DYNAMIC GAMMA CORRECTION CIRCUIT
FOR USE IN IMAGE PROJECTORS

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Filed: Sep. 3, 1993

Abstract
Apparatus that implements a nonlinear transfer function ( guilt ) that provides for gamma correction of nonlinear image projectors. The nonlinearity of the transfer function is designed to compensate for the nonlinearity of a nonlinear light modulator, such as a liquid crystal light valve and cathode ray tube combination, for example, that is used in the image projector. The gamma correction circuit comprises a plurality of amplifiers that include current sources coupled together to sum their output currents, and each amplifier is adapted to implement a predetermined transfer function, and provide differing levels of current. An optional output resistor can be employed to convert the composite output current into a corresponding output voltage. Each of the plurality of amplifiers typically comprises two or second current coupled pair transistors plus their associated current sources. The present invention corrects the gray scale nonlinearity of the image projector in which it is employed. The amplifier configuration of the circuit does not use feedback, so its processing bandwidth remains high. The present invention also produces "soft" breakpoints, creating a relatively smooth transfer function. The gamma correction circuit of the present invention is useful in any application using a nonlinear amplifier. The present gamma correction circuit may also be used in any image projector or display using liquid crystal or other nonlinear imaging technology. If gamma correction is used in conjunction with dynamic threshold correction then the gamma correction is made dynamic by adding the threshold correction signal to the base of one of the transistors in the gamma correction circuit.

19 Claims, 14 Drawing Sheets