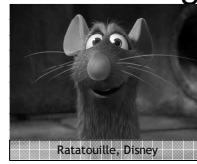


Rendu Expressif Non Photorealistic Rendering NPR

David Vanderhaeghe

Images de synthèse

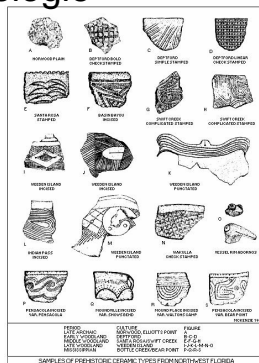
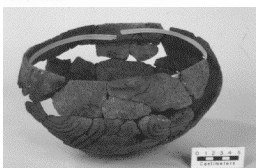


Des images pour quoi faire?

Des images pour quoi faire

- Idées, intentions, émotions
 - Transmettre une information
 - Efficacité du message
- => Lisibilité de l'image

Archéologie



<http://uwf.edu/archaeology/projects/prehist/prehist.htm>

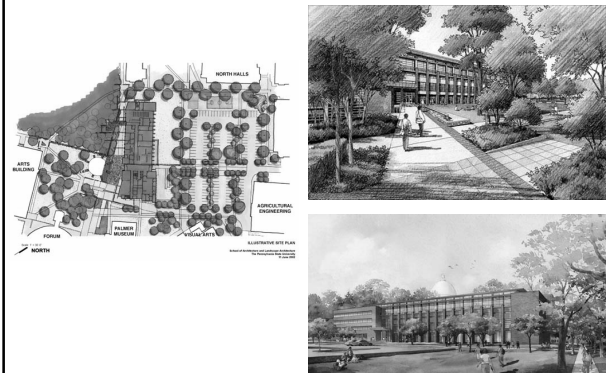
Architecture

Projet de rénovation



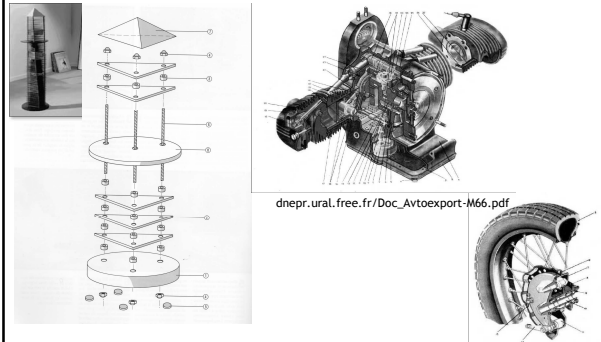
www.archi-fr.net/architecte/projet/

The Stuckeman Family Building for the School of Architecture and Landscape Architecture



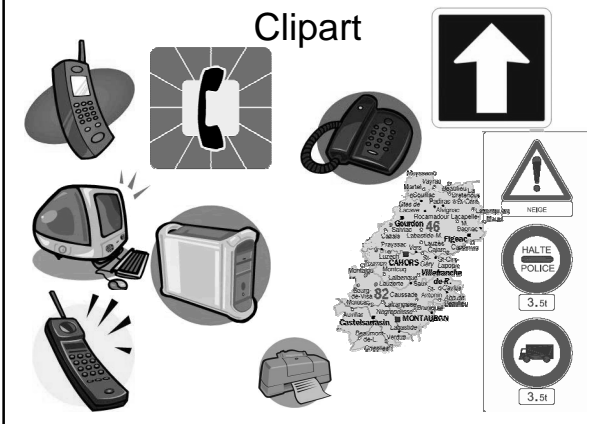
www.artsandarchitecture.psu.edu/news/building_updates/sala/

