PAPER • **OPEN ACCESS**

An improved Performance of Segmentation Evaluation Based on Feature Extraction using Kinect Sensors

To cite this article: Mahmood H. Enad *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **745** 012047

IOP Conf. Series: Materials Science and Engineering **745** (2020) 012047 doi:10.1088/1757-899X/745/1/012047

An improved Performance of Segmentation Evaluation Based on Feature Extraction using Kinect Sensors

Mahmood H. Enad[1], Mohanad Aljanabi[2], Haider. K. Latif [2], Jameel Kaduim Abed[3]
[1]Electrical Techniques Department, Technical Institute of Karbala, Al-Furat Al-Awsat Technical University, Najaf, Iraq.
[2]Electrical Power Techniques Engineering Department, Technical College /AL- Mausaib, Al-Furat Al- Awsat Technical University Najaf, Iraq.
[3]Department of Medical Instrumentation Techniques Engineering, Electrical Engineering Technical College, Middle Technical University, Baghdad 1022, Iraq

*Corresponding author: com.mhn@atu.edu.tr.

Abstract: - Kinect sensor suggestions new viewpoints for the advance and application of inexpensive, portable and easy-to-use indication less motion capture skill. The goal of this work is to estimate accuracy of the Kinect cameras for full body motion investigation. This study developed an application that of using multiple depth and RGB Kinect sensors for that reasonable system that prepared with multi-depth of sensing was used in this work. Additional application confirmed the Kinect camera validity the evaluated of postural control and different images of biomedical for segmentation skin lesions. In this work, multi-depth assessment and segmentation are conjointly addressed using RGB input image under Median filter with post-processing. Compared with our algorithm outputs an organized-to-use highly suitable for creating 3D Kinect sensors with pre and post-processing steps. The multi-depth extracted image features have higher measurement and accuracy. The results are dealing out the depth and RGB picture with segmentation evaluation depend on feature extraction technique to enhance accuracy.

Keywords: - Feature Extraction, Kinect Sensors, Segmentation, Multi-depth Evaluation, Median Filter.

1.Introduction

Human motion investigation has many applications: biomechanical examination, medical analysis, serious or fun gaming, security, presently, most of the movement tracking is achieved using MBS, especially for medical solutions [1] and [2]. It is a modest and public method where human can relate with machines. There has been a several studies completed in 2D acknowledgement, nevertheless a lot to organize in 3D.
With the statement flow-cost RGB sensors for example the Microsoft Kinect and 3D sensor, the opportunity of rebuilding of backgrounds, objects and even ourselves in 3D has been touched [3]. Microsoft Kinect sensors an innovative camera offers color and deepness data of images. It is a progressive sensor utilized for high presentation 3D picture capture working for human machine communication. The sensors have typically an RGB image, a pixel and a microphone. The sensor detects RGB mechanisms with a determination of 640 x 480. Here the Kinect sensor is utilized for recognition of Sign language to aid the deaf to advance their memory and language times [4].

Kinect sensor is an enhance-on trick for the gaming structure that allows workers to control games, with physical motion and without the want for a separate input controller like a joystick or keyboard [5].
Figure 1 illustrations the Kinect sensor. It has deepness sensor, colour camera, an IR light resource, and 4 microphones. A slope motor allows the device to be sloped in rise and down path.

Figure 1. Kinect Sensors

Kinect has an RGB sensor and an IR emit. It can take a highlighted picture and deepness of apiece pixel in the section. This information comprises graphic and information of the part. They are matching and they enable us to do everyday jobs that are hard, if not unbearable, after we use pictures. Furthermost of the image processing schemes are depending on the color stations of the images. However, others picture features can be applied for dealing out, such as: deepness, standard, luminance [6].
The 3-segmentation supported by depth data are (640 x 480, 320 x 240 and 80 x 60) pixels, and the depth information has the space data to the attached thing from the camera side by side. Consequently, the data developed by Kinect (RGB + Depth) has a construction that makes an original method to procedure images. In this study, we will discover opportunities caused by this building, named RGBD Image. These potentials are actual time tracking of a structure human [5].
A study in Kinect sensors is completed out for 2D as well as 3D images. Hong M. Z et al [7] strategic on an actual-time cataloguing based on hand tracking from depth image with an accuracy of 92% by using HMM. Yuan Yao et al [8], authors applied a method for developing several applications. Kinect sensor is appropriate for reliability and accurate tracing. A pixel-depending on recognition and 3D classical contour-based was applied with an accuracy of 52.31% and 74.65%. Chih H.W et al [9] the expected system used only depth information to identify the images. Alexandre Savaris et al [10], paper displays a comparison using Nearest Neighbour, Neural Networks, and SVM as classifiers for kinetic cameras. The authors in [11] usage wavelet relations, designed on control images, as structures to train a Neural Network for changed group. Fabio M, et al [12] evaluated that informal route distances can be positively applied for acknowledgement tasks. Avoiding direction, identical and using length-based rescaling, it is probable to become a dependable distance quantity that is active for Nearest Neighbour depend on route establishment.
Exactly, the idea of integrating the multi-depth assessment and segmentation into structure is interested by the detail that both segmentation information and multi-depth charts characterize

