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Capture Patterns of Live Movement using IGNT Edge Detection

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Abstract: The fundamental elucidation of any 2D/3D image or scene is typically the edge of the image. In order to have clear understanding, better implementation and enhancements, better interpretation of edges in a image is must. The prominent features of the camera in the Kinect sensor at present is not used while the Edge Detection process. That leads to more intensified Edge Detection in 2D/3D images and videos. That is known to be the implementation of Improved Gradient Noise Tolerant Method (IGNT). This paper illustrates a clear implementation of the concepts and methods used in the IGNT technique applied to the Kinect sensor.
Keywords: Edge Detection, IGNT, sensors, Kinect, camera, 3D modeling histogram.

I. INTRODUCTION

For the application of exact properties of any image Edge Detection is the very basic and most eminent technique [1]. Edge is an disruption in the values of image particularly focused in attitude, deepness and flash which acts as a main properties for gray scale image [2].From that image is Thresholding is processed by automatic clustering or grouping of objects with edge detection using the IGNT method. In this an image is segmented and preprocessed using an auto-segmentation method. This makes the IGNT method productive by the application of Thresholding and Binarization. Where, frequent Binarization process decreases the chance of image noises along with the Gaussian and high frequent detection. Even at greater noises Binarization is executed well and at reality making the Kinect more effective and methodical.[3]. Thus, the Kinect plays an eminent role in tracking the 3D scenes in any image or videos. Where the images undergoes the above mentioned processes like Thresholding with Edge Detection as its basic concept of description..In 2D imaging technique it produces a vertical and horizontal dimension with flat views. Whereas, 3D images are processed on real time volumetric accession that to the pyramidal data set of values [4]. In the proposed IGNT method, consolidating 2D images and 3D geometry of the images have led the Kinect sensors and their algorithms more enhanced. At present, Canny Edge Detection is implemented in Kinect sensor. But IGNT method is better and far more compatible for clear Edge Detection in the motion tracking process. The understanding of the IGNT method as it is implemented with Kinect sensor is Analyzed and interpreted in this paper.

II. KINECT THE KINETIC DEVICE

Any movements of human or objects are captured by the Kinect sensor and those act as characteristics that are spotted and drawn out for Edge Detection technique [3].Edge detection segments and tracks the object by detecting every part of the object that is sensored [5, 6].The most captivities points such as body, face and hand are studied, absorbed and detected for motion tracking of the moment created. The kinetic motion of the object tends to be the input image feature for the algorithm. Thus, providing the reaction in response to the action recognized by the sensor.

III. KINECT WITH IGNT

The usage of IGNT methods in Kinect sensor is shown in the figure-1. The Kinect sensor acts as ordinary camera with kinetic device. As the scenes or images are moved their motions is captured by the device and are extracted as three dimensional images alone which are costly for the kinetic devices. Usually edge detection is carried on 2D images by the camera. Yet the usage of kinetic devise automatically estimates the movements of the objects captured by the camera and those images are considered as reference images [7].In these reference images, the phenomenon of relative frequencies for the defined gray scale levels for the particular image is enhanced by the process of histogram equalization. This process is used in the processing of contrast adjustments either increasing it according to the histogram frequency occurrence, resulting in global contrast enhancement when close contrast values that are usable is accounted and these adjustments leading to higher contrast for areas of lower contrast. Intensities and contrast adjustments are distributed accordingly.

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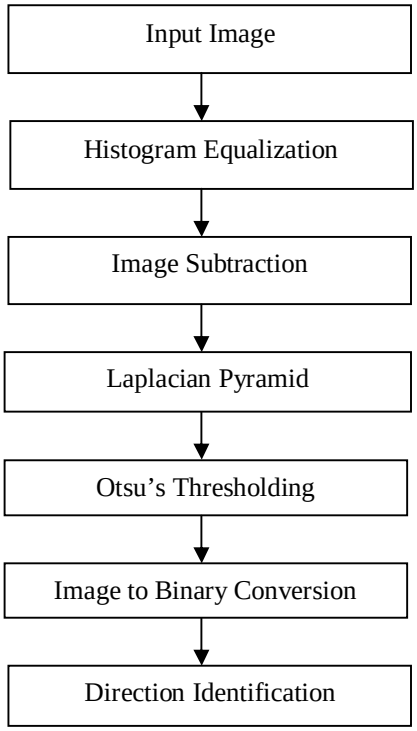


Fig.1 Processes Involved in Kinetic Device with IGNT Edge Detection Method.

The effective increase in the most frequent intensity values that the progress in the contrast leading to the gray scale transformation that flattens the resulting histogram is achieved in histogram equalization. The original image with increased histogram is simply a scaled version of gray scale transformation, resulting in Image Subtraction that is influenced for Histogram Equalization method. So, Edge Detection using IGNT method is applied based on following procedures processing, Thresholding [9, 10], and Binarization and Feature Extraction [11]. It also performs in accordance with two or more methods with the highest proposition values of edges for the detected 3D image or scene.

