

Automated Stereoscopic 3D Image Reconstruction for the Web

Judit Tövissy, Sándor Kopácsi

Dennis Gabor College, Budapest, Hungary

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• Project started in Hungary, in 2012

Collaboration between DGC and HAS ICSC

www.3dweb.hu



Introduction // Eloaywyn

Minoan Orete constitutes the first literate civilization of Europe and the beginning of European recorded history. In 1878, Minos Kalokairinos carried out pioneering excavations in the West Wing of the Palace of Knossos and discovered the first Linear B tablet. In the first month of excavations at Knossos in 1900, Arthur Evans discovered 3 Bronze Age Soripts, Minoan "Oretan Hieroglyphic" and Linear A, and Mycenaean Cinear B, thus bringing Minoan and Mycenaean Cinet into the historical period Η γραφή και επομένως η καταγραφή της ιστορίας στον ευρωπαϊκό χώρο εμφανίζεται για πρώτη φορά στη μινωκή Κρήτη. Το 1878 ο Μίνως Καλοκαιρινός διεξάγει τις πρώτες ανασκαφές στη Δυτική Πτέρυγα των Ανακτόρων της Κνωσού, ανακαλύπτοντας μεταξύ άλλων και την πρώτη πινακίδα σε Γραμμική Β Γραφή. Από τον πρώτο ήδη μήνα των ανασκαφών του στα ανάκτορα της Κνωσού ο Άρθουρ Έβανς ανακάλυψε τα τρία είδη

Phaistos Disk



GÁBOR DÉNES FŐISKOLA

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Phaistos Disk





OR GARETH OWENS

ERASMUS

PROMOTRAILE







PHAISTOSIDIS



TEDX HERAKLION ENGLISHITALKYOUTUB

Distance Representation with Depth Maps



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Depth Map Generation for 2D Images GÁBOR DÉNES FÖISKOLA

• Issue:

- Reverse-engineering of an entire dimension is non-trivial.
- Reconstruction needs to be based on agreed upon guidelines
- Assumption #1:
 - Objects in focus are likely to be closer to the camera than others.
- Assumption #2:
 - Objects that are **brighter** are likely to be in the foreground of an image.



Depth Map Generation for 2D Images



Resulting 3D Conversion





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Depth Map Generation for 2D Images







Resulting 3D Conversion









Steps of Reconstruction









Image Segmentation

Clustering by Mean Shift Algorithm







Qualitative Depth Map (QDM)

• Absolute Brightness:

 $A(x) = \sqrt{(255 - R(x))^2 + (255 - B(x))^2 + (255 - G(x))^2}$





Focus Detection



Previously Developed by HAS ICSC





Depth-Focus Map

• Combination of a QDM and a Focus Map





Stereoscopic Generation

Based on the previous Depth-Focus Map





Innovation: Stencil Filtering

- Pixel-based 2D Graphics
 - Von Neumann Neighbours
- 3D Rendering
 - Raytracing
- Instead of Von Neumann neighbouring pixels
- Initiate a *Recursive Ray* in each direction
- Find the first non-blank pixel





Innovation: Stencil Filtering

- Recursive Von Neumann Stencil
- Never documented before
- Objective: Find relevant pixels
- Will result in most relevant data

	neigh- bour	
neigh- bour	Pixel (x,y)	neigh- bour
	neigh- bour	





Stencil Filtering



$P(x,y) = \phi(RVNS(x,y), S(x,y))$

Resulting Pixel Filtering Kernel Recursive Von Neumann Neighbouring Pixels

Original Pixel



Stencil Filtering – Basic Filtering Kernel

- Result of an averaging process Clearly visible edges





Stencil Filtering – Cross Filtering Kernel

- Representation of relevance
- Pixels weighted according to distance





Stencil Filtering – Cross Filtering Kernel

Conclusion: Distance is less relevant than was believed



Stencil Filtering – Median Filtering Kernel



Advantage in Realism:

Each new pixel is an instance of already existing values in the image





Stereoscopic 3D Conversion









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