Plan de construction

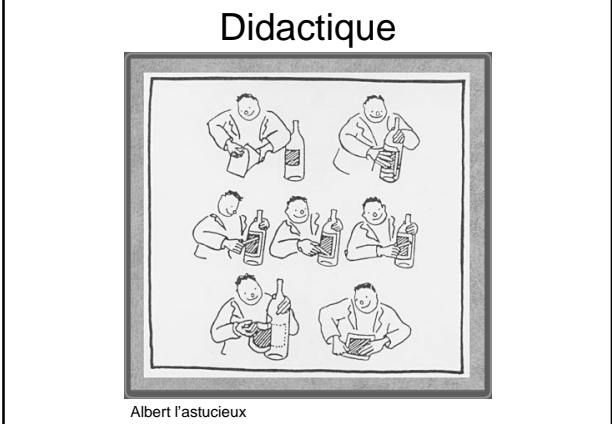


www.loisirs-bricolage.com/page/affaire/cd/cd.htm

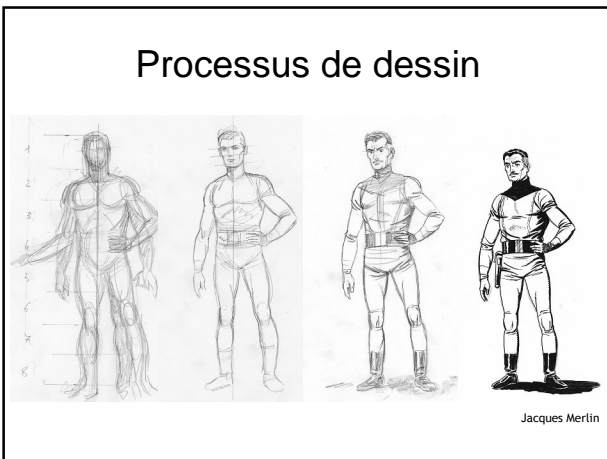
Clipart

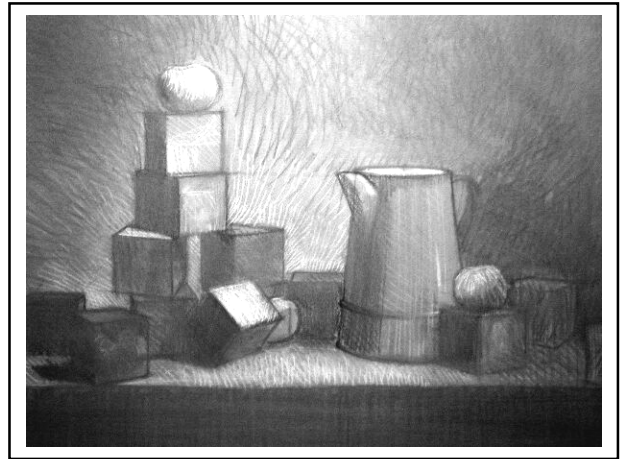
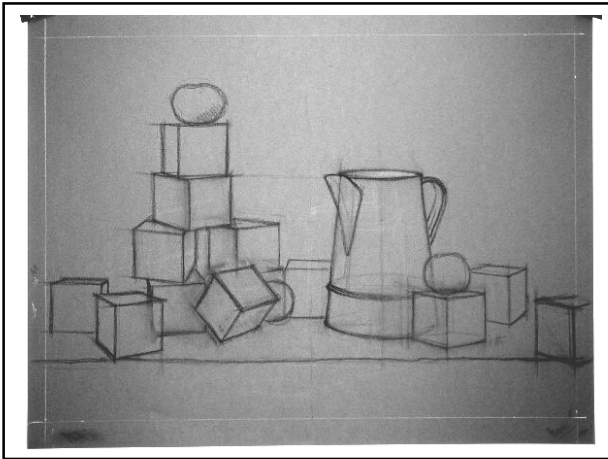


Didactique



Processus de dessin





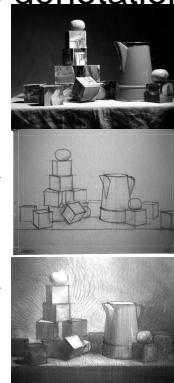
Système de dénotation

An Invitation to Discuss Computer Depiction,
F. Durand NPAR 02

[A LIRE]

Système de dénotation

- Spatial
 - 3D vers 2D
- Primitives
 - Points
 - Lignes
 - Régions
- Marques
 - Trace de l'outil
- Attributs
 - Lien entre tout



- Spatial :
projection
orthogonale
- Primitives 1D
- Marques 0D
- Attributs :
orientation



- Spatial :
- Primitives :
- Marques :
- Attributs :



Seurat

- Spatial :
- Primitives :
- Marques :
- Attributs :

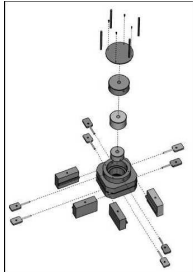
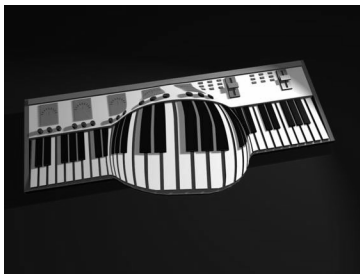


Picasso

Projections Expressives

Spatiales

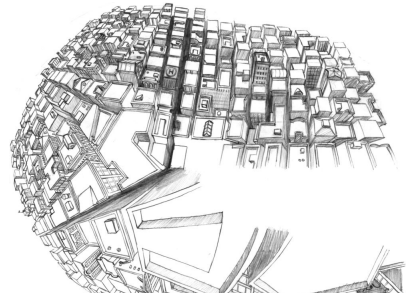
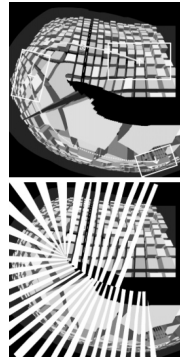
- Passer de 3D vers 2D : Projections



COLEMAN P., SINGH K.,
- RYAN : Rendering your animation nonlinearly
projected-, NPAR'04

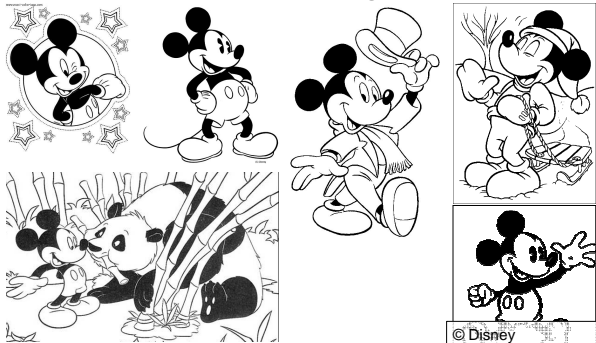
AGRAWALA M., PHAN D., HEISER J., HAYMAKER J.,
KLINGNER J., HANRAHAN P., TVERSKY B.,
- Designing effective step-by-step assembly instructions -,
ACM Trans. Graph., 2003

Multiperspectives



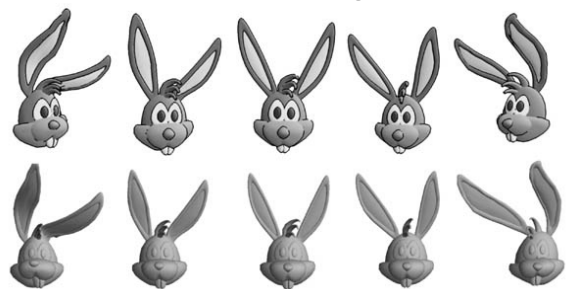
Multiperspective panoramas for cel animation,
D. Wood, A. Finkelstein, J. Hughes, C. Thayer,
D. Salesin, SIGGRAPH 97