IV. ALGORITHM

The following steps are observed while implementing the algorithm for the features.

A. Histogram Equalization is calculated after transfiguring color image into gray scale image using the formula.

$$pn = \frac{number\ of\ pixels\ with\ intensity\ n}{total\ number\ of\ pixels}$$

n = 0, 1, L-1. The histogram equalized value will be given by

$$G(I, j) = \text{floor}\ (L-1) \sum_{n=0}^{f(i,j)} p_n)$$

B. Outputs of Inage Subtraction are added in order to form a single image.

C. IGNT Algorithm

D. The single image undergoes pyramids reduction and expansion for preprocessing along with the smoothing and sampling process [8].

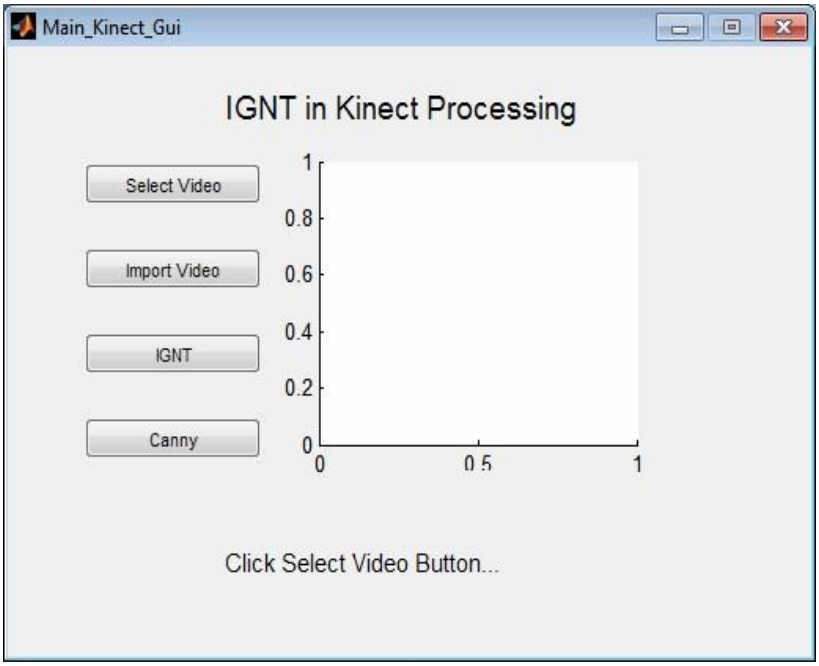
E. Automatic segmentation is done with the use of histogram bimodal image resulting in Thresholding of the image [9, 1].

F. Based on the quality of Thresholding, Binarization in pixels of the image is performed.

G. Finally, the Feature Extraction is applied by reducing the Gaussian and high frequency noises with the use of Binarization and extraction performed along with the algorithm with the utmost localization [11].

Basically a converted gray scale's contrast is adjusted by increasing the most frequent intensity values that applies the histogram equalization process. And the adjustment of the contrast is calculated using the algorithm formula mentioned. This equalized value increases the global contrast of the total image with the usable data. Lower areas of contrast gain higher contrast by distributing the intensities more deliberately. After this process of enhancement and adjustment in intensities, the image undergoes image subtraction process. In this process the essential part of the image is extracted by subtracting the rest. Here, objects act as the main parts of the image or the video that is to be extracted. Image subtraction detecting the object in motion is a prominent concept where the ratio is the difference measured between the current frames to the reference frame in a video stream. Whereas, the foreground data obtained in the image are mostly irrelevant data that are noises of the image. But objects are acknowledges with the combination of both relevant and irrelevant data. Thus IGNT method eliminates these irrelevant data and detects the edges using only the relevant data after preprocessing Thresholding and Feature Extraction processes. Firstly repeated smoothing and sampling [8, 13] and then pyramid reduction and expansion are executed. The pyramids reduction can either be low pass or band pass for the processing stages. The image then is subjected to Otsu's Thresholding of automatic image segmentation using histogram bimodal image [9].This process is capable of multilevel Thresholding that concludes with continuous data flow that is indispensable. A more effective and efficient method of Binarization is implemented to the converted gray scale image to convert it completely too binary image using optimal segmenting limit. Initially, Feature Extraction is accomplished by the algorithm that creates maximum localization for reduction of Gaussian and highest frequency noises along with Binarization [11]. Presently Canny Edge Detection algorithm is used in kinetic device. But the final value obtained in Feature Extraction is given as a reaction response to action by the Kinetic device.

