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Refereed Journal Papers

[jpshin-01:2014] Tomoya Murata and Jungpil Shin. Hand Gesture and Character Recognition Based on Kinect Sensor,. *International Journal of Distributed Sensor Networks (SCI)*, 2014(5):278460, July 2014.

> The purpose of this research was to see if Kinect sensor can recognize numeric and alphabetic characters written with the hand in the air. Kinect sensor can capture motion without the sensor device being attached to the user's body. The input screen has both modes of numerals and alphabet. The recognition rate was measured and the user wrote the numbers from zero to nine and the letters from A to Z twice. Alphabet recognition relied on Palm's Graffiti. The input numerals and alphabet were recognized by dynamic programming matching based on interstroke information. In addition, this system can perform the numeral operation, such as $+$, ?, $\times$, and /.Most people are not used to writing in the air and are unfamiliar with Kinect sensor, and it takes some time to master them both. First, the user needs to become accustomed to using the sensor. Average recognition rates of 95.0characters.

[jpshin-02:2014] Hsien-Chou Liao, Chih-Hung Yang, Hong-Wei Huang, and Jungpil Shin. Consistent Labeling Approach for a PTZ Camera Based on Template Cache and Least Recently Used Replacement Strategy. *International Journal of Signal Processing, Image Processing and Pattern Recognition*, 8(2):361–374, Feb. 2015.

> Object tracking is an important function of video surveillance system. For the same object in a multi-camera environment, how to assign the same label to this object is so-called consistent labeling problem. Many consistent labeling approaches proposed by previous studies mainly based on the environment with multiple fixed cameras. In this study, a consistent labeling approach is proposed for a PTZ (Pan-Tilt-Zoom) camera. The same object is assigned the same label while the object in the FOV (Field-of-View) of a PTZ camera without influencing by the pan/tilt rotation. In order to achieve the above goal, the proposed approach using several methods, such as temporal differencing, template matching, mean-shift tracking, Kalman filter, and so on. A template cache is also designed for preserving the templates of an object with various angles and a least recently used (LRU) replacement mechanism is used to update the cache. The experimental results show that accuracy of the proposed approach for the consistent labeling of a PTZ camera can reach about 83 percentage.

Summary of Achievement

[naru-01:2014] S. Yamamoto, T. Matsunaga, R. Nakamura, Y. Sekine, N. Hirata, and Y. Yamaguchi. Rotational Pixel Swapping Method for Detection of Circular Features in Binary Images. *IEEE Transactions on Geoscience and Remote Sensing*, 53:710–723, 2015.

> We propose a new automatic method called the rotational pixel swapping (RPSW) method to detect circular features in binary images of remote sensing images. The method is based on a multiplication operation between the original image and the rotated images. We show that the RPSW selectively enhances rotational symmetric patterns and weakens nonrotational symmetric patterns, including noise components, without any noise reduction processes. The method can detect not only simple circles but also more complex circular features such as incomplete ring structures or several concentric rings. Furthermore, we demonstrate that the RPSW provides the stable detection of circular features such as terrestrial impact structures, which are irregular imperfect circular shapes, in binary images based on Earth-observation satellite images. The RPSW would provide a potential method of future surveys or statistical studies using huge data sets of multiband or hyperspectral images obtained by Earth-observation satellites.

[naru-02:2014] Y. Yokota, K. Gwinner, J. Oberst, J. Haruyama, T. Matsunaga, T. Morota, H. Noda, H. Araki, M. Ohtake, S. Yamamoto, P. Glaser, Y. Ishihara, C. Honda, N. Hirata, and H. Demura. Variation of the lunar highland surface roughness at baseline 0.15-100 km and the relationship to relative age. *Geophysical Research Letters*, 41(5):2013GL059091, 2014.

> We report the surface roughness analysis of the lunar highlands for the baseline range 0.15-100 km. We use the Median Differential Slope α m to investigate the scale dependency of the roughness and derive the global α m distribution from SELENE Laser Altimeter and Terrain Camera data. While α m(l) versus baseline l (km) plots vary among different highland types, all highlands commonly show a peak at 3-30 km. The Pre-Nectarian surface shows a relatively large α m(20-30 km). Our analysis is supported by the simulation of synthetic surface cratering models and crater statistics. In our simulation, a peak of α m(30 km) is successfully reproduced. The actual crater density shows good correlation with an empirical roughness indicator. However, a large part of the Nectarian surface shows a peak at 6-9 km baseline. This peak may be caused by secondary craters and ejecta deposit textures from the Nectarian system basins.

