Design of an Gesture Recognition Based Car Gaming

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----------**ABSTRACT**----------

This paper proposed a gesture recognition based car gaming proposed. This project developed based on the five skeleton gestures which will help to interact with the computer to play car game using kinect sensor. The five gestures namely Forward, Right, Left, Normal and Close. It will perform the operation with a slight delay. The kinect can be defined as a Natural Interaction (NI) device, which operates in the context of Natural User interface (NUI). NI refers to a concept where by the interaction with devices is based on human senses. Proposed method provides a suitable efficient and user friendly interface between human and computer for interaction with virtual game using human skeletal gestures.

Keywords - **Gesture recognition, Natural Interaction (NI), Natural User Interface (NUI), Kinect Sensor, 3D Image**

I.INTRODUCTION

Human motion analysis is gaining more and more attention in the field of human machine interaction. On one side, such popularity is caused by the fact that, existing devices become more sophisticated and combined with growing computational power has allowed to solve complicated problems. On the other side recently appeared number of more affordable devices which may be used as a part of relatively inexpensive systems. Human gesture recognition consists of identifying and interpreting automatically human gestures using a set of sensors. The documentation presents an up to-date review of the state-of-the-art in human gesture recognition which includes gesture representations, recognition techniques and applications. Several questions arise when tried to define the word “gesture”.
The work Kinect is defined as a natural interaction (NI) device, which is used to operate with Natural user interface (NUI).Natural interface refers to interaction between human and the computer.

II. ABOUT KINECT SENSOR

The Kinect sensor consisting of several advanced sensing hardware**.** Kinect sensor mainly consisting of depth sensor a color camera, and a four-microphone array that provide 3D motion capture of human body, facial recognition, and voice recognition capabilities. The arrangement of the Infrared (IR) projector, the color camera, and the IR camera is shown in the Figure1. The depth sensor mainly consisting of the IR projector combined with the IR camera, it is made up of monochrome complementary metal oxide semiconductor (CMOS) sensor. Kinect is defined as a motion sensing input device developed by Microsoft to interact with the Xbox *360* without the use of any a physical controller. It was originally designed as a natural user interface (NUI)

for the Microsoft Xbox 360 video game console to create a new control-free experience for the user where there's no more need for an input controller. Kinect for Xbox 360 brings games and entertainment to life in extraordinary new ways with no controller required.
The IR camera measures the reflected light. Due to pattern recognition on the IR points and triangulation between the source and receiver, depth is measured. Prime Sense the company behind the technology of the Kinect talks of "Light Coding"-technology Prime Sense.

Figure 1 The infrared (IR) projector, IR camera, and RGB camera inside a Kinect sensor.

III. RELATED WORK

This paper consisting of recognition module and detection tracking. Gesture can originate from any

bodily motion or state but commonly originates from the face or hand. Current focuses in the field include emotion recognition from face and hand gesture recognition. Many approaches have been made using camera and computer vision algorithms to interpret sign. Current focuses in the field include emotion recognition from face and hand Gesture recognition. Many approaches have been made using cameras and computer vision algorithm to interpret sign language. However, the identification and recognition of posture, gait, and human behavior is also the subject of gesture recognition technique.

The gesture based interaction interface being proposed here can be substantially applied towards many applications like Virtual Reality Sign Language and Games [1]. They have developed an interactive version of the game where gesture recognition based input technologies are successfully applied. They have implemented the game as playable and enjoyable using simple vision algorithms. The recognition system is composed of the server and client computers: the server recognizes the player's movements and the client the punch. Punch gestures detected by the client are fed into the server to control the game [2]. In this paper they proposed a novel method of using human body gestures depth image as gaming application input. Depth images have natural advantages over grayscale or color images in terms of robustness against illumination change, texture complexity, and background interference. The proposed method consists of three major components: depth image acquisition, mean shift established preprocessing, and HMM-based gesture recognition. They are validating their method by applying it to a boxing game scenario to distinguish boxing gestures such as dodge, jab, hook, and uppercut [3]. In this paper they explore the capacity of using skeleton information provided by Kinect for human posture recognition in a context of a heath monitoring framework. They conduct 7 different types of experiments with 4 types of features extracted from human skeleton. The obtained results show that this Kinect sensor can detect with high accuracy four interested postures (lying, sitting, standing, and bending) [4].In this paper, they propose a comparison of human gesture recognition using data mining classification methods in video streaming. In particular, they are interested in a specific stream of vector of twenty body-joint positions which are representative of the human body captured by Kinect camera. In the recognized gesture patterns the study are sit down, stand, and lie down. Classification methods chosen for comparison study are back propagation neural network support vector machine, naive Bayes and decision tree [5]. In this paper the system processes depth information to overcome the shortcomings of 2D vision system for the same application. It achieves left and right-palm tracking, and face and facial feature detection (eye, nose, and ears) detection.

