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[Continued on next page]

(54) Title: A SENSOR PROFILE ADJUSTER

(57) Abstract: A sensor profile adjusting module (10) where a method of adjusting and converting sensor readings in an agricultural management system (20) is provided, where the method includes the steps of receiving sensor data from sensor, determining if sensor data packet contains moisture, retrieving moisture reading from data packet, retrieving dependent constants based on moisture reading or calculating drift value based on lab research for each sensor and storing data in the system (20) database and displaying in a user interface.

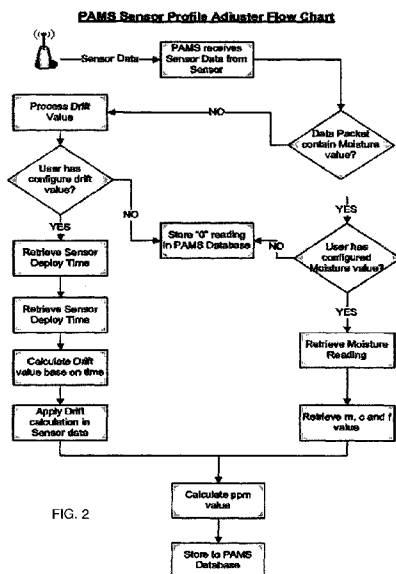


FIG. 2



HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

A SENSOR PROFILE ADJUSTER

FIELD OF INVENTION

- 5 The present invention relates to a sensor profile adjuster, more particularly relates to a method of adjusting and converting sensor data readings in an agricultural management system.

BACKGROUND OF INVENTION

10

In modern agricultural industries, accuracy and perfection is essential. Accurate record keeping and gathering of accurate data have all become crucial factors for improving overall agricultural system. Most operating agricultural systems have a plurality of sensors for monitoring various parameters during operation for control purposes.

15

In some occasions, the sensors in the system may degrade or provide inaccurate readings. The further use of these erroneous data may lead to erroneous conclusions about the system being used. A malfunction situation may escape undetected or reversely, a pseudo malfunction may be reported causing needless alarm to the user.

- 20 Such events may pose a tremendous economic loss as well as a potentially dangerous situation.

Thus there is a need to provide for a solution that allows for compensation of inaccuracies in sensor hardware systems to ensure that these errors will not be
25 magnified and further affect the accuracy of systems as a whole.

SUMMARY OF INVENTION

Accordingly there is provided a method of adjusting and converting sensor readings in an agricultural management system when moisture values are available, said method
5 includes the steps of receiving sensor data from sensor, determining if sensor data packet contains moisture, retrieving moisture reading from data packet, retrieving dependent constants based on moisture reading and storing data in system database and displayed in user interface.

10 There is also provided a method of adjusting and converting sensor readings in an agricultural management system when moisture values are not available, said method includes the steps of receiving sensor data from sensor, determining if sensor data packet contains moisture, calculating drift value for each sensor; wherein the drift value is used to calculate actual sensor data, and storing data in system database and
15 displayed in user interface.

There is also provided a sensor profile adjusting module wherein the module is part of an agricultural management system allows adjusting and converting of sensor readings to be stored in the database, wherein said module includes a method of moisture
20 compensation calculation and drift value compensation calculation.

The present invention consists of several novel features and a combination of parts hereinafter fully described and illustrated in the accompanying description and drawings, it being understood that various changes in the details may be made without
25 departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and
5 thus are not limitative of the present invention, wherein:

FIG. 1 illustrates an architectural diagram of the agriculture management system of the present invention.

FIG. 2 illustrates incoming process flow in the sensor profile adjuster module of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a sensor profile adjusting module and method of adjusting and converting sensor data. Hereinafter, this specification will describe the present invention according to the preferred embodiments of the present invention. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

10

The following detailed description of the preferred embodiments will now be described in accordance with the attached drawings, either individually or in combination.

The present invention provides for a sensor profile adjusting module (10) that adjusts and converts the value of the reading sent by a sensor in the system by using a formula. The formula is applied directly to all incoming sensor data from the sensor output. The corrected sensor data will then be converted to a more user-friendly unit such as parts-per-million (ppm) and stored into a system database if the data from the sensor is received in other units such as millivolt. The sensor profile adjusting module (10) is part of a larger agricultural management system (20) as shown in Figure 1.

