Analysis of Remote Sensing Image Super Resolution using Fluid Lenses

Titre	Analysis of Remote Sensing Image Super Resolution using Fluid Lenses
Type de publication	Thèse, HDR
Type	Thèse
Année	2017
Langue	Anglais
Date de soutenance AAAA-MM-JJ	2017-05-23
Nombre de pages	111
Diplôme	Doctorat
Auteur	Rasti, Pejman [1]
Pays	Estonie
Université	University of Tartu
Ville	Tartu

Résumé en anglais	In this thesis, a study of both hardware and software solutions for image enhance¬ment has been done. On the hardware side, a new liquid lens design with a DESA membrane located directly in the optical path has been demonstrated. Two pro¬totypes with two different DESA, which have a 40 and 20 mm active area in diameter, were developed. The lens performance was consistent with the mechan¬ics of elastomer deformation and relative focal length changes. A laser beam was used to show the change in the meniscus and to measure the focal length of the lens. The experimental results demonstrate that voltage in the range of 50 to 750 V is required to create change in the meniscus. On the software side, a new satellite image enhancement system was proposed. The proposed technique decomposed the noisy input image into various frequency subbands by using DT-CWT. After removing the noise by applying the LA-BSF technique, its resolution was enhanced by employing DWT and interpolating the high-frequency subband images. An original image was interpolated with half of the interpolation factor used for interpolating the high-frequency subband images, and the super-resolved image was reconstructed by using IDWT. A novel single-image SR method based on a generating dictionary from pairs of HR and their corresponding LR images was proposed. Firstly, HR and LR pairs were divided into patches in order to make HR and LR dictionaries respectively. The initial HR representation of an input LR image was calculated by combining the HR patches. These HR patches are chosen from the HR dictionary corre-sponding to the LR patches that have the closest distance to the patches of the in¬put LR image. Each selected HR patch was processed further by passing through an illumination enhancement processing order to reduce the noticeable change of illumination between neighbor patches in the super-resolved image. In order to reduce the blocking effect, the average of the obtained SR image and the bicubic interpolated image was calculated. The new kernels for sampling have also been proposed. The kernels can improve the SR by resulting in a sharper image. In order to demonstrate the effectiveness of the proposed kernels, the techniques from [83] and [50] for resolution enhance¬ment were adopted. The super-resolved image was achieved by combining the HR images produced by each of the proposed kernels using the alpha blending tech-nique. The proposed techniques and kernels are compared with various conventional and state-of-the-art techniques, and the quantitative test results and visual results on the final image quality show the superiority of the proposed techniques and ker¬nels over conventional and state-of-art techniques.
URL de la notice	http://okina.univ-angers.fr/publications/ua17500 [2]
Président du jury	Prof. Väino Sammelselg

Liens

[1] http://okina.univ-angers.fr/httpperso-laris.univ-angers.frrasti/publications
[2] http://okina.univ-angers.fr/publications/ua17500