

苹果采摘机器人果实识别与定位方法 Recognition and Location of Fruits for Apple Harvesting Robot

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摘要: 提出了利用归一化的红绿色差 $(R-G)/(R+G)$ 分割苹果的方法。对不同光照情况下拍摄的苹果图像进行了识别,并对识别后的图像进行预处理后,获得苹果的轮廓图像。对轮廓图像采用随机圆环法进行果实圆心、半径提取。通过建立基于面积特征与极线几何相结合的匹配策略实现双目视觉下的果实定位,对于搜索区域内面积相似的果实,通过计算垂直投影的互相关函数最大值的方法,得到排序基准线,然后根据顺序一致性原则进行匹配。实验结果表明:识别算法可以较好地消除阴影、裸露土壤等影响,识别率达到92%。采用随机圆环法,可以准确地提取果实的圆心、半径。在60~150 cm的距离范围内,测量误差小于2cm。An apple recognition method with normalized color difference $(R-G)/(R+G)$ was presented. The apples in the images taken under different lighting conditions were recognized. Some pretreatments were applied to get contour images. The shape features of the apples were extracted from the contour images based on the method of random circle ring. A matching algorithm based on area feature and epipolar geometry was discussed to position the apples. The apples with similar areas were matched according to the principle of left-right order consistency by calculating the maximum value of cross-correlation function of vertical projections. The experiments results show that the proposed recognition method can eliminate influence of shade, and soil, to a certain extent. The recognition rate reaches 92%. The circle centers and radius are extracted precisely and rapidly based on the method of random circle ring. The errors are less than 2 cm when the measure distance is between 60 cm and 150 cm.

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