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COMBINATION OF WAVELET & FAST CURVELET BASED IMAGE FUSION IN MEDICAL RESEARCH

Dr. C. Senthil Singh
Professor, Jeppiar Engineering College International Journal on Recent Researches in Science Engineering & Technology

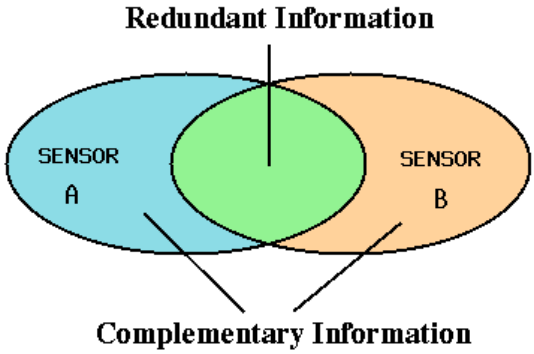
Abstract—Image fusion is a technology which keeps images as main research contents. It refers to the techniques that incorporate multi-images of the same scene from multiple image sensor data or integrate multi images of the same scene at different times from one image sensor. The image fusion algorithm based on Wavelet Transform which faster developed was a multi-resolution analysis image fusion method in recent decade. Wavelet Transform has good time-frequency characteristics. Nevertheless, its excellent quality in one-dimension can't be comprehensive to two dimensions or multi-dimension simply. Separable wavelet which was on both sides of by one-dimensional wavelet has limited directivity. This research paper introduce the Second Generation Curvelet Transform and uses it to fuse images.
Key words: Image fusion,sensor, multi-images,scene.

Introduction

One of the most significant fields concerning about image analysis and computer vision is image fusion. With the progress of multi-sensors, it is probable to obtain data from different sensors. Because of the different properties of multi-sensors, these images might provide totally different information. A new and improved image can be got if attractive into account all the images. So image fusion has emerged as a promising esearch field in recent years, and it is of great importance in many applications, such as object detection, Automatic Target Recognition, remote sensing, computer vision, smart buildings, robotics, battlefield surveillance, guidance and control of autonomous vehicles, monitoring of complex machinery, meteorological imaging and military applications. Image fusion also has wide application domain in medicine diagnosis. Medical images have difference species such as CT, MRI, PET, ECT, SPECT. These different images have their respective application ranges. For instance, functional information can obtain by PET, SPECT. They contain relative low spatial resolution, but it can provide information about visceral metabolism and blood circulation. And that anatomical image consist of high spatial resolution such as CT, MRI, B-mode ultrasonic, etc. Medical fusion image is to merge functional image and anatomical image jointly into one image. This image can provide abundance information to doctor to diagnose clinical disease. In recent years, a lot of researchers have paid their attentions on the field of multi resolution region-based image fusion rather than pixel-based. Researchers such as Marr and Linderberg found that multi resolution theory is also very useful in plenty of image processing applications. Z.Zhang proposed a region-based fusion.
This transform is a non-adaptive technique for multi-scale object representation. Curvelets are an suitable basis for representing images (or other functions) which are smooth apart from singularities

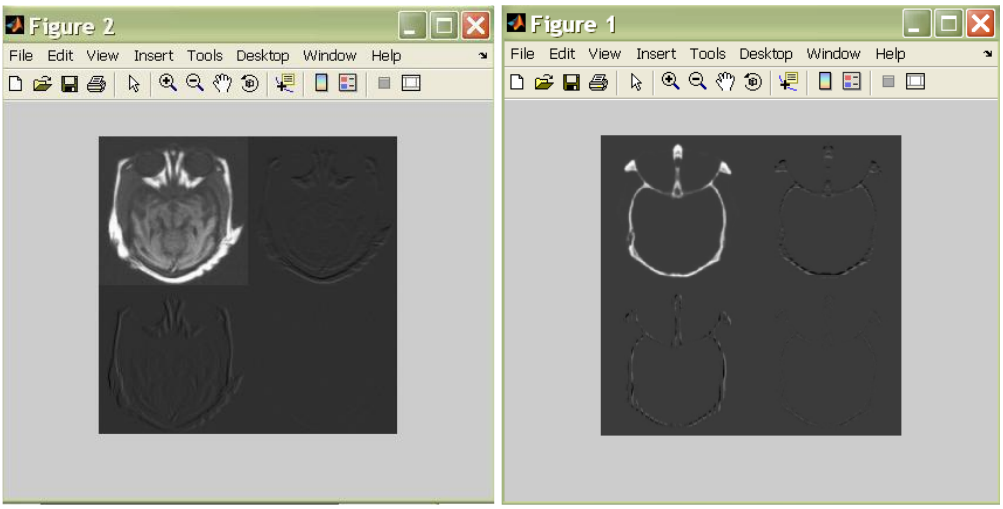
along smooth curves, where the curves have bounded curvature, i.e. where substance in the image have a minimum length scale . But this transform does not give proper information about the sharp edges of an image.