The automation of the human body parts motion monitoring and its analysis in relation to the psychomotor exercise indicated to the patient and the storage of the result of the realization of a set of exercises free the rehabilitation experts of doing such demanding tasks [6].In this paper they proposes the topological representation encoded the intrinsic topology of the body's shape in a skeleton based structure, guarantying invariance to range, rotations and postural changes, and getting a high level of detail with a moderate computational cost. In the volumetric illustration, on the other hand, the postures were described in terms of 3D cylindrical histograms working within a wider range of distances in a faster way and also guarantying good invariance properties [7]. This survey paper proposes a real time implementation for a human skeleton recognition by Kinect that can be used for vision-based human interfaces. Using the low-cost device Kinect with its SDK tool kit gives us a possibility to resolve with ease some difficult problems encountered when working with conventional cameras. In particular, we are interested in a specific stream of vector extraction of twenty body-joint as a coordinate to identify skeletal structure of the human body captured by Kinect camera. The recognized gesture patterns from skeletal structure used to study various postures [8]. This paper proposes a real time implementation and novel methods for a hand-pose estimation that can be used for vision-based human interfaces [9].

IV. ARCHITECTURE DESIGN

The Kinect is an upcoming technology which basically looks like a webcam. It detects the 3D image representation of an object. It tracks the skeleton of the person standing in front of Kinect camera within a finite amount of distance.

The Kinect which operates in the context of Natural User Interface. Natural interface refers to a concept whereby the interaction with devices is based on human senses. The input skeleton gesture image is preprocessed in Kinect and the features of the image are extracted from the input. Data base is generated using sensor, gesture is recognized.

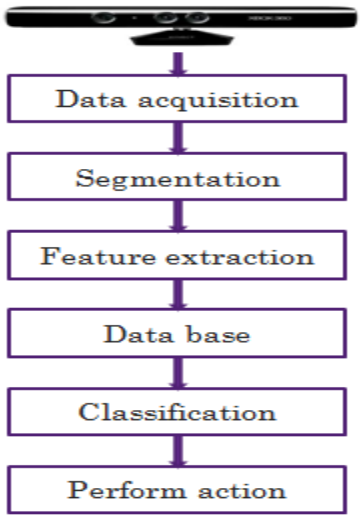

Figure 2 Game architecture

Segmentation is nothing but partitioning of the pixels from the image, in terms of homogenous and non-homogenous. It depends on the algorithm called Levenberg-Marquardt back propagation. Based on the segmentation feature extraction is done here the feature extraction is nothing but it is defined as extracting set of features or characteristics from input, and data base is generated. Based on data base, classification is done after that it will perform the action. The Figure 2 indicates the game architecture.

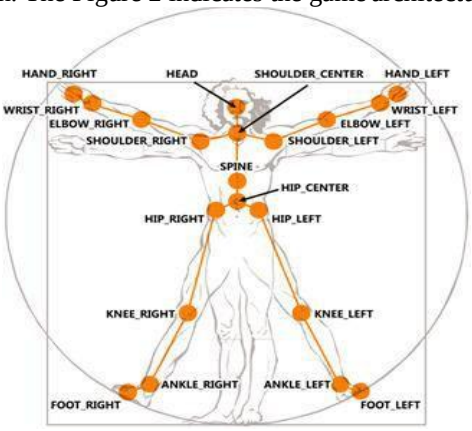

Figure 3 Human skeleton joints as reference points

The new version of Kinect with its SDK (Software Development Kit) containing the skeleton tracking tool. This tool provides us to collect 20 joint information about the skeleton. The joint information is collected in frames. For each frame, the positions of 20 points are estimated and collected. The 20 joints which are taken as a reference points is as shown in Fig 3. The first information is the index of the joints. Each joint has a unique index value. The second information is the positions of each joint in x, y, and z coordinates. These three coordinates are expressed in terms of meters. The x, y, and z axes are the body axes of the depth sensor.