View dependent geometry

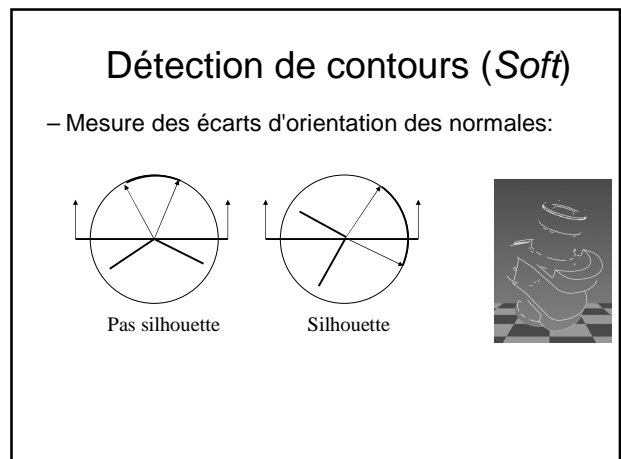
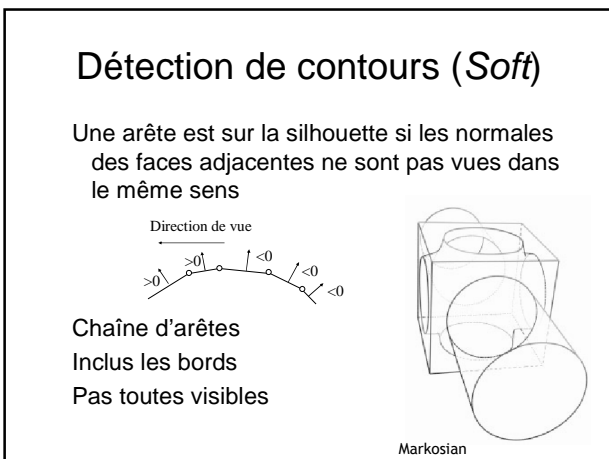
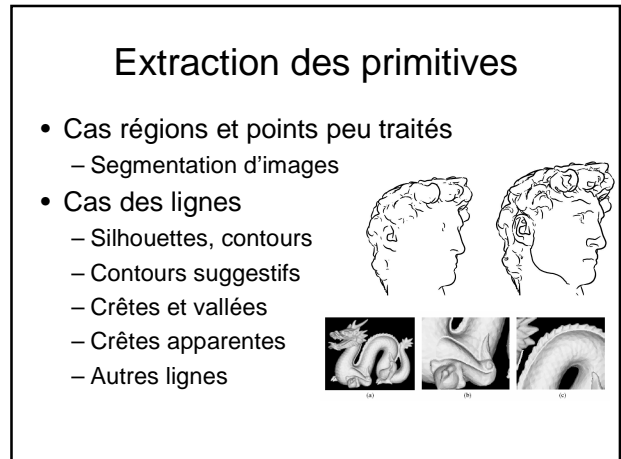
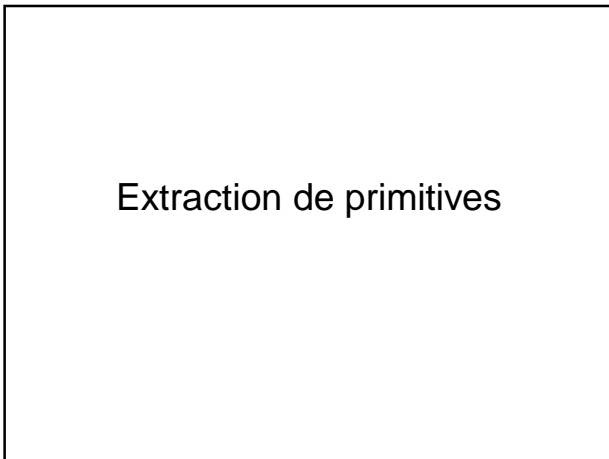
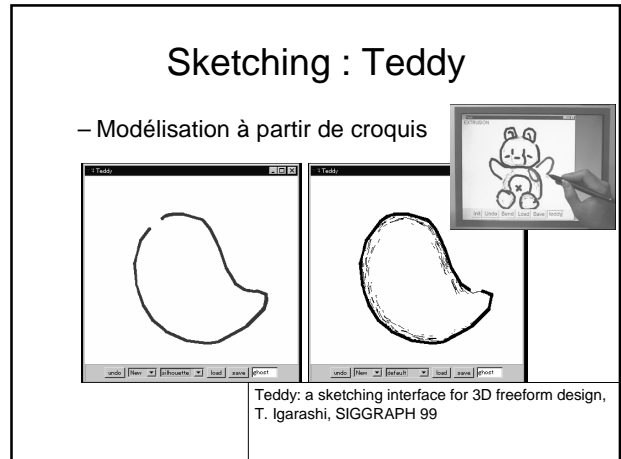
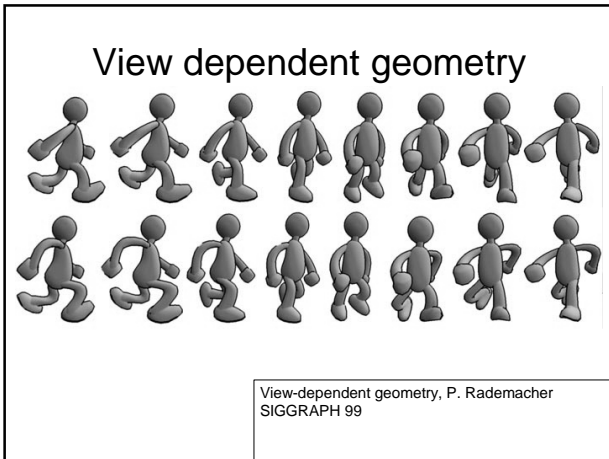