Hence an image fusion based on Combination of Discrete Wavelet Transform and Fast Discrete Curvelet Transform is used here. The algorithms applied include Variance , Region-Based algorithm etc. Different kinds of fusion methods are compared at last. The experiments show that the method could extract useful information from source images (of MRI and CT scans-in medical field) to fused images so that clear images are obtained. This paper analyzes the characteristics of the Second Generation Curvelet Transform and put forward an image fusion algorithm based on Discrete Wavelet Transform and the Second Generation Curvelet Transform. We concerned about the selection principles about low and high frequency coefficients according to different frequency domain after Wavelet and the Second Generation Curvelet Transform. In addition , Region-Based algorithm etc. is chosen to compare the fusion results.
It is defined as the process of reducing redundant information and improving complementary information in the source images concerned.



COMBINING WAVELET AND CURVELET TRANSFORM – EXPLANATION

The steps are as follows:
Resample and registration of unique images, we can correct original images and distortion so that both of them have similar probability distribution. Then Wavelet coefficient of similar component will stay in the same magnitude.



By Wavelet change to decay the original images into proper levels. One low frequency approximate component and three high-frequency detail components will be acquired in each level. Curvelet Transform of individual acquired low frequency approximate component and high frequency detail components from both of images, neighborhood interpolation method is used and the details of gray can't be changed.

CONCLUSION

Thus the input images (CT and MRI) are transformed by a combination of discrete wavelet and fast discrete curvelet transform , thereby ensuring the presence of both sharp and curved edge information.

REFERENCES

[1] Fumiaki N. Ishikawa, Hsiao-kang Chang, KoungminRyu, Po-chiang Chen, Alexander Badmaev, Lewis Gomez De Arco, Guozhen Shen, and Chongwu Zhou, "Transparent Electronics Based on Transfer Printed AlignedCarbon Nanotubes on Rigid and Flexible Substrates", ACS Nano Article, pp 73–79, 2009.
[2] Yanfei Xu, Guankui Long, Lu Huang, Yi Huang, Xiangjian Wan, Yanfeng Ma, Yongsheng Chen, "Polymer photovoltaic devices with transparent grapheme electrodes produced by spin-casting", Carbon48, pp. 3308-3310, 2010.
[3] J.F. Wager, "Transparent electronics: Schottky barrier and hetero-junction considerations", Thin Solid Films, Elsevier Science, pp. 1755-1764, 2008
[4] Yuan Yanga, Sangmoo Jeongb, Liangbing Hu, Hui Wua, Seok Woo Lee, and Yi Cui, "Transparent lithium-ion batteries", PNAS, Vol. 108 No. 32, pp. 13013-13018, 2011
[5] Rogers J, Someya T, Huang Y (2010) Materials and mechanics for stretchable electronics.Science 327(5973):1603–1607.
[6] Forrest SR, (2004) The path to ubiquitous and low-cost organic electronic appliances on plastic.Nature 428(6986):911–918.
[7] Xu S, et al. (2014) Soft microfluidic assemblies of sensors, circuits, and radios for the skin.Science 344(6179):70–74.
[8] Arias AC, MacKenzie JD, McCulloch I, Rivnay J, Salleo A (2010) Materials and applications for large area electronics: Solution-based approaches. Chem Rev 110(1):3–24.
[9] Yan H, et al. (2009) A high-mobility electron-transporting polymer for printed transistors. Nature457(7230):679–686.
[10] Berggren M, Nilsson D, Robinson ND (2007) Organic materials for printed electronics. Nat Mater6(1):3–5.
[11] Noriega R, et al. (2013) A general relationship between disorder, aggregation and charge transport in conjugated polymers. Nat Mater 12(11):1038–1044.
[12] sakalakos L (2010) Nanotechnology for Photovoltaics (CRC Press, Boca Raton, FL), p 170.
[13] Sirringhaus H (2014) 25th anniversary article: Organic field-effect transistors: The path beyond amorphous silicon. Adv Mater 26(9):1319–1335.
[14] Di CA, Zhang F Zhu D, (2013) Multi-functional integration of organic field-effect transistors (OFETS): Advances and perspectives. Adv Mater 25(3):313–330.
[15] Dou L, Liu Y, Hong Z, Li G, Yang Y (2015) Low-bandgap near-IR conjugated polymers/molecules for organic electronics. Chem Rev 115(23):12633–12665.
[16] Nielsen CB, Turbiez M, McCulloch I (2013) Recent advances in the development of semiconducting DPP-containing polymers for transistor applications. Adv Mater 25(13):1859–1880.