geometrical data of a section. In this way, the feature extractors can be improved qualified because of the developed previous information.

2.The Proposed Method and Materials

We suggest building a prototypical where the features extracted are appropriate for both tasks (orientation, width to height, eccentricity, compactness and solidity), so important to an enhanced accuracy in the assessed information. One of the chief benefits of the planned method is the straightforward style segmentation and multi-depth chart are assessed from databases image, provided that an achievable resolution to these problems. The summary of the technique used to progress feature extraction using Kinect sensors as shown in Figure 2 involves of the resulting steps. The first step is picture capture where the pictures are occupied by digital camera under various environments for example scaling, translation and rotation. The second step is a pre-processor in which control detection, levelling, and other filtering procedures arise. In the final step, the structures of the images are taking out with evaluation parameters [13]. The last stage is the classification, where the acknowledgement rate is designed. The following is a report of these steps as shown in figure 2.

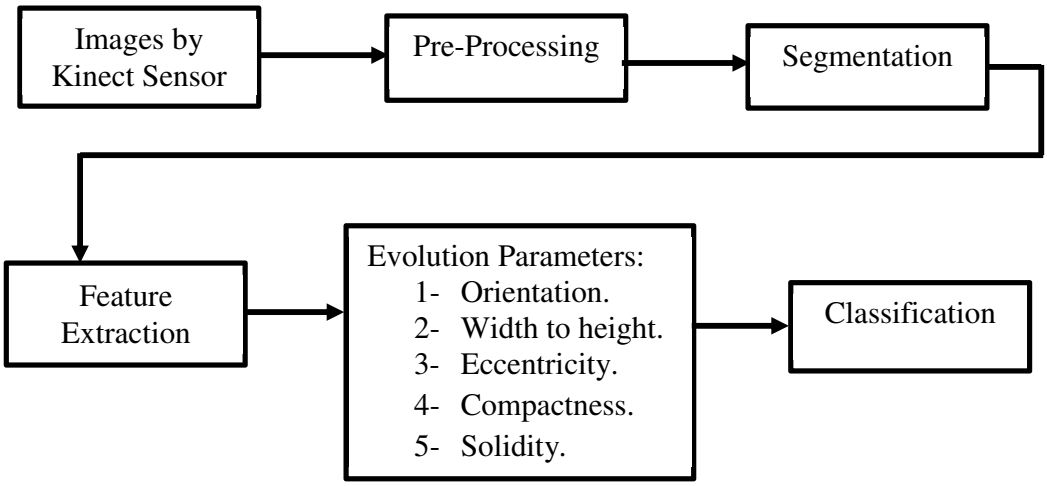

Figure 2. Overview of the technique used to progress feature extraction using Kinect sensors.

Eccentricity range (0-1) where 0 resources wide-ranging circle in hand area and 1 resource straight line in the hand section. Eccentricity signified as 'Ɛ' as in equation (1) is the ratio of two Eigen values of covariance matrix.

$$\text{Eccentricity}=Ɛ = \frac{\lambda 1}{\lambda 2} \quad (1)$$

Where λ1 and λ2 are Eigen values of covariance matrix.

3. Results and Discussion

Table 1: Qualified outcomes of absolute and relative errors Vs ground truth (GT) information on the RGB and multi-depth. The information gotten with Kinect sensors has many difficulties. The RGB image and the multi-depth information have together distributions with median filter. At the side of this, it is required to regulate the cameras with the purpose of combine acceptably the RGB image with the multi-depth information [13-15].

