

EXHIBIT

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(12) **United States Patent**
Papakipos et al.

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(45) **Date of Patent:** **Mar. 11, 2003**

(54) **SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR PIXEL SHADERS FOR PROGRAMMABLE SHADING**

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(51) **Int. Cl.⁷** **G06T 17/00**

(52) **U.S. Cl.** **345/426**

(58) **Field of Search** 345/418, 419, 345/420, 426, 427, 428

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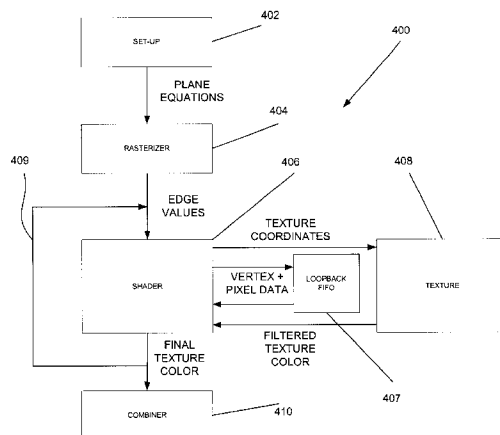
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(57) **ABSTRACT**

A system, method and article of manufacture are provided for interweaving shading calculations and texture retrieval operations during texture sampling in a graphics pipeline. First, a shading calculation is performed in order to generate output. Next, texture information is retrieved, and another shading calculation is performed using the texture information in order to generate additional output. Texture information may be retrieved and shading calculations may then be repeated as desired. Thereafter, the generated output may be combined. As such, the repeated texture information retrieval and shading calculations may be carried out in an iterative, programmable manner.

59 Claims, 5 Drawing Sheets



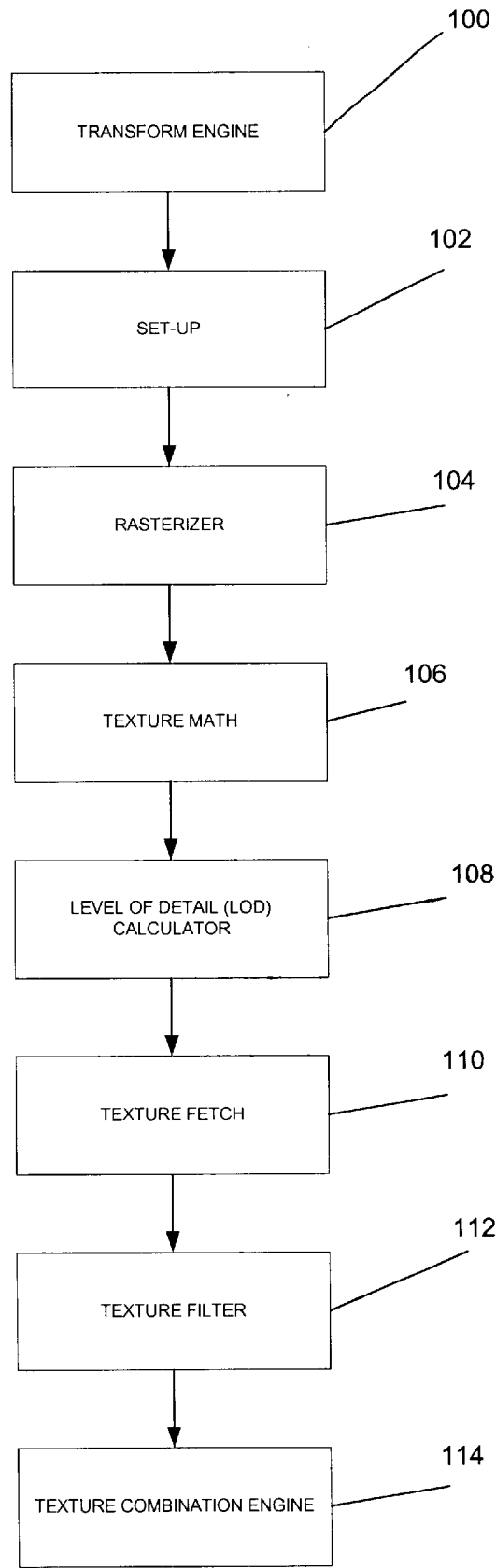


FIGURE 1
(PRIOR ART)

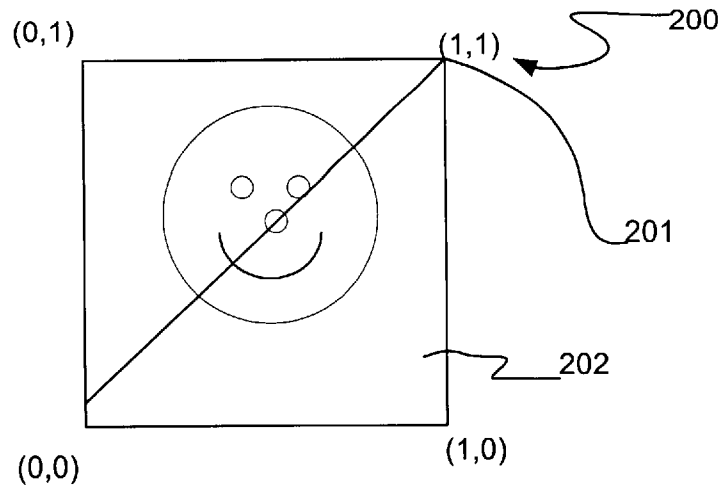


FIGURE 2
(PRIOR ART)