© Disney

View dependent geometry

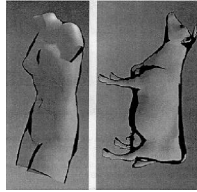


View-dependent geometry, P. Rademacher
SIGGRAPH 99



Détection de contours (*Hard*)

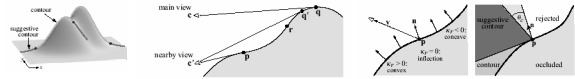
- Méthodes *hardware*
 - *Environment mapping*
 - Pas précis, mais bon effet artistique



- *Stencil buffer*
 - Afficher 4 fois la scène dans le *stencil* buffer en décalant de 1 pixel en x et y et en incrémentant le *stencil* buffer à chaque passe
 - Utiliser le *stencil* comme masque pour afficher là où sa valeur est 2 ou 3 (bit 1)
- Ne détecte pas les lignes intérieures.

Suggestive contours [De Carlo]

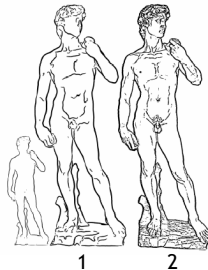
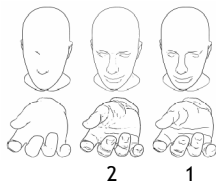
- Ajouter les lignes qui vont devenir des silhouettes dans un point de vue proche



- (1) Point d'inflexion des courbes radiales vues du côté convexe
- (2) Minimum de N.V dans la direction de vue projetée sur le plan tangent

Suggestive contours

- 2 algos :
 - espace objet (1)
 - espace image (2)



Vallées/montagnes

- Lignes suivant les zones de fortes courbure
 - Maximum de courbure dans la direction principale

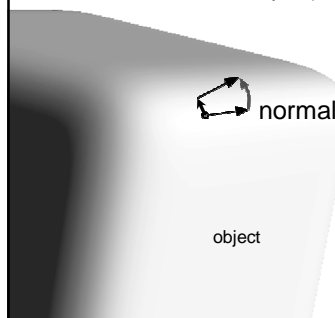


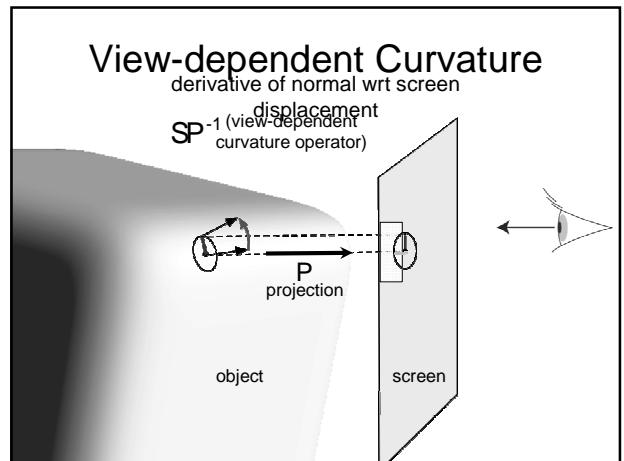
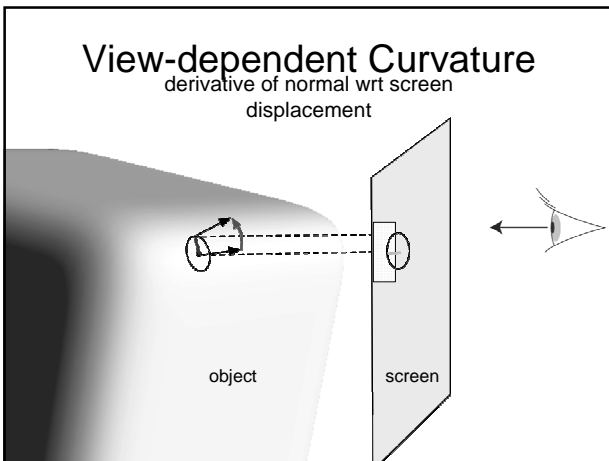
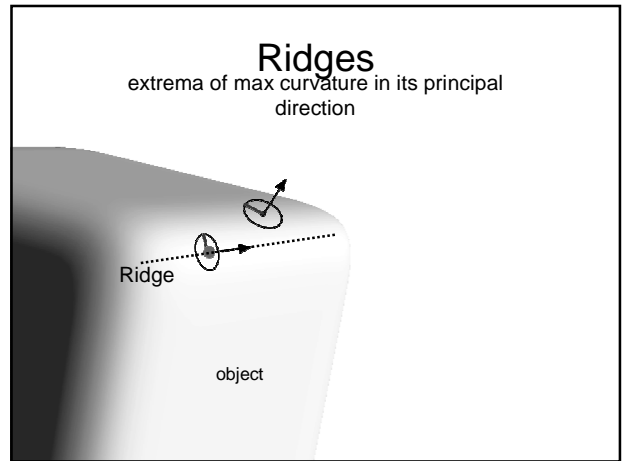
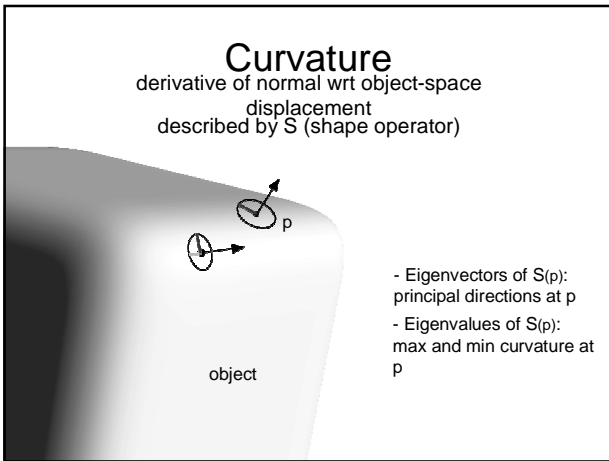
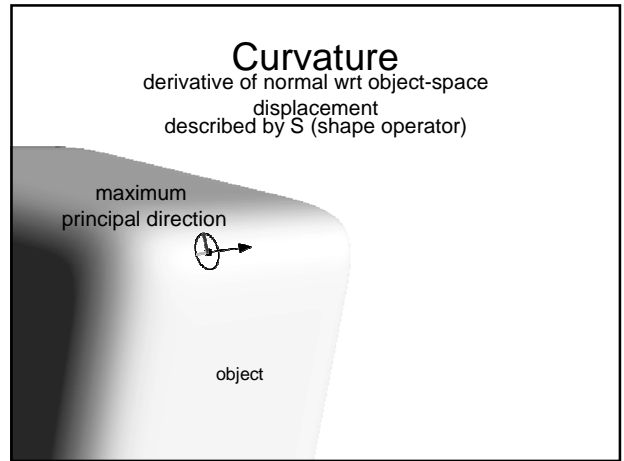
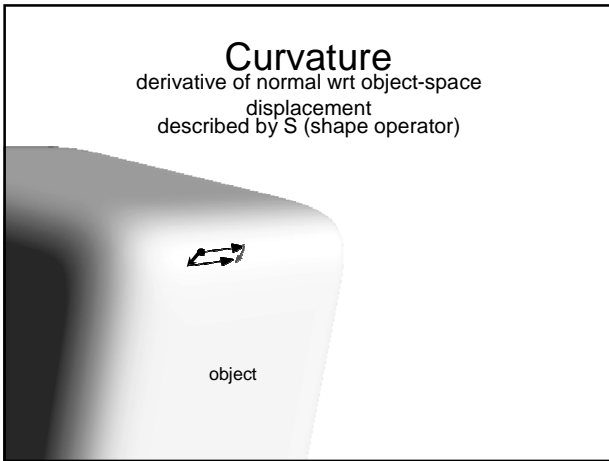
- Calcul en espace objet (géométrie différentielle) ou espace image (suivre les gradients)