V. RESULTS



A. Kinect GUI

Fig. 2 a) Kinect GUI

The Graphical User Interface in Kinect compares the results acquired from the Canny Edge Detection algorithm and the proposed method proving that the IGNT method is far better in motion tracking than the existing system. This analysis is applied to a video while it is linked in a stream. The movement of the object in the video is tracked using the sensor. Every part of the object is detected and features are extracted for any action performed by the system.

B. Selection- Importing the video frames of an experimental videos

Fig. 2(b) Selection importing the video frames of an experimental video

The experimental video is imported and executed. It undergoes histogram equalization that enhances the contrast and intensities far better and more stabilized. Yet these adjustments are totally dependent on the sensor used. Thus, Histogram Equalization benefits only when the processing of the sensor is appreciated.

C. Preprocessing using IGNT

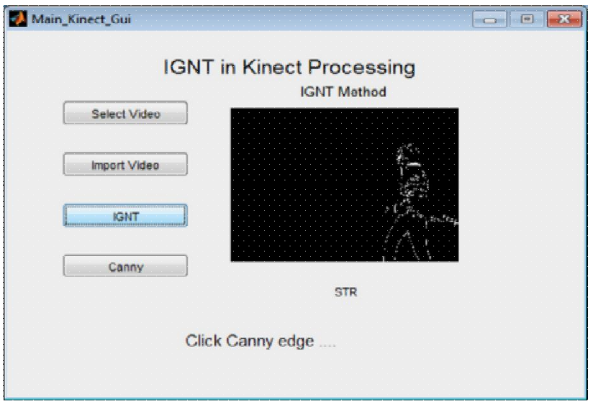


Fig. 2(c) Processing using IGNT

The process of Image Subtraction is then fulfilled to reduce the kinetic motion of the object from the backgrounds detected by the Kinect sensor as in figure-2(c). All the secured gradient values are preprocessed with smoothing and sampling in order to reduce

noises in every scene. The object is tracked in every frame and the changes seen from one frame to another is examined to be the motion of the object i.e. predicted and deliberated.

D. Implementation of Canny Edge Detection

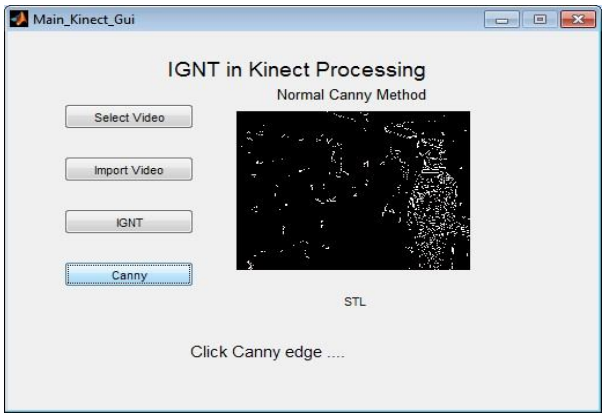


Fig. 2(d) Implementation of Canny Edge Detection

As the figure-2(d) the noise and extraneous data are also detected along with the edge in the Canny Edge Detection method and it is applied after processing. This makes the object uncertain for detection and inhibiting the background noise to act as edge by the Kinect sensor. So the sensor is unaware and makes the uncertain estimation of the action mainly the sign language input given by humans. The transitions are uncertain and the objects kinetic motions are ineluctable and unclear. In IGNT method noise is indulged by Thresholding and Binarization processing that detects the object without noises and enhancing the implementation of Kinect sensor.

E. Implementation of the proposed method

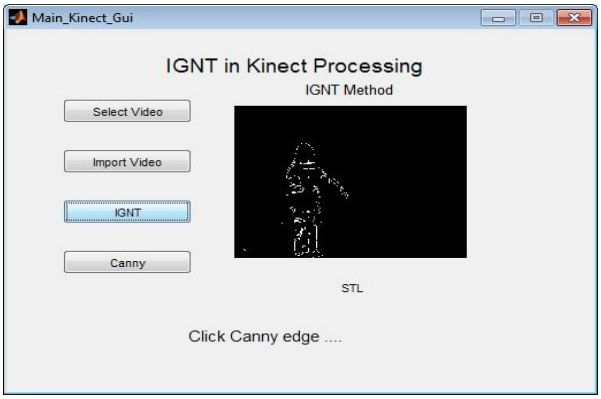


Fig. 2(e) Implementation of the IGNT Method

By manifesting the various techniques involved in IGNT method, all arduous of recognizing the objects without interruptions and noises as shown in the figure-2(e). A relative comparison between Canny Edge Detection and IGNT method for the Kinect sensor to detect and track motions of the objects in 2D and 3D images are perused. Thus, implementing the IGNT method enhances the quality of the Kinect sensor and is described in figure-2 [14, 15].

