(54) Title: METHOD AND APPARATUS FOR DETERMINING ABSOLUTE POSITION OF A TIP OF AN ELONGATE OBJECT ON A PLANE SURFACE WITH INVARIANT FEATURES

(57) Abstract: A method and apparatus for determining a pose of an elongate object and an absolute position of its tip while the tip is in contact with a plane surface having invariant features. The surface and features are illuminated with a probe radiation and a scattered portion, e.g., the back-scattered portion, of the probe radiation returning from the plane surface and the feature to the elongate object at an angle 2 with respect to an axis of the object is detected. The pose is derived from a response of the scattered portion to the surface and the features and the absolute position of the tip on the surface is obtained from the pose and knowledge about the feature. The probe radiation can be directed from the object to the surface at an angle Q to the axis of the object in the form of a scan beam. The scan beam can be made to follow a scan pattern with the aid of a scanning arrangement with one or more arms and one or more uniaxial or biaxial scanners. Angle t can also be varied, e.g., with the aid of a separate or the same scanning arrangement as used to direct probe radiation to the surface. The object can be a pointer, a robotic arm, a cane or a jutting implement such as a pen, and the features can be edges, micro-structure or macro-structure belonging to, deposited on or attached to the surface which the tip of the object is contacting.
Published: with international search report

Date of publication of the international search report:

23 November 2006

For two-letter codes and other abbreviations, refer to the “Guidance Notes on Codes and Abbreviations” appearing at the beginning of each regular issue of the PCT Gazette.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/43645

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : G06M 7/00
US CL : 250/221
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)
U.S. : 250/221 382/118;341/5;178/18.01.09

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category *</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search
25 November 2005 (25.11.2005)

Date of mailing of the international search report
27 DEC 2005

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Form PCT/ISA/210 (second sheet) (April 2005)
Continuation of B. FIELDS SEARCHED Item 3:
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emit4,radia4,scatt5,stylus,pen,inclina4,orient4,angle,tip,posit4,surface,beam,detec4,absolute,coordi5