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Augmented Reality using Advanced Array Processing of Multiple-Marker

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Abstract. Marker sequence list technique is to detect the standard marker and then, set the marker sequence range based on the coordinate of the detected standard marker to recognize marker sequences. when similar patterns are assigned as sub-markers, marker sequence ranges could be overlapped and consequently the marker sequence misdetection rate would be increased. Therefore, this study suggests a new marker sequence technique which does not employ the existing marker in order to resolve the overlapping of sequence ranges.

Keywords: Augmented Reality, Multiple Marker Detection, Marker Array

1 Introduction

Augmented reality views the real world and its objects and augments them. At that time, objects of the real world can be viewed by two different methods and these methods make the augmented reality into the marker based augmented reality and the markerless augmented reality.

However, at the process of recognizing of markers, markers with similar patterns are recognized as the same marker. Thus, only patterns which have less similarities should be registered and it results in the limitation of the no. of markers to be generated.

In order to resolve this issue, a marker sequence list technique of which can augment up to 256 objects by creating marker sequences which are generated by combining 4 markers with distinctive patterns [1].

However, since the standard marker is required to set the marker sequence range, the standard marker must be detected in advance. Also, when similar patterns are assigned as sub-markers, marker sequence ranges could be overlapped and consequently the marker sequence misdetection rate would be increased.

Therefore, this study suggests a new marker sequence technique which does not employ the existing marker in order to resolve the overlapping of sequence ranges.

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3 Method of Advanced Marker Array

The figure 1 reveals the overall flow of the marker sequence process technique suggested by this paper.

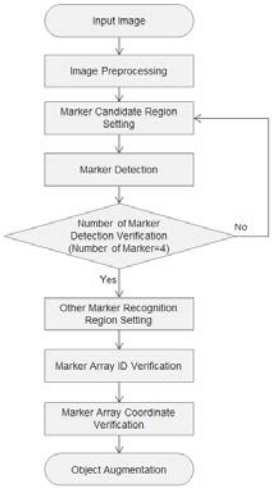

Fig.1. Contents Augmentation using Marker Array

3.1 Image Prepocessing

For the detection of markers, the image binary process is required, and this paper, entered images are converted into grey images and the converted grey images goes through the image binary process of which suggested by Wu[2].

3.2 Marker Recognition

For detection of markers, Mantle which is the black border, should be detected. In order to do so, candidate marker ranges should be detected with CAMShift (Continuously Adaptive Mean Shift)[3] algorithm which can trace objects at high speed based on colors.

3.3 Marker Detection

In this paper, MMPM(Moment-Preserving Pattern Matching)[4] using 2 bit quantization is applied for pattern matching process for detecting markers and then, as the CC(Correlation Coefficient)[5] match patterns and detect markers.

3.4 Other Marker Recognition Region Setting

To check the marker sequence ranges of the detected markers, the existence of other markers should be checked as well. For this, the area of the standard marker should be measured with the coordinate of marker corner point and set up of the range for recognizing markers up and down and right and left. At this, the size of the set range should be about 30% larger than of the standard marker.

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3.5 Marker Array ID Verification

In case of a marker sequence suggested by this study, ranges of which other markers are recognized are varied over makers in the marker sequence range.

Check an order of marker sequences upon the existence of other markers in the marker sequence area and create marker sequence ID in accordance with the confirmed order of marker sequences.

3.5 Object Augmentation

To augment objects, coordinates of the real world should be projected onto 2-D camera image coordinates and in order to realize that, in this paper, the camera calibration[6]

Fig.1. Contents Augmentation using Marker Array

4 Conclusion

In this paper, an enhanced marker sequence detection method is suggested for resolving issues of the previous marker sequence list technique of which marker sequence recognition areas are being overlapped.

However, when brightness of entered images gets lowered, the marker sequence detection rate could be lowered as well. Therefore, a study on binary techniques robust against changes in brightness would allow to detect a marker sequence in an environment of which experiences frequent changes in brightness.

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References

1. Donghyun, K., Yohwan, S., Seoksoo, K.: Study of marker array list method for augmented reality service based mart home. IJSH, vol, 5, no.4 , pp.51--64 (2011)
2. Wu, B.F., Chen, Y.L., Chiu, C.C. .: A discriminant analysis based recursive automatic thresholding approach for image segmentation. IEICE Trans. Inf. & Syst. vol.E88-D, no.7, pp. 1716--1723 (2005)
3. Allen, J.G., Xu, R.YD J., Jin, S.: Object tracking using CAMShift algorithm and multiple quantized feature spaces. Pan-sydney Area Workshop on Visual Information Processing, pp.3—7 (2003)
4. Svdlow, M., Mcglem, C.D., Anuta, P.E.: Image registration: similarity measure and preprocessing math comparisons. IEEE Transactions on, Aerospace and Electronic Systems, vol.AES-14, no.1, pp.128--140(1978)
5. Rafael, C.G., Richard, E.W.: Digital image processing. addison-wesley publishing company. (1992)
6. Kato, H., Billinghurst, M., Poupyrv, I., Imamoto, K., Tachibana, K.: Virtual object manipulation on a table-top AR environment. IEEE and ACM International Symposium on Augmented Reality, pp.111--119 (2000)

