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D E C I S I O N
of 6 November 2001

Case Number: T 0430/98 - 3.4.2
Application Number: 93308757.9
Publication Number: 0598518
IPC: G01C 21/20, G 01S 5/14

Language of the proceedings: EN

Title of invention:

Method of calculating GPS measuring deviation and navigation system using same

Applicant:

PIONEER ELECTRONIC CORPORATION

Opponent:

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Headword:

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Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - no (confirmed)"

Decisions cited:

-

Catchword:

-



Case Number: T 0430/98 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 6 November 2001

Appellant: PIONEER ELECTRONIC CORPORATION
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Tokyo-to (JP)

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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 22 December 1997
refusing European patent application
No. 93 308 757.9 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. A. Rayner
V. Di Cerbo

Summary of Facts and Submissions

- I. The appellant has appealed against the decision of the examining division refusing European patent application number 93 308 757.9. The patent application relates to a navigation system comprising GPS receiving means. During the proceedings before the examining division, reference was made to EP-A-393 935 (=document D1).

Attention was drawn by the examining division towards a correspondence in substance despite a difference in terminology between parameters specified in document D1 as "state of the satellite arrangement" and "status signal" and in claim 1 as "measuring accuracy" and "URA", respectively (see for example point 2.1 of the communication of 14 October 1996). In the minutes of the oral proceedings before the examining division, this correspondence was accepted in the submissions of the applicant (see for example the second paragraph on page 1 or the first complete paragraph on page 2.)

- II. In the decision under appeal, the examination division considered the subject matter of claim 1 to lack an inventive step having regard to document D1. The examining division reasoned that while document D1 discloses positioning using two map-matching processes, i.e. dead reckoning at step 1 and GPS at step 3 in the flow chart of Figure 3, these two processes are temporally separate, resulting in a strong suggestion to the skilled person towards carrying out the GPS positioning without having first undergone the step 1 type matching. In connection with the GPS positioning, the skilled person learns of parameters which cause GPS positioning to be inaccurate. While conceding that document D1 consistently employs the expression "or" in

relation to satellite configuration and detection accuracy, this is in the context of a list of such parameters to be used and thus would not have been understood as "exclusive or". The applicant had acknowledged that the two parameters concerned correspond to URA and measuring accuracy as recited in claim 1, only the terminology differing. Thus, neither a single GPS map matching step nor a combination of the two known parameters were considered inventive so that the subject matter of claim 1 and, for corresponding reasons that of claim 6, did not involve an inventive step.

III. The appellant requested setting aside of the decision and grant of a patent based on documents filed with the statement setting out the grounds of appeal and, if the board were minded to maintain the decision, oral proceedings. According to the appellant, a dead reckoning system is important in document D1 as a first step without consideration of GPS and no teaching is given as to how the computational expense of map matching can be reduced. On a specific level, the GPS map matching carried out according to document D1 as a sub step requires a probability or a status signal but not both and does not take into account the number of satellites from which information is received. Given that the object of the invention is to reduce computational expense, a skilled person would not have added to such expense by employing the two parameters taught in document D1 in combination let alone a third.

IV. In the annex to a summons to oral proceedings, the board expressed, with reference to the problem solution approach to assessment of inventive step, its doubts about the line of argument of the appellant, because it

seemed to confuse the computational overhead of the dead reckoning with the GPS measuring accuracy. These issues seemed separate and the board inclined to the view that it would have been obvious to the skilled person to have used all available standard parameters for the GPS determination. As a separate issue, computing overhead was naturally reduced if dead reckoning were not carried out.

V. The appellant then requested cancellation of the oral proceedings and issue of a decision in writing. The oral proceedings were cancelled consequent to this request.

VI. The wording of the independent claims of the application is as follows:

1. A navigation system comprising:

GPS receiving means (4) for receiving satellite information, from a plurality of GPS satellites, including URA (User Range Accuracy) information, and outputting at least the URA information, a measured position at the receiving point of the satellite information calculated from the satellite information, and a measuring accuracy indicative of the accuracy of the measured position that varies in dependence upon the position of the GPS satellites; and

map information storing means (10) for storing map information, including digitised road information; characterised by:

deviation calculating means (7) for calculating a GPS measuring deviation, indicative of a possible deviation range of the measured position from the receiving point, by an operation employing at least the URA information of the satellites, the number of satellites from which information is receivable, and

the measuring accuracy; and

current position estimating means (7) for estimating a current position by searching only a single search area using map matching, the single search area being defined within the radius of the GPS measuring deviation around the measured position and adopting this estimated position as the current position.

