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Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Michelle K. Lee

Director of the United States Patent and Trademark Office



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(12) **United States Patent
Buyuksahin**

(10) **Patent No.: US 9,030,653 B1**
(45) **Date of Patent: May 12, 2015**

(54) **MULTI POINT, HIGH SENSITIVE TACTILE SENSING MODULE FOR ROBOTS AND DEVICES**

2560/0418; A61B 2562/0238; A61B 2562/12; A61B 3/1241; A61B 3/16
See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

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5,983,725 A 11/1999 Fischer et al.
8,607,629 B2* 12/2013 Higaki et al. 73/160
2011/0067504 A1 3/2011 Koyama et al.

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

OTHER PUBLICATIONS

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* cited by examiner

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(57) **ABSTRACT**

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The features of the system are: fiber optic cables (instead of human sensory receptor) and low cost CMOS or CCD image sensor (which can be found in a conventional webcam, camcorder, digital camera etc.) are used by pairing each pixel of the image sensor with corresponding fiber optic cable, which is assured to transfer all light beams to the processor on a single photo frame where the coordinates and the level of displacements are detected precisely by the aid of image processing techniques, in order to provide tactile sensing. The system can work with a computer or it can work individually with an electronically circuit that contains an independent processor.

(52) **U.S. Cl.**
CPC **G01L 5/226** (2013.01); **G01L 1/242** (2013.01); **G01L 1/248** (2013.01)

(58) **Field of Classification Search**
CPC A61B 5/01; A61B 5/14546; A61B 5/412; A61B 5/6814; A61B 2560/0214; A61B 2560/0219; A61B 2560/0252; A61B

7 Claims, 5 Drawing Sheets