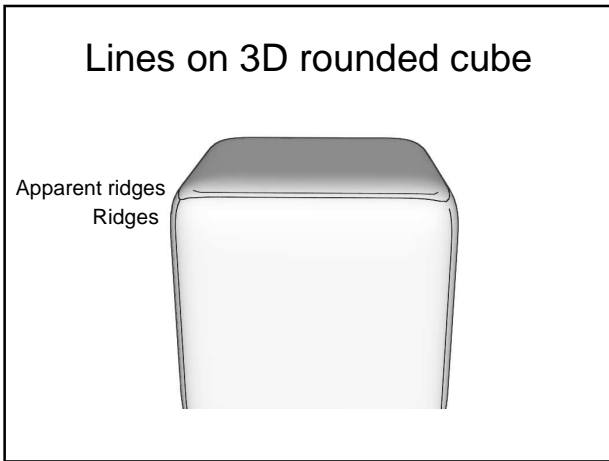
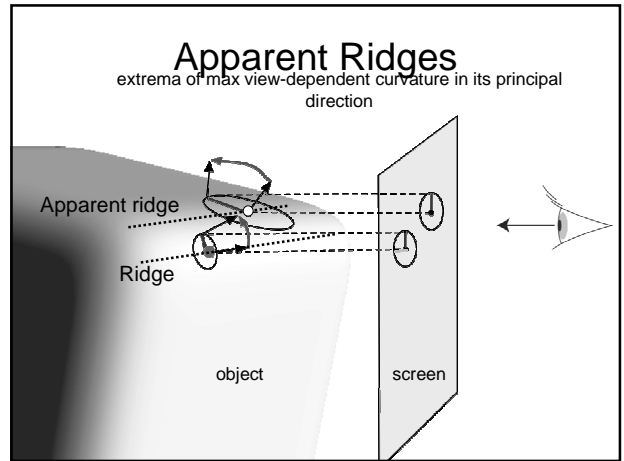
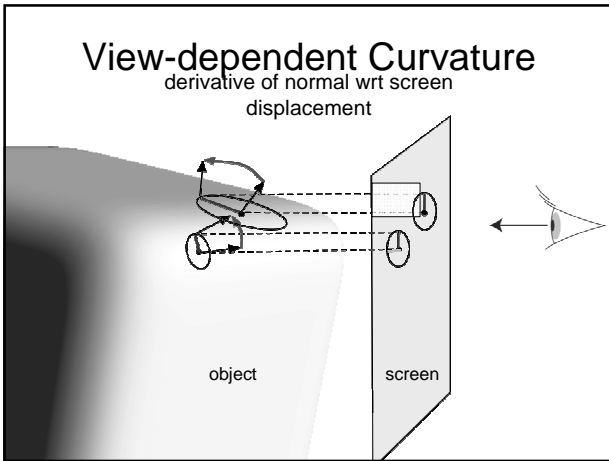
Crêtes apparentes

- Apparente Ridges, T. Judd, T. Adelson, F. Durand, SIGGRAPH 2007

Curvature
 derivative of normal wrt object-space
 displacement
 described by S (shape operator)



