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信息科学

改进的SURF算法在特征匹配中的应用

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摘要： 提出一种新的多尺度改进加速鲁棒特征（SURF)分块特征匹配算法，定义为Modified-SURF(M-SURF)。此方法在运用图像积分技术的SURF基础上进行分块特征匹配，使计算速度进一步加快；同时使用了基于二阶多尺度模板生成的特征描述子，提高了特征点匹配的鲁棒性。文中首先推导了M-SURF算法二阶多尺度模板公式；然后，介绍了分块匹配的方法，解决了匹配计算速度与精度不能兼得的矛盾，通过实验获得了分块模板的最佳参数；最后，采用欧氏空间最近距离比次近距离的方法衡量匹配的优劣度，利用LMedS方法剔除误匹配点，使匹配精度有较大的提高。对多组图像进行了匹配实验，结果表明：与SURF和尺度不变特征变换（SIFT）算法比较，M-SURF的计算速度提高了28%，匹配精度提高了3%。该算法能够很好地实现特征点的正确匹配，具有很高的使用价值。

关键词： 立体匹配 欧氏空间 特征描述子 特征匹配 尺度空间

Application of improved SURF algorithm to feature matching

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Abstract: A new improved method, Speed Up Robust Features(SURF) matching by image partition, is propoed, which is defined as Modified-SURF(M-SURF). The method uses the feature matching adopting an image integral based on SURF to speed up the computing speed, meanwhile,it takes the second-order feature descriptors derived by the second-order multi-scale gauge to improve the feature matching robustness. The paper firstly deduces the formula of the second-order multi-scale gauge. Then, it introduces the image partition algorithm to resolve the inconsistency between the computing speed and the precision of matching. With an experiment,it obtains the optimal parameters of image partition matching. At last, it weighs the quality of matching by the algorithm of the ratio of the shortest distance and shorter distance in Euclid space, and improves the matching precision by eliminating the false matching dot with the LMedS. The result shows that the computing speed of M-SURF has raised more than 28% and the matching precision of M-SURF increases by 3% as comparing with those of SURF and Scale Invariance Feature Transfer(SIFT) by matching tests for several series of images. This algorithm can achieve a better matching of feature points and has a practical value.

Keywords: Stereo matching Euclid space feature descriptor feature matching scale space

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