6. A method of measuring a current position of a movable body comprising the steps of:

receiving satellite information, from a plurality of GPS satellites, including URA (User Range Accuracy) information,

calculating a measured position indicative of the receiving point of the satellite information from the satellite information;

calculating a GPS measuring deviation, indicative of a possible deviation range of the measured position from the receiving point, by an operation employing at least the URA information of the satellites, the number of satellites from which information is receivable, and the measuring accuracy; and

searching candidate roads within the radius of the GPS measuring deviation around the measured position and fixing the current position by estimating which of the candidate roads matches the measured position without reference to any other estimating operation.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

Novelty

2.1 Document D1 discloses a vehicle location detecting system wherein the location of a vehicle is estimated with the aid of distance and heading sensors (dead reckoning) and wherein pattern matching (see Figure 5) between the estimated location and the road network data obtained from a road map memory is performed, the vehicle location being detected in accordance with a degree of similarity of each road and in accordance with a probability area having a certain probability of including the actual location of the vehicle (see page 2, lines 4 to 10). The road map memory comprises a mass storage medium memory such as a CD-ROM in which the road map is divided into grid blocks. A map data base used for graphically displaying roads and coordinate location (see page 4, lines 12 to 20) is stored. When the vehicle location cannot be obtained by dead reckoning (see page 5, lines 38 to 44), an estimated location obtained from a state of the satellite arrangement or status signal representing a received state of radio waves from the satellites (page 5, lines 3 to 5) is automatically employed in the pattern matching (see roads A and B and the GPS only circular deviation area in Figure 6), that is, the location is replaced with the estimated location calculated by a GPS receiver (see page 3, line 8; page 6, line 33 or page 7, line 29).

2.2 The navigation system according to the independent claims in dispute is novel with respect to the system disclosed in document D1 by virtue of explicit reference to inclusion of number of satellites in the GPS measuring deviation calculation. In addition, reference in claim 1 to searching only a "single"

search area using map matching and in claim 6 to without "reference to any other estimating operation" excludes dead reckoning.

Inventive step

- 3.1 A problem solved by the novel features of the independent claims mentioned in point 2.3 can, as argued by the appellant, be seen as that of reducing computing overhead which is always a desideratum for the skilled person. However, since dispensing with computer operations always reduces overhead, the board has no doubt that the skilled person would have expected dispensing with dead reckoning to achieve such a reduction.

The main line of argument advanced by the appellant is not however that it is not obvious that dispensing with dead reckoning reduces computer overhead but amounts instead to a challenge to the pertinence of document D1 in this respect. This challenge relies on the premise that the skilled person is compelled to believe from document D1 that a GPS position determination must be effected only after a dead reckoning calculation. The board does not however accept this premise for the simple reason that the GPS calculation employed according to the teaching of document D1 is a step in its own right and produces a result which *replaces* that of the dead reckoning. Since the GPS positioning is a *replacement*, it does not from a technical point of view rely on the dead reckoning estimation and thus, as correctly argued by the examining division, is taught to the skilled person as obviously distinct therefrom. Consequently, the line of argument challenging the pertinence of document D1 fails to convince the board.

3.2 A further line of argument of the appellant relating to reducing computer overhead concerns the novelty of GPS parameters and leads to the conclusion that use of more parameters results in an increase in overhead and is therefore unexpected because it contradicts the problem to be solved by the invention. In the view of the board, this line of argument is in error because it confuses the desirability of using all available parameters for accuracy of GPS position determination with dispensing with processes irrelevant to the GPS positioning. There is no contradiction between the two, both of which are obvious desiderata, so that this line of argument also fails to convince the board.

3.3 The final line of argument of the appellant also concerns parameters used in the GPS position determination. The appellant relied on use of the word "or" in document D1 in relation to the satellite arrangement and status signals to mean that the skilled person understands that in GPS position determination just one of these signals and certainly no further parameter is used, i.e. the "or" is to be understood as an "exclusive or". However, it must be remembered that the skilled person is fully conversant with GPS position determination and therefore knows what parameters are necessary and will not be blinded by an unfortunate choice of words in document D1. In particular, the board agrees with the examining division that the parameters are understood in this context as an example list and thus considers the line of argument of the appellant as removed from actual practice, there being no technical sense in restricting GPS position determination to just one of the standard parameters. By the same token, number of satellites, amounts to no more than another standard parameter, use

of which is obvious to the skilled person for accuracy, for example in 2-D or 3-D position determination. Therefore, this final line of argument of the appellant also failed to convince the board.

- 3.4 Since the board considers both the reduction of non GPS overhead and the use of standard GPS parameters in the GPS determination obvious to the skilled person in view of his technical knowledge and in the light of the teaching of document D1, the subject matter of independent claims 1 and 5 is not considered to involve an inventive step within the meaning of Article 56 EPC.

Order

for these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

E. Turrini