Refereed Proceeding Papers

[jpshin-03:2014] Jungpil Shin Yu Tang. Image Stitching with Efficient Brightness Fusion and Automatic Content Awareness. In Mohammad S. Obaidat, editor, *International Conference on Signal Processing and Multimedia Applications (SIGMAP 2014)*, pages 60–66, Vienna, Austria, June 2014. INSTICC, INSTICC.

Image Stitching, also be called photo stitching, is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. Image stitching is challenging in two fields. First, the sequenced photos taken from various angles will have different brightness. This will certainly lead to a un-nature stitched result with no harmony of brightness. Second, ghosting artifact due to the moving objects is also a common problem and the elimination of it is not an easy task. This paper presents several novel techniques that make the process of addressing the two difficulties significantly less labor-intensive while also efficient. For the brightness problem, each input image is blended by several images with different brightness. For the ghosting problem, we propose an intuitive technique according to a stitching line based on a novel energy map which is essentially a combination of gradient map which indicates the presence of structures and prominence map which determines the attractiveness of a region. The stitching line can easily skirt around the moving objects or salient parts based on the philosophy that human eyes mostly notice only the salient features of an image. We compare result of our method to those of 4 state-of-the-art image stitching methods and it turns out that our method outperforms the 4 methods in removing ghosting artifacts.

[jpshin-04:2014] Wen-Chang Cheng Jia-Yu Jhang Hsien-Chou Liao, Yu-Ming Chen and Jungpil Shin. Fall Detection Based on the Fusion of Vision and Tri-axial Accelerometer. In *International Conference on Advanced Computer Science and Engineering (ACSE2014)*, pages ACSE–A005, Guangzhou, China, June 2014. IEEE, IEEE.

Elder people make up a large and increasing percentage of the population. An unfortunate fall could lead to serious injuries in elder people. Therefore, fall detection is an important application for elder healthcare. A common fall detection approach is based on the vision or tri-axial accelerometer. For the approach based on the vision from a camera, the fall detection function is useless under some conditions, such as the person is occluded, outside the

field-of-view (FOV) of the camera, in the dark of the night. For the approach based on the tri-axial accelerometer (TAA), false alarms of normal behaviors decrease the feasibility of the fall detection function. Therefore, an approach by fusing the vision and TAA for the fall detection is proposed in this paper. For the vision part, the shape deformation is analyzed to detect the occurrence of a fall. Two fusion rules are also defined to achieve high fall detection rate and low false alarm rate. According to the experimental study, the fall detection rate can achieve 100time. It shows that the proposed approach can reduce the false alarms significantly and improve its feasibility in the practical environment.

Grants

[naru-03:2014] N. Hirata. Grants-in-Aid for Scientific Research (KAKENHI), 2013-2015.

Academic Activities

[jpshin-05:2014] Jungpil Shin, June 2014.

> Program Committee, (held in Zurich, Switzerland, 2014 June 14   15)

[jpshin-06:2014] Jungpil Shin, Oct 2014.

> Program Committee, (held in San Diego, California, USA Oct. 5-8, 2014)

[jpshin-07:2014] Jungpil Shin, Feb 2015.

> Program Committee, (held in Lisbon, Portugal, February 22 - 27, 2015)

[jpshin-08:2014] Jungpil Shin, Marfch 2014.

> Program Committee, (held in Orlando, Florida, USA, on March 4-7, 2014)

[jpshin-09:2014] Jungpil Shin, June 2014.

> Program Committee, (held in Anchorage, Alaska, USA, June 27 - July 2, 2014)

[naru-04:2014] N. Hirata, 2014.

> Chair of the committee for general affairs

[naru-05:2014] N. Hirata, 2013-2015.

> Member of Program Subcommittee, and Editor of Proceedings

Patents

[jpshin-10:2014] Jungpil Shin. Stroke Synthesis Method and Character Synthesis Method PAT.NO. 2011-018668, March 2015.

[jpshin-11:2014] Jungpil Shin. Stroke Synthesis Method and Character Synthesis Method PAT.NO. 10-2011-0113797, March 2015.

Ph.D and Others Theses

[jpshin-12:2014] Takuya Kutsuoka. Graduation Thesis: Writer Verification based on Three-dimensional Information using Kinect Sensor, University of Aizu, 2014.

Thesis Advisor: Jungpil Shin