From the skeleton tracked by the Kinect first it extracts the feature of joint positions. Since, each joint has 3 values and also 3 coordinates and the detected skeleton has of 20 joints. So, the feature vector has 60 dimensions.

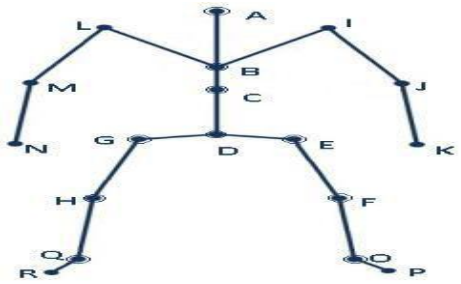

Figure 4 Important joints taken as reference points

The system can choose important joints for representing the postures. Other features can be derived based on joint position such as joint angles. Proposed design will analyze the recognition performance using these joints. Figure 4 shows the important point used as a reference points.

V. EXPERIMENTAL RESULTS

The image processing techniques used in the application for interactions with car game have been implemented in Matlab with the use of image acquisition toolbox in this image data acquisition functions are used.

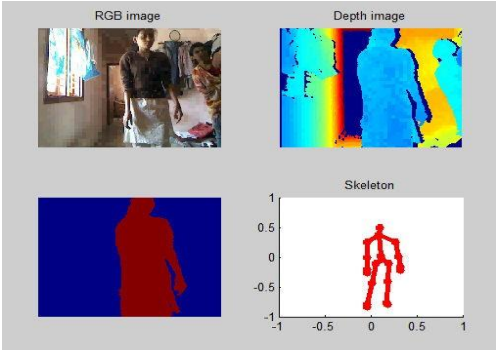

Figure 5 Forward gesture position

Figure 6 Right gesture position

In Figure 5 the proposed system identifies all the 20 coordinates with respect to pre-stored database this posture is identified as a Forward position. This can be achieved in the game by considering the condition that by considering the difference of z coordinate of shoulder centre and the z-coordinate of left hand and comparing this value with 0.5 Threshold and considering the difference of z coordinate shoulder centre and the x-coordinate of right hand and comparing this value with 0.5 Threshold.

Figure 6 the proposed system identifies all the 20 co-ordinates with respect to pre-stored database this posture is identified as a forward right position. By this gesture car will move in the forward and turning towards right direction. This can be achieved in the game by considering the condition that by considering the absolute value of difference of y -coordinate of left hand and the y-coordinate of right hand and comparing this value with 0.15 Threshold.

Figure 7 Left gesture position

In Figure 7 the proposed system identifies all the 20 co-ordinates with respect to pre-stored database this posture is identified as a Left position. By this gesture car will move in the forward and turning towards left direction. This can be achieved in the game by considering the condition by considering the absolute value of difference of y-coordinate of left hand and the y-coordinate of right hand and comparing this value with 0.15 Threshold.

VI. CONCLUSION AND FUTURE ENHANCEMENT

In the field of Human-Computer Interaction system design is majorly been in quality of interaction. Hence instead of designing regular interfaces, research branches have had focus on the concepts of intelligent and adaptive interfaces rather than command or action based ones. Developed algorithm is an interactive gesture for PC based car game called “Car Drifting” using a gesture recognition based interface.

The application of car game controlling uses four gesture through human skeletal gestures and verify the results with respect to different distances. The proposed algorithm operates properly from the range1000 to 3000 mm with a less delay. The proposed system shows different recognition rate with respect to distance and scenarios. This design provides a suitable efficient and user friendly interface between human and computer for interaction with virtual game using human skeletal gestures.

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