

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国际局



(10) 国际公布号
WO 2021/217976 A1

(43) 国际公布日
2021 年 11 月 4 日 (04.11.2021)

- (51) 国际专利分类号:
B25J 9/16 (2006.01) *G06T 7/80* (2017.01)
B25J 19/02 (2006.01) *G06K 9/00* (2006.01)
- (21) 国际申请号: PCT/CN2020/111190
- (22) 国际申请日: 2020 年 8 月 26 日 (26.08.2020)
- (25) 申请语言: 中文
- (26) 公布语言: 中文
- (30) 优先权:
202010349776.X 2020年4月28日 (28.04.2020) CN
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(54) Title: METHOD AND APPARATUS FOR CONTROLLING MECHANICAL ARM ON BASIS OF MONOCULAR VISUAL POSITIONING

(54) 发明名称: 一种基于单目视觉定位的机械臂控制方法及装置

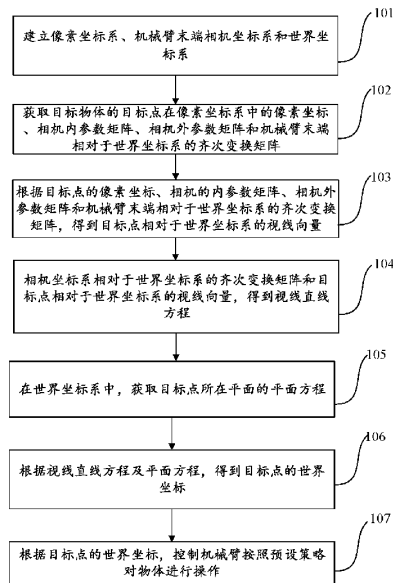


图 1

- 101 ESTABLISH A PIXEL COORDINATE SYSTEM, A MECHANICAL ARM TAIL-END CAMERA COORDINATE SYSTEM, AND A WORLD COORDINATE SYSTEM
- 102 ACQUIRE PIXEL COORDINATES OF A TARGET POINT OF A TARGET OBJECT IN THE PIXEL COORDINATE SYSTEM, A CAMERA INTRINSIC PARAMETER MATRIX, A CAMERA EXTRINSIC PARAMETER MATRIX, AND A HOMOGENEOUS TRANSFORMATION MATRIX OF A MECHANICAL ARM TAIL END WITH RESPECT TO THE WORLD COORDINATE SYSTEM
- 103 ACCORDING TO THE PIXEL COORDINATES OF THE TARGET POINT, THE CAMERA INTRINSIC PARAMETER MATRIX, THE CAMERA EXTRINSIC PARAMETER MATRIX, AND THE HOMOGENEOUS TRANSFORMATION MATRIX OF THE MECHANICAL ARM TAIL END WITH RESPECT TO THE WORLD COORDINATE SYSTEM, OBTAIN A LINE-OF-SIGHT VECTOR OF THE TARGET POINT WITH RESPECT TO THE WORLD COORDINATE SYSTEM
- 104 ACCORDING TO THE HOMOGENEOUS TRANSFORMATION MATRIX OF THE CAMERA COORDINATE SYSTEM WITH RESPECT TO THE WORLD COORDINATE SYSTEM AND THE LINE-OF-SIGHT VECTOR OF THE TARGET POINT WITH RESPECT TO THE WORLD COORDINATE SYSTEM, OBTAIN AN EQUATION OF A STRAIGHT LINE-OF-SIGHT
- 105 ACQUIRE, IN THE WORLD COORDINATE SYSTEM, A PLANE EQUATION OF A PLANE IN WHICH THE TARGET POINT IS LOCATED
- 106 OBTAIN WORLD COORDINATES OF THE TARGET POINT ACCORDING TO THE EQUATION OF THE STRAIGHT LINE-OF-SIGHT AND THE PLANE EQUATION
- 107 CONTROL, ACCORDING TO THE WORLD COORDINATES OF THE TARGET POINT, A MECHANICAL ARM TO OPERATE AN OBJECT ACCORDING TO A PRESET POLICY

(57) Abstract: Provided are a method and apparatus for controlling a mechanical arm on the basis of monocular visual positioning. The method comprises: first, acquiring pixel coordinates of a target point of a target object in a pixel coordinate system; then performing transformation by using a homogeneous transformation matrix of a camera coordinate system with respect to a mechanical arm tail end and a homogeneous transformation matrix of the mechanical arm tail end with respect to a world coordinate system, so as to obtain an equation of a straight line-of-sight; and finally, acquiring, in the world coordinate system, a plane equation of a plane in which the target

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本国际公布:

- 包括国际检索报告(条约第21条(3))。

point is located, and obtaining world coordinates of the target point by means of the equation of the straight line-of-sight and the plane equation. Therefore, compared with the prior art, the embodiments of the present application have no need for two monocular cameras, refine a positioning system, provide simple operations, do not involve the matching of image feature points and the measurement and calculation of an optimal distance, simplify a processing algorithm, and reduce the requirements for a hardware device.

(57) 摘要: 本申请提供了一种基于单目视觉定位的机械臂控制方法及装置, 首先获取目标物体的目标点在像素坐标系下的像素坐标, 然后利用相机坐标系相对于机械臂末端的齐次变换矩阵及机械臂末端相对于世界坐标系的齐次变换矩阵进行转换, 得到视线直线方程, 最后在世界坐标系中, 获取目标点所在平面的平面方程, 并通过视线直线方程及平面方程, 得到目标点的世界坐标, 因此, 与现有技术相比, 本申请实施例无需两个单目摄像机, 简化定位系统, 操作简单, 且不涉及图像特征点的匹配和最优距离的测算, 简化处理算法, 降低对硬件设备的要求。