



US005436832A

# United States Patent [19]

[11] Patent Number: **5,436,832**

Bessacini et al.

[45] Date of Patent: **Jul. 25, 1995**

- [54] **FUZZY CONTROLLER FOR BEAM RIDER GUIDANCE**
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- [21] Appl. No.: **147,271**
- [22] Filed: **Nov. 5, 1993**
- [51] Int. Cl.<sup>6</sup> ..... **G06F 165/00**
- [52] U.S. Cl. .... **364/424.02; 364/423; 364/516; 395/905; 244/3.13**
- [58] Field of Search ..... **364/424.01, 424.02, 364/423, 444, 462, 516; 395/3, 900, 905; 342/61, 62; 318/589; 244/3.11, 3.12, 3.13; 114/21.1, 21.2; 89/1.809, 5**

5,285,380 2/1994 Payton ..... 364/174  
 5,319,556 6/1994 Bessacini ..... 364/424.01

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### [57] ABSTRACT

A beam rider guidance system for directing a steerable object, such as a torpedo. The guidance system senses the bearing between a first site and a second site and determines the bearing between the first site and the steerable object as it moves toward the second site. Various error signals are then generated and classified into sensed linguistic variables based on membership functions of different sensed variable membership functions to become fuzzy inputs to a controller that produces fuzzy control output linguistic variables and associated membership functions from a control output membership function set based upon logical manipulation of the fuzzy inputs. These fuzzy control output membership functions are converted into an output having an appropriate form for control, subject to operational constraint to prevent unwanted effects.

- [56] **References Cited**
- U.S. PATENT DOCUMENTS**
- 4,220,296 9/1980 Hesse ..... 244/3.14  
 4,860,968 8/1989 Pinson ..... 244/3.14  
 5,012,717 5/1991 Metersky et al. .... 39/1.11

**34 Claims, 12 Drawing Sheets**

