

Technology Opportunity, Ref. No. UA-19/269

## **Apparatus and method for determining the orientation and position of two rigid bodies**

Miniaturized absolute rotary encoder (aka ASTRAS, Angular Sensor for TRacking Systems) usable in high accuracy tracking systems for example in articulated surgical devices and other mechanical systems. ASTRAS is based on a camera, a shadow mask, an LED and a mirror attached to two rigid bodies constrained by a rotational joint.

<b>Keywords</b>	Absolute rotary encoder, angular sensor, tracking system, ASTRAS, endoscope
<b>Inventors</b>	Prof. Dr. Phillippe Cattin, Lorenzo Iafolla, Dr. Lilian Witthauer; Department of Biomedical Engineering, University of Basel
<b>References</b>	<ol style="list-style-type: none"><li>1. Lorenzo Iafolla, Lilian Witthauer, Azhar Zam, Georg Rauter, Philippe Claude Cattin: Proof of Principle of a Novel Angular Sensor Concept for Tracking Systems. DOI: <a href="#">link</a></li><li>2. Philippe Claude Cattin, Lorenzo Iafolla, Lilian Witthauer: WO2018109218 (A1) - Apparatus and Method for Determining the orientation and position of two rigid bodies, <a href="#">link</a></li></ol>
<b>Background</b>	Many applications such as in medical devices, robotic- and mechanical-systems require precise feedback on the position of joints or rotary axis for their control. The accuracy of the system is limited by its sensors. Additionally, size restrictions limit the choice of rotary encodes applicable to certain fields.
<b>Invention</b>	A high accuracy, miniaturizable, absolute rotary encoder has been invented to measure the position of either rotary joints or the angle between two structures. This device is called ASTRAS and can measure the orientation angle of two bodies constrained by a joint to a single degree of freedom or the absolute position of a rotary axis. The measurement is made by attaching a camera, a shadow mask, and a LED to the first body whilst a mirror is attached to the second body in a way that the shadow detected by the camera depends only on the angle. As the smallest camera at the present state of the art is $1 \times 1 \times 0.5 \text{ mm}^3$ , ASTRAS can be, accordingly, miniaturised to similar size whilst still retaining its very high accuracy of $10^{-5}$ radian.
<b>Fields of Use</b>	High accuracy angular sensor for robotics and medical devices; all the applications of the rotary encoders that require high accuracy and small size.
<b>Patent Status</b>	PCT Patent filed (Application Nr. PCT/EP2017/083171)
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