Table 1. The outcomes qualified of proposed method and our methods with different dataset bases.

Sequence	Multi-depth and RGB(Proposed)	Our Methods
Standard Deviation (STD)	0.0833	0.0706
Median Filter (MF)	0.0946	0.0671
Mean	0.0936	0.0801
RMS	0.0950	0.0949
Max	0.2589	0.1458

Meanwhile using an easy Median filter Prototypical, on the multi-depth dimension, for apices that are visible in all borders. Its outcomes in a simple algorithm of be close to weighted signed border. In our situation, we are absorbed in the limited version of this outcome, because the surface blocking. Figure 3 illustrations that Kinect red information has a lot of noise and holes.

Figure.3 Information with filtered of Kinect sensor method.

Segmentation is a straightforward process in image processing. In this case the pixels within the sections are homogeneous to colour, intensity or texture, the boundaries between segments represent the discontinuity in the image and are used to detect shapes in the image. This is an area opening operation where it removes the pixels values less than 500 from the binary image.
This pre-processed and segmented image is further applied for feature extraction. Figure 3 displays the multi-depth, the RGB and the segmented image.
Despite the fact in non-linear cataloguing, as before said a kernel is applied. Statistically, any function K (x, y) is a kernel and can be rewritten as in (2).

$$K(x, y) = \Theta(x) \cdot \Theta(y) \quad (2)$$

where Θ is the function that charts into the higher-dimensional structure space [6].
The outcomes presented in the Figure 4 illustrations that are detected using support vector machine (SVM) for cataloguing. The accuracy is approximately 85 %. The assessment metric used for classification is classified amount. Classified percentage is a number of models correctly classified over the total number of models confirmed.
The features extracted are appropriate for both responsibilities (orientation, width to height,

eccentricity, compactness and solidity), the significant to an improved accuracy in the evaluated information.

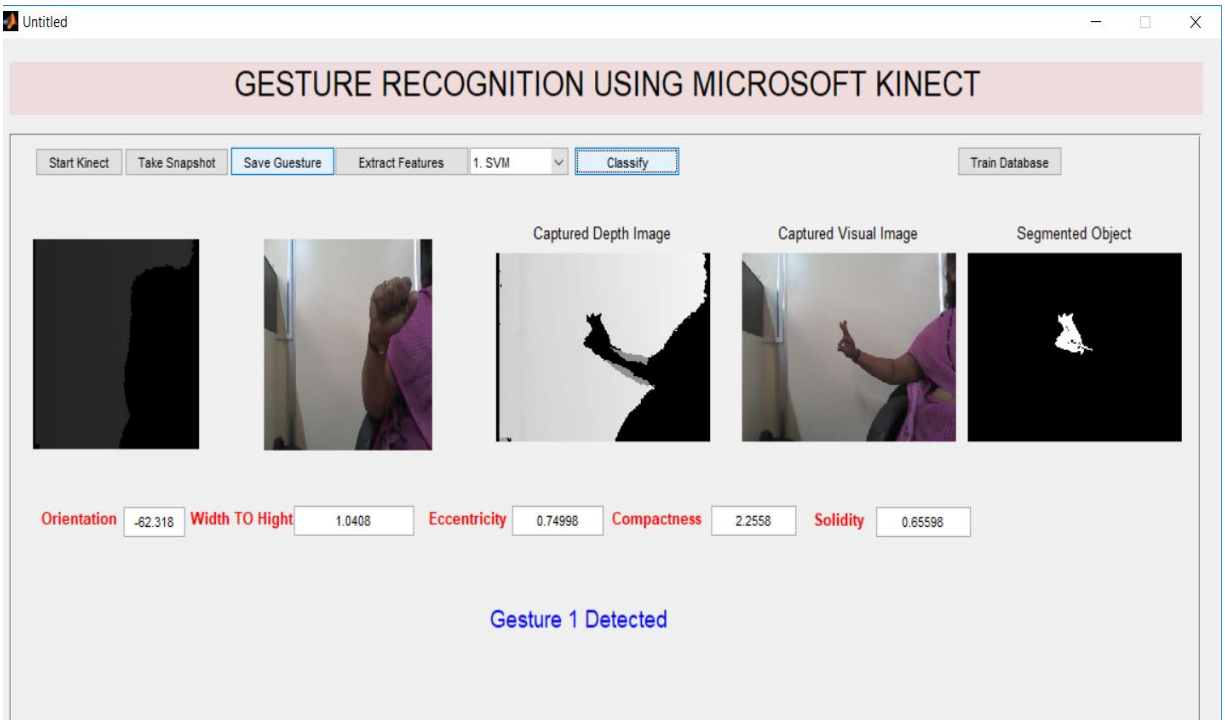

Figure.4 Sample outcome showing features extraction and detected sign after segmentation.