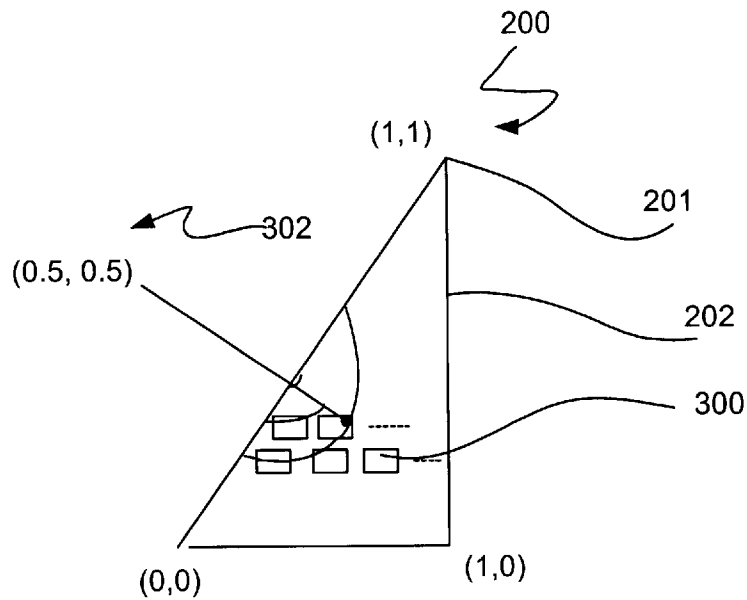


FIGURE 3
(PRIOR ART)

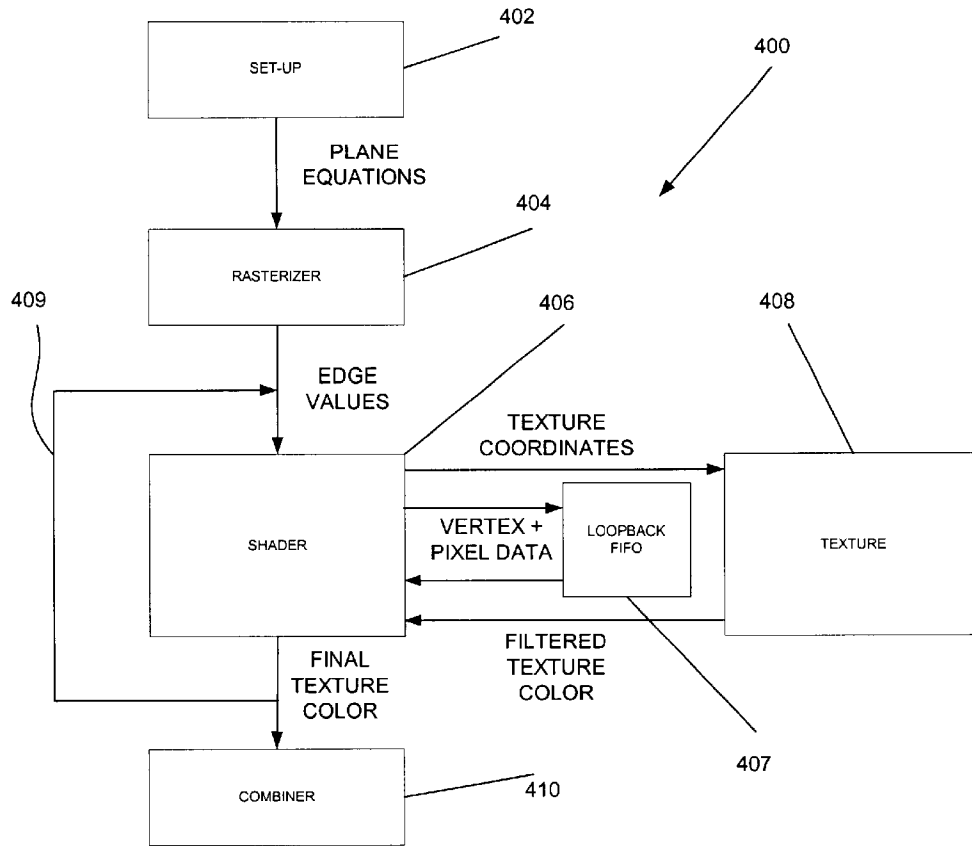


FIGURE 4

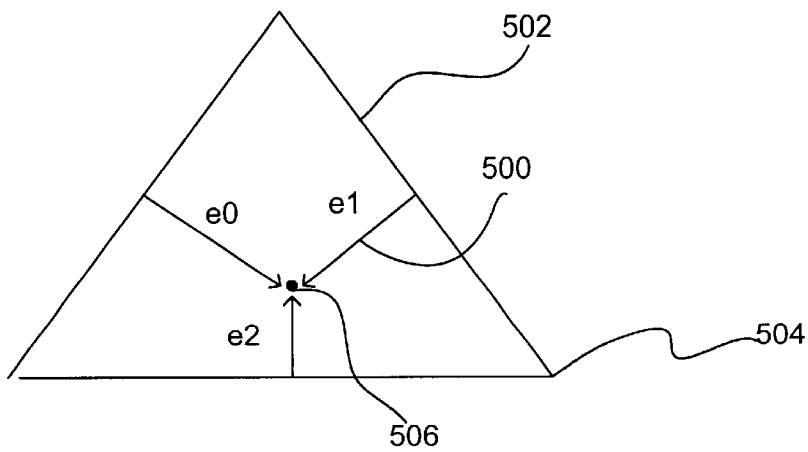


FIGURE 5

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