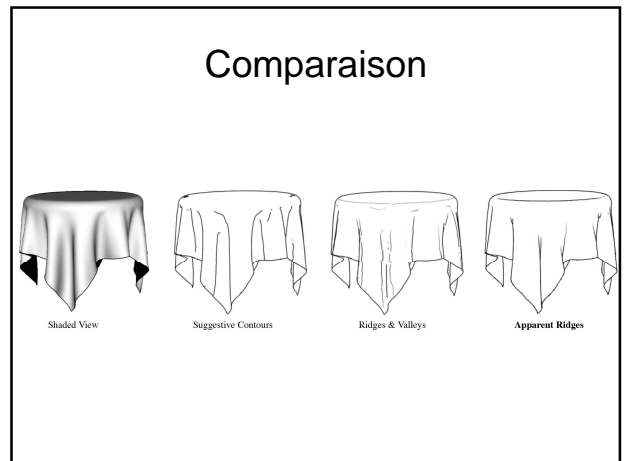
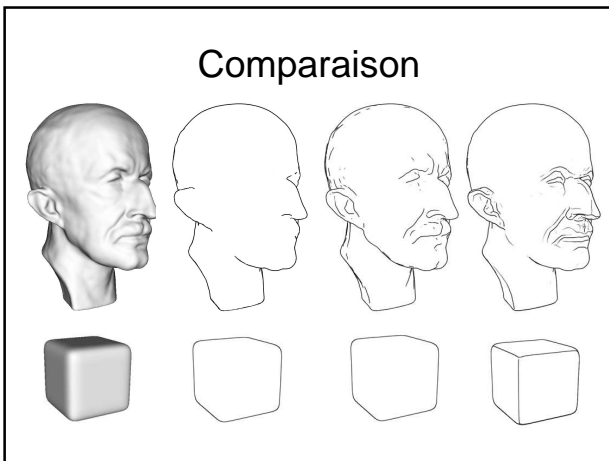




Comparaison

- Silhouette : sépare la figure du fond
- Contour : marque les discontinuités de profondeur
- Vallées/montagnes donnent la forme sous-jacente
- Suggestive contour ?

Figure 13: Comparison of several visual effects (two views of each). Left: edge detection applied to the depth map to extract depth discontinuities. Center: contours with valley lines computed as local maxima of curvature. Right: contours with suggestive contours computed using the object-space algorithm.



Quelles lignes veut-on ?

- Celles qu'aurait dessiner un artiste ?
- Celles qui représente « au mieux » l'objet ?

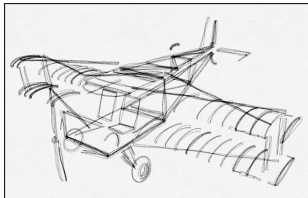
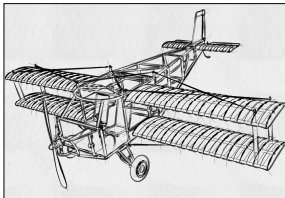
La question reste ouverte, mais en plus il faut penser à la **cohérence temporelle**:
Évolution des lignes au cours du temps.

Et la stylisation

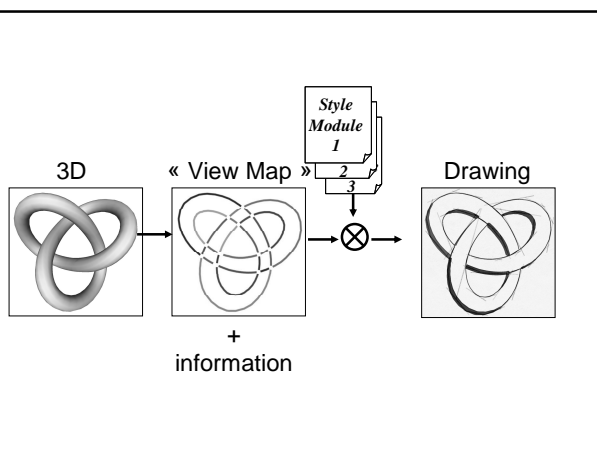
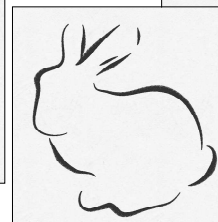
Effets de marques

Stylisation de dessin [S. Grabli]

