum, H.Y. 2001. Asymptotically Admissible Texture Synthesis, In Proc. Second International Workshop of Statistical and Computational Theories of Vision, Vancouver, Canada.
[Zalesny2000]	Zalesny, A. and Van Gool, L. 2000. A compact model for viewpoint dependent texture synthesis. SMILE 2000. Workshop on 3D Structure from Images, Lecture Notes in Computer Science 2018, M Pollefeys <i>et. al.</i> (Eds.), pp.123-143.

[Zalesny2001]	Zalesny, A. and Van Gool, L. 2001. Multiview Texture Models. In Proc. IEEE Computer Soc. Conf. on Computer Vision and Pattern Recognition, Volume: 1, Page(s): 615–1180.
[Zelinka2002]	Zelink, S. and Garland, M. 2002. Towards real-time texture synthesis with the jump map. Proceedings of the 13th Eurographics workshop on Rendering, Pisa, Italy, Pages: 99 – 104. ISBN:1-58113-534-3.
[Zhang1998a]	Zhang, Z. 1998. Modeling Geometric Structure and Illumination Variation of a Scene from Real Images", In Proc. International Conference on Computer Vision (ICCV'98), Bombay,India. Page(s): 1041–1046.
[Zhang1998b]	Zhang, J.; Wang, D. and Tran Q. N. 1998. A wavelet- based multiresolution statistical model for texture. IEEE Transactions on Image Processing, Vol, 7, No. 11, November.
[Zhang2003]	Zhang, J.; Zhou, K.; Velho, L.; Guo, B. and Shum H. Y. 2003. Synthesis of Progressively Variant Textures on Arbitrary Surfaces. SIGGRAPH2003.
[Zhu1998]	Zhu, S. C.; Wu, Y. and Mumford, D. 1998. Filters, Random fields And Maximum Entropy (FRAME). International Journal of Computer Vision 27(2) 1-20, March/April.
[Zhu2000]	Zhu, S.C.; Liu, X.W. and Wu, Y.N. June 2000. Exploring texture ensembles by efficient Markov chain Monte Carlo-Toward a "trichromacy" theory of texture. IEEE Transactions on Pattern Analysis & Machine Intelligence, vol.22, no.6, pp.554-69.