3D Virtual Dressing Room

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ABSTRACT

It is a common behavior for people to try clothes before shopping in life. In stores, it is time taking activity to try clothes. In online shopping, it might not even be possible to try on clothes. Our objective here is to increase the time efficiency and improve the access of clothes by creating a virtual environment. Traditional methods leads to various issues ,in that method we put on and off the clothes but these leads to deterioration of the quality of clothes.in traditional there is limited variety of clothes and also sometime the privacy of small children and women can comes into danger.
Our proposed method is mainly based on isolation of the user from the alignment of models, video stream and detection of skin color. The unwanted occlusions of the user and the model can be handled by applying skin color detection in video. With the user, we use the modules for locations of the joints for positioning, scaling and rotation in order to align the 2D cloth models. In real time, model is superimposed on the user. To get accurate alignment position, scale, rotation and ordering of cloth models and user is the