- Système flexible permettant de décrire le style d'un dessin au trait

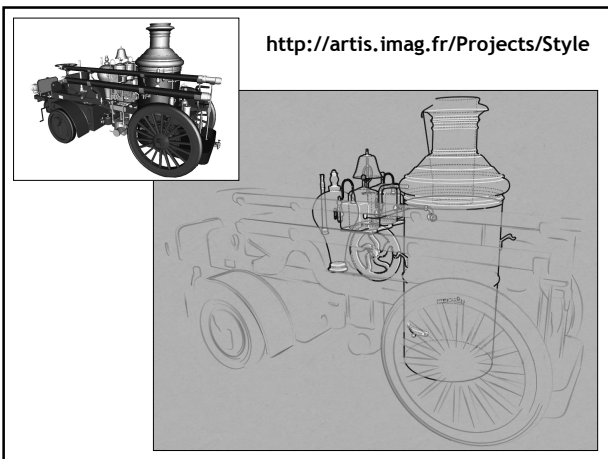
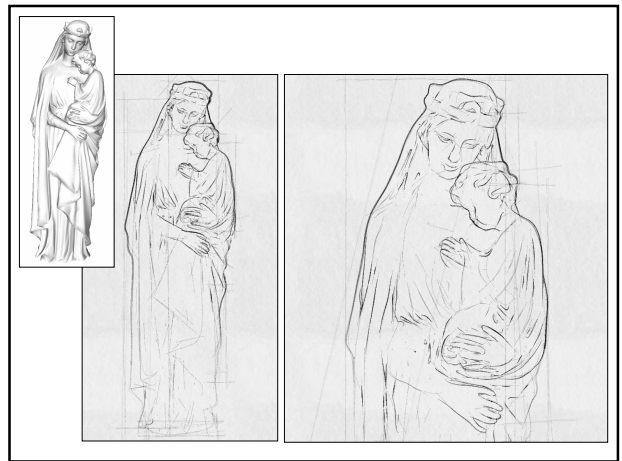
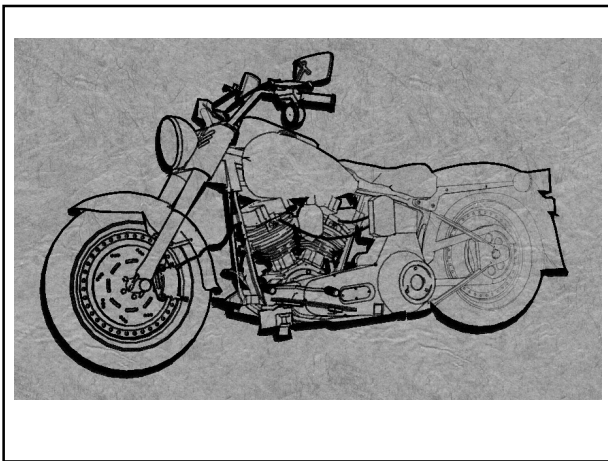
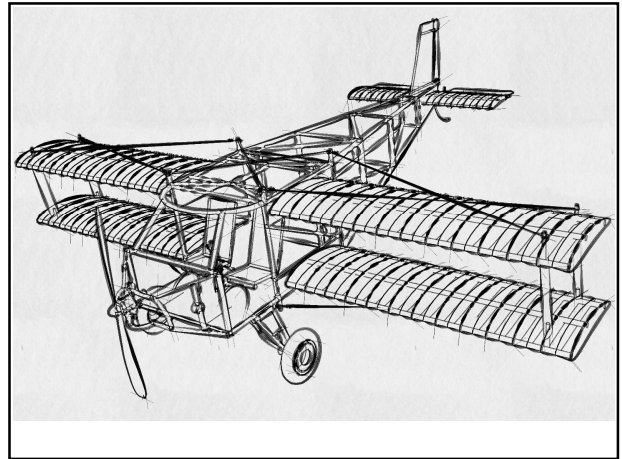
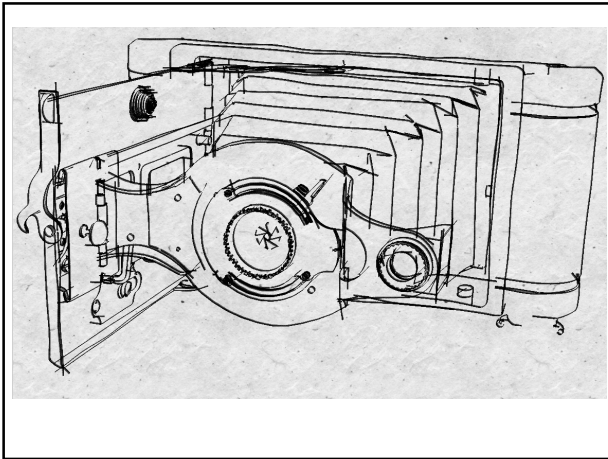


- Indépendant du modèle 3D





Paramètres de style

- Géométrie (2D, 3D coordonnées, normales...)
- Courbure
- Lignes : adjacence, nature (contours, vallées...)
- Visibilité, occlusion, discontinuité de profondeur
- Matériau
- Densité



Simulation Artistique

- But : dessiner une image
 - Tirer parti de l'outil informatique
 - Style « prédéfini »
 - Intervention utilisateur

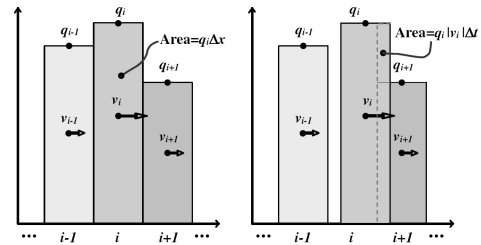
Création interactive

- Photoshop : manipulation de pixels
- Painter : simulation medium naturel
- IMPaSTo : a realistic, interactive model for paint, B. Baxter, J. Wendt, M. Lin, SIGGRAPH 04
- DAB : interactive haptic painting with 3D virtual brushes, B. Baxter, V. Scheib, M. Lin, D. Manocha, SIGGRAPH 01
- MoXi : real-time ink dispersion in absorbent paper, N. Chu, C. Tai, SIGGRAPH 05

...

Pigment sur canvas

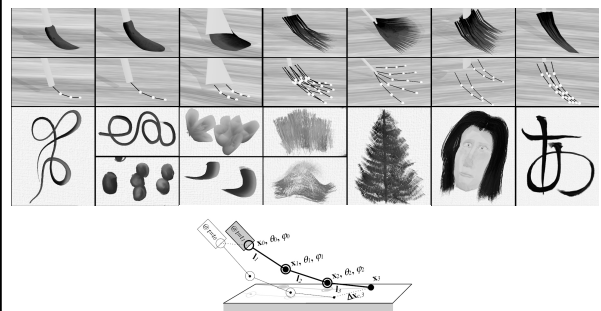
- Simulation interaction « papier/encre »



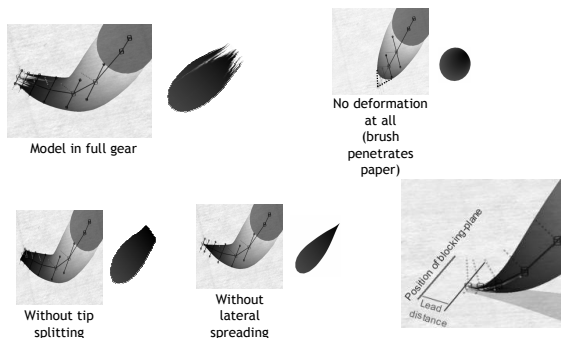
Encre/Peinture/Pigment

Scanned Paint	101 Samples Riemann Sum	8 Samples IMPaSTo	3 Samples RGB w/ K-M	3 Samples RGB Linear