4. Conclusions

While Kinect sensors were advanced for gaming, it's routine is appropriate for a range of healthcare imaging applications. It is presently under clinical examination, then studies have so far to demonstrate patient advantage in a controlled and randomized method.

A significant influence of this work is that we prove that the technique of RGB and multi-depth data produces to healthy frame-to-frame alignment, which is the most significant section of a 3D mapping application. Additionally, the practice of system for example the Microsoft Kinect unlocks the opportunity of open resource personal 3D recording. We hence address this as a significant domain where future study will be exceedingly advantageous for future applications. Accurateness and usability of Microsoft Kinect sensors as little-price transportable other human body tracking schemes were estimated.

5. References

[1] Cappozzo A,Della C U,Chiari L 2005 Human movement analysis using stereo photogrammetry. Part 1: theoretical background Gait and Posture. vol.21.,no.2, pp. 186 196.

[2] Galli M S,Cimolin V, Menegoni F,Trotti C,Milano E A 2012 Gait pattern in myotonic dystrophy (Steinert disease): A kinematic, kinetic and EMG evaluation using 3D gait analysis Journal of Neurology Sciences. vol.314., pp. 83 87.

[3] Newcombe R A,Izadi S,Hodges S,Fitzgibbon A W 2011 Kinect fusion: Real-time dense surface mapping and tracking in Proceedings of the 10th IEEE International Symposium on

Mixed and Augmented Reality. pp. 127 136.
[4] Kajal S H 2015 Kinect Sensor based Object Feature Estimation in Depth Images International Journal of Signal Processing, Image Processing and Pattern Recognition. vol.8., no.12, pp.237 246.
[5] Clark A S,Pua M V,Fortin K,Denehy L I,Bryant A L 2012 Validity of the Microsoft Kinect for assessment of postural control Gait and Posture. Vol.36.,no.3,pp.372-377.
[6] Lai K,Bo L,Fox D 2014 Detection-based object labeling in 3d scenes Proceedings of the International Conference on Robotics and Automation.
[7] Hong M z and Chi M P 2012 Real-time Hand Gesture Recognition from Depth Image Sequences IEEE. DOI 10.1109/CGIV.2012.
[8] Fspon 2014 Circuits and systems for video technology vol. 24., no. 11.
[9] Chih H W,Wei L C,C H L 2017 Depth-based hand gesture recognition Multimedia Tools.
[10] Alexandre S,Wagenheim V,2010 Comparative evaluation of static gesture recognition techniques based on nearest neighbor, neural networks and support vector machines J Braz Computer Soc. Vol.16., pp.147 162, DOI 10.1007/s13173-010-0009-z.
[11] Lakshman K R, Sudharsana P, Gokul K V 2019 Sign Language Recognition using Depth Data and CNN SSRG International Journal of Computer Science and Engineering (SSRG – IJCSE). Vol.6., Issue 1.
[12] Fabio M,Pietro P, Andrea C, Lucio D S 2018 Comparing 3D trajectories for simple mid-air gesture recognition Computers & Graphics.doi: 10.1016/j.cag.2018.02.009.
[13] Kathy R, Clifton F, Chia S J,Meredith R M 2004 Exploring the effects of group size and table size on interactions with tabletop shared display groupware In Proceedings of the 2004 ACM conference on Computer supported cooperative work. pp. 284 293, New York, NY, ACM.
[14] Volker R X,Philipp S c,Benjamin G ü 2017 The ring: authenticating users' touches on a multi-touch display In Proceedings of the 23nd annual ACM symposium on User interface software and technology, UIST vol.10., pp.259 262, New York, NY, USA
[15] Paulo T, Fernando R R,Luis P R 2015 Generic System for Human-Computer Gesture Interaction: Applications on Sign Language Recognition and Robotic, Soccer Refereeing Springer Science Business Media Dordrecht.