Each sensor is assigned to a specific constant, which is dependent on the sensor type and sensor. Therefore, each sensor carries a different constant value and each sensor will be assigned to a specific constant based on its type in order to be differentiated between one another.

25

The user interface of this system (20) that links between the system (20) and the sensors enables users to modify the constants or variables on a table listing in the database using Asynchronous JavaScript and XML (AJAX) technology. This changed table will take effect immediately and will be reflected in the data stored in the database as soon as sensor data is sent to the system (20).

The method of adjusting and converting the sensor data includes compensating for moisture in the soil where the sensor has been placed, drift value of the sensor data and conversion from millivolt to parts-per-million (ppm).

10

As illustrated in an embodiment of the present invention in Figure 2, an agricultural management system (20) receives sensor data from sensor. The system determines if the sensor data packet contains any moisture values. When it is confirmed that the data packet does contain moisture values, the system (20) uses the moisture values to retrieve the specific constant values such as m, c and f that are used to differentiate sensors. The module (10) then uses these constants to calculate the ppm values for the data packet. The data is now stored into the system (20) database and displayed in a user interface of the system (20). The retrieved constant values from moisture readings are used to derive a formula as below:

20

$$Y = [mX + c] \times f$$

where Y is actual sensor data and X is the final sensor data after massaged by this correction formula. In this case is the moisture reading. This value will be display in the PAMS User interface.

25 Conversely, if the system does not indicate moisture values from the received data from the sensors, the sensor profile adjusting module (10) will then proceed to calculate the drift value that starts from a sensor's deploy time. Thus, the exact time of

when the sensor was deployed is required. With this information, the drift value can be calculated. For example, a sensor was deployed at 10 a.m. and the current time is 2 p.m. The drift value is assigned to be of a value x . The sensor reading received by the system (20) at 2 p.m. is y .

5

Therefore,

$$\begin{aligned}\text{Actual sensor data} &= [\text{Total hours} \times \text{Drift value}] + \text{Sensor reading} \\ &= [(4\text{hours}) \times (x)] + y \\ &= 4x + y\end{aligned}$$

10

Subsequently, the system (20) applies a conversion formula in the module (10) in order to convert the actual sensor data from millivolt to p.p.m and displays it on the user interface of the system (20). The retrieved constant values from moisture readings are used to derive a formula as below:

15

$$Y = [mX + c] \times f$$

where m , c and f are the constant values retrieved from the moisture readings and Y is the actual sensor data.

20

These corrected values are stored into the system (20) database and displayed on the user interface.

In the event that the user has not configured any drift values or moisture values in the system (20), the module (10) will store a value of '0' in the database at the respective locations to indicate a null sensor reading.

25

The described invention can be used in any sensor system that requires an adjustment of sensor readings that needs to compensate for drift values and moisture values.

CLAIMS

1. A method of adjusting and converting sensor readings in an agricultural management system (20) when moisture values are available, said method
5 includes the steps of:
 - i. receiving sensor data from sensor;
 - ii. determining if sensor data packet contains moisture;
 - iii. retrieving moisture reading from data packet;
 - iv. retrieving dependent constants based on moisture reading; and
10 v. storing data in system (20) database and displayed in a user interface.
2. The method as claimed in claim 1, wherein the sensor data received in millivolt is converted to parts-per-million (ppm) using the retrieved dependent constants in a sensor profile adjusting module (10).
15
3. The method as claimed in claim 2, wherein the converted sensor data is displayed in a user interface of the agricultural management system (20).
4. The method as claimed in claim 1, wherein the moisture value is not configured
20 in the system (20), the value '0' will be stored in the database.
5. A method of adjusting and converting sensor readings in an agricultural management system (20) when moisture values are not available, said method includes the steps of:
25
 - i. receiving sensor data from sensor;
 - ii. determining if sensor data packet contains moisture;

- iii. calculating drift value based on lab research for each sensor; wherein the drift value is used to calculate actual sensor data; and
- iv. storing data in system (20) database and displayed in a user interface.

- 5 6. The method as claimed in claim 5, wherein the sensor data received in millivolt is converted to parts-per-million (ppm) using the calculated drift value in a sensor profile adjusting module (10).
- 10 7. The method as claimed in claim 6, wherein the converted sensor data is displayed in a user interface of the agricultural management system (20).
8. The method as claimed in claim 5, wherein the drift value is not configured in system (20), the value '0' will be stored in the database.
- 15 9. The method as claimed in claim 1 and 5, wherein the data stored in the database is modified using Asynchronous JavaScript and XML (AJAX) technology.
- 20 10. A sensor profile adjusting module (10) wherein the module (10) is part of an agricultural management system (20) allows adjusting and converting of sensor readings to be stored in the database, wherein said module (10) includes a method of moisture compensation calculation and drift value compensation calculation.