Pinceau (IMPaSTo, DAB)



Pinceau (MoXi)



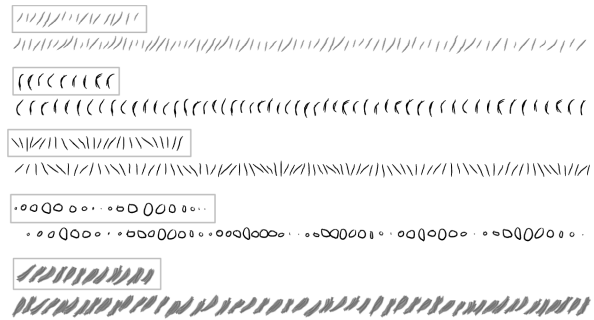
Résultats



IMPaSTo, DAB, ...

Remplissage de régions

Hachurage par l'exemple



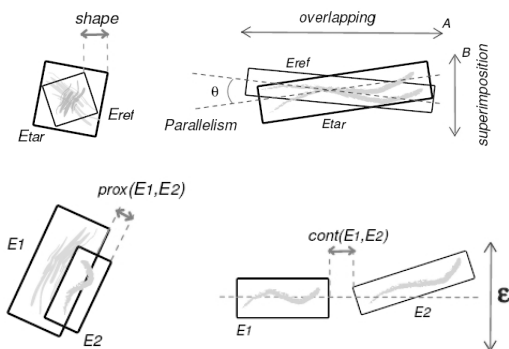
Hachurage par l'exemple

- Stroke Pattern Analysis and Synthesis, P. Barla, S. Breslav, J. Thollot, F. X. Sillion, L. Markosian, Eurographics 2006
- Hatching by exemple: a statistical approach, P. Jodoin, E. Epstein, M. Granger-Piché, V. Ostromoukhov, NPAR 2002

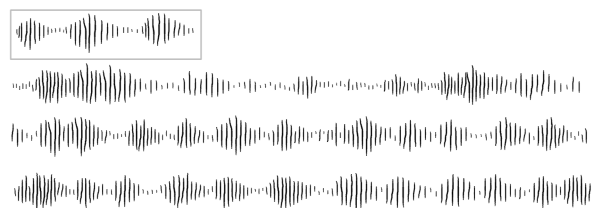
Hachurage par l'exemple

- Approche « synthèse de texture »
- Calcul statistique sur éléments entrés
- Génère sortie arbitrairement grande

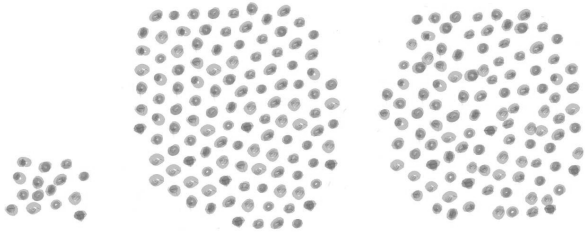
Hachurage par l'exemple



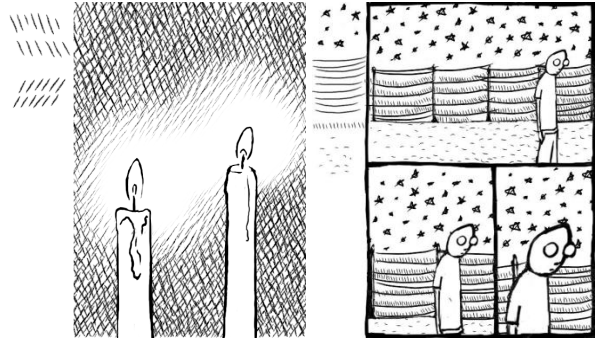
Hachurage par l'exemple



Hachurage par l'exemple

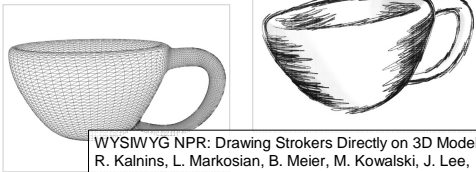


Hachurage par l'exemple



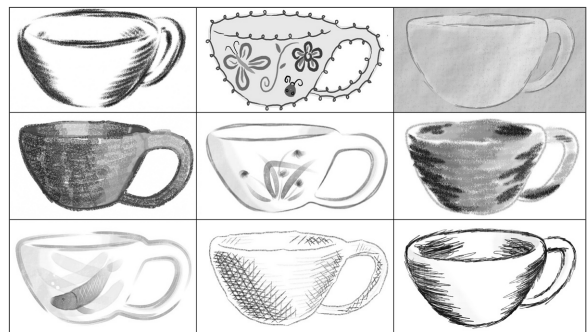
WYSIWYG NPR [A LIRE]

- Dessin sur modèle 3D
- Stylisation propagée sur l'animation
- Styles flexibles



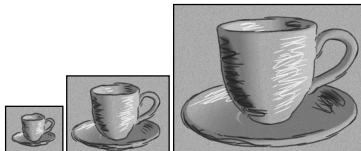
WYSIWYG NPR: Drawing Stokers Directly on 3D Models,
R. Kalnins, L. Markosian, B. Meier, M. Kowalski, J. Lee,
P. Davidson, M. Web, J. Hughes, A. Finkelstein,
SIGGRAPH 02

Exemple de styles

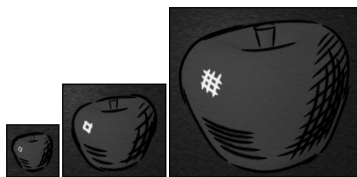


Niveaux de détail

Manuel



Automatique



FIN DU COURS 1