VI. CONCLUSION

The understanding of computer models about what actions the humans mind exactly prefers is achieved by human Computer Interaction (HCI) that is almost applied in all the fields of artificial intelligence today. Kinetic device is one such device that makes this relationship between the machine and the human stronger. Yet it is still in the development and research process. The IGNT method for detecting the edges in both 2D and 3D images/videos proposed for kinetic device enhances the ideology of HCI.

Automatic Thresholding, Binarization and Feature Extraction paves way to IGNT to track exactly the objects in the scene and eliminating the unwanted noises and irrelevant data. The algorithm used to adjust the histogram and the process of histogram equalization helps in continuity in the sequence of the frames in a video while preprocessing without the drawbacks of current methods. The Edge Detection process for detecting an object is here dependent on the complied package of equalization, Binarization, and Thresholding and Feature Extraction. It overcame the impossibilities of existing methods and kinetic device is intellectually benefited with its postulation. This paves way for the Kinect sensor to be processed in advanced applications of today's world.

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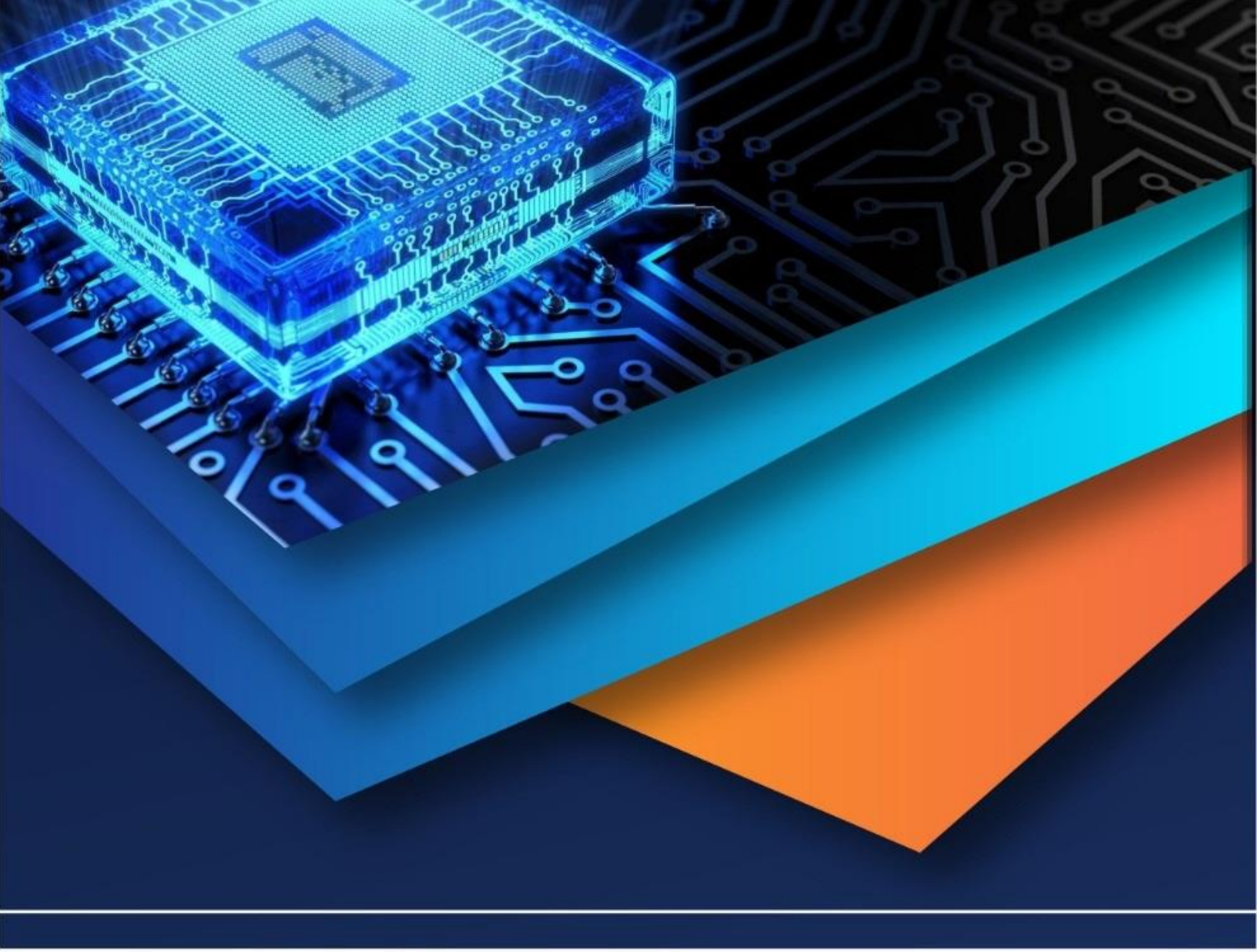

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