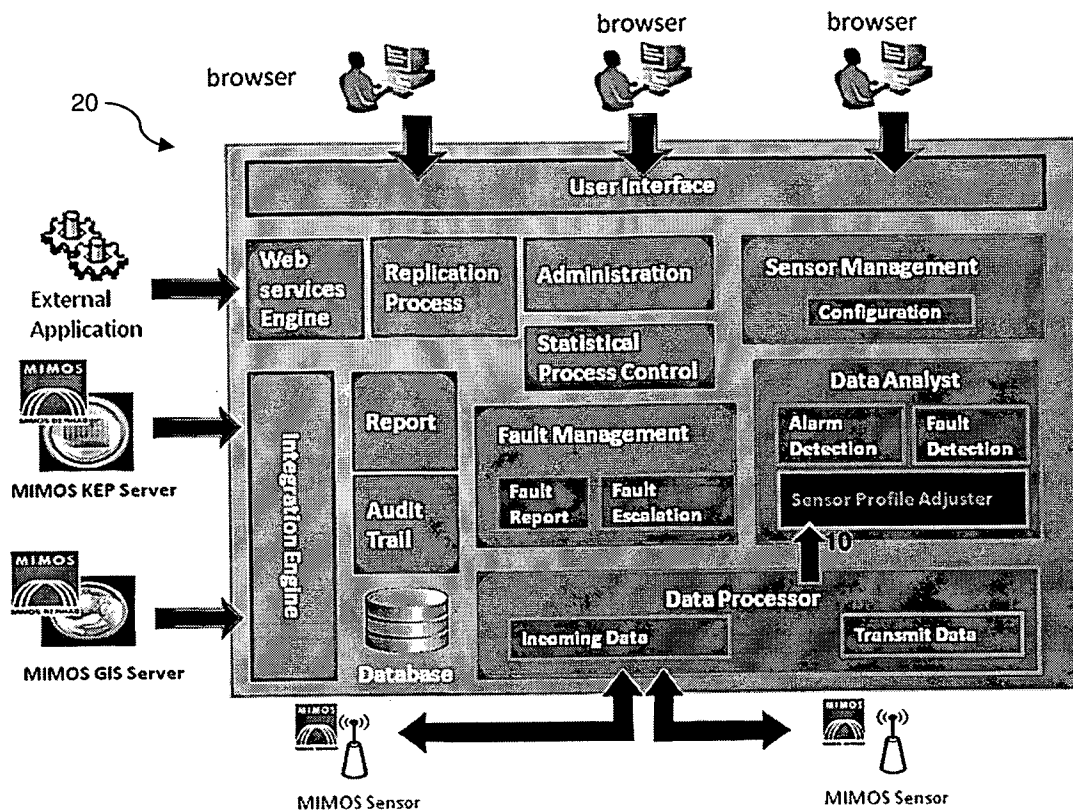


FIG. 1

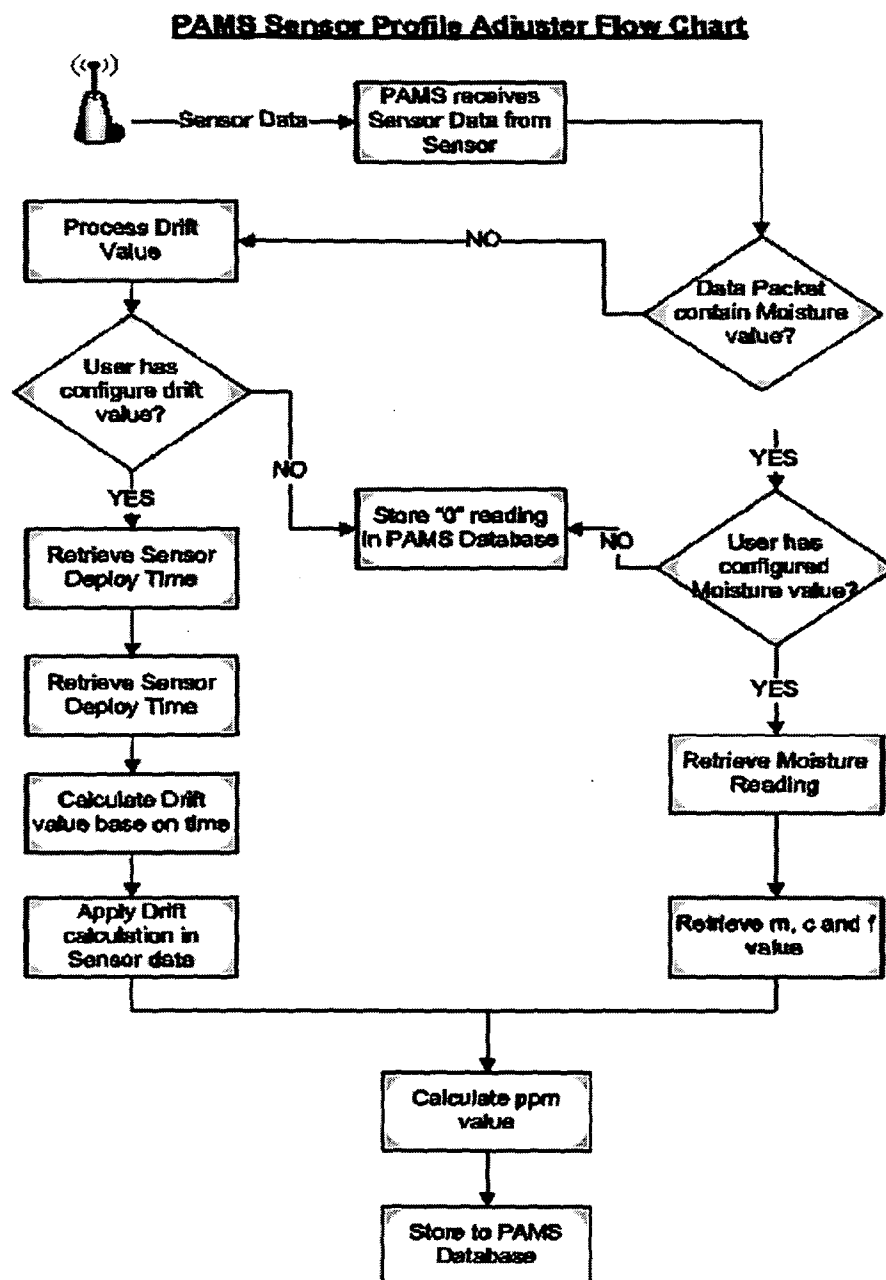


FIG. 2

A. CLASSIFICATION OF SUBJECT MATTER**G06Q 50/00(2006.01)i, G06F 19/00(2006.01)i**

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)

G06Q 50/00; A01G 25/16; A01G 31/00; G01N 22/04; G01N 25/56; G01N 27/22; G01N 33/18; G01R 27/02

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords:sensor, soil, moisture, adjusting, compensate.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	WO 2008-031152 A1 (AGRILINK HOLDINGS PTY LTD. et al.) 20 March 2008 See the abstract, pages 2-20, and claim 19.	1,4 2-3,5-8
Y A	US 6691563 B1 (SAMIR TRABELSI et al.) 17 February 2004 See the abstract, columns 4-10, claims 1-2, and figure 1.	1,4 2-3,5-8
A	KR 10-2000-0049705 A (JONG PIL HAN) 05 August 2000 See the abstract and pages 3-4.	1-8
A	JP 2004-077412 A (KYUSHU ELECTRIC POWER CO., INC. et al.) 11 March 2004 See paragraphs [0005]-[0022].	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 JULY 2010 (19.07.2010)

Date of mailing of the international search report

20 JULY 2010 (20.07.2010)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/MY2009/000210**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 10
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claim 10 does not clearly define the matter for which protection is sought.
3. ☒ Claims Nos.: 9
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/MY2009/000210

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008-031152 A1	20.03.2008	AU 2007-295943 A1 EP 2068612 A1 US 2009-302870 A1	20.03.2008 17.06.2009 10.12.2009
US 6691563 B1	17.02.2004	None	
KR 10-2000-0049705 A	05.08.2000	KR 10-0372361 B1	15.02.2003
JP 2004-077412 A	11.03.2004	None	