



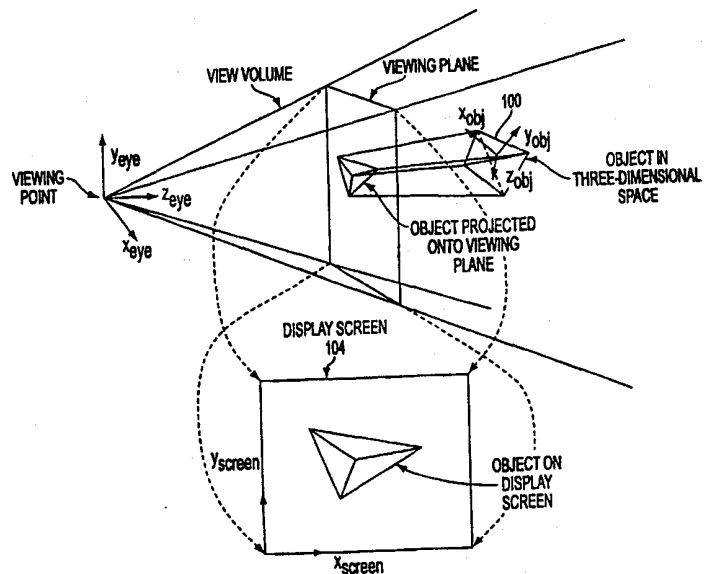
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US99/19036</p> <p>(22) International Filing Date: 20 August 1999 (20.08.99)</p> <p>(30) Priority Data: 60/097,336 20 August 1998 (20.08.98) US 09/213,990 17 December 1998 (17.12.98) US</p> <p>(71) Applicant: RAYCER, INC. [US/US]; 2585 East Bayshore Road, Palo Alto, CA 94303 (US).</p> <p>(72) Inventors: DULUK, Jerome, F., Jr.; 950 North California Avenue, Palo Alto, CA 94303 (US). DODGEN, Steven, L.; 15735 Forest Hill Drive, Boulder Creek, CA 95006 (US). PAPAKIPOS, Matthew, N.; 1701 Oak Avenue, Menlo Park, CA 94025 (US). TUCK, Nathan, D.; 8666 Somerset Avenue, San Diego, CA 92123 (US). BRATT, Joseph, P.; 1045 Oaktree Drive, San Jose, CA 95129 (US). HESSEL, Richard, E.; 3225 Flemington Court, Pleasanton, CA 94588 (US).</p> <p>(74) Agents: ANANIAN, R., Michael et al.; Flehr Hohbach Test Albritton & Herbert L.L.P., Suite 3400, 4 Embarcadero Center, San Francisco, CA 94111-4187 (US).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 15 June 2000 (15.06.00)</p>

(54) Title: TANGENT SPACE LIGHTING IN A DEFERRED SHADING ARCHITECTURE

(57) Abstract

A method for performing tangent space lighting in a deferred shading graphics processor (DSGP) encompassing blocks that preprocess data and a Phong shader that executes all preprocessed fragments. A preprocessor block receives texture maps in a variety of formats and converts those maps to a format useable by the Phong shader. Preprocessor blocks provide the Phong shader with interpolated surface basis vectors, a vector T_b that represents bump data in object space and other data to perform lighting and bump mapping computations for each fragment that needs lighting effects computed. The Phong shader performs all lighting computations in eye space, requiring it to transform bump data from tangent space to eye space by multiplying a matrix M comprising eye space basis vectors derived from surface basis vectors and the vector T_b . The basis vectors are derived by the DSGP preprocessor so the multiplication ($M \times T_b$) gives the perturbed surface normal N' in eye space, reflecting the bump effects. N' is used in lighting computations.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/19036

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06T 15/60, 11/40
US CL :345/426, 430

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/426, 430

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST, CAS ONLINE
search terms: bump map, tangent space, eye space, unit normal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,880,736A (MARK PEERCY ET AL.) <i>07</i> MARCH 1999, col. 3, lines 32-62, col. 4, lines 51-65, col. 5, lines 10-20, col. 8, lines 39-50, col. 9, lines 9-10, 52-67, col. 10, lines 1-3, 29-31, 55-67, col. 11, lines 1-7, 17-50, col. 12, lines 35-67, col. 13, lines 8-54, abstract.	1-9, 11, 13-19

Further documents are listed in the continuation of Box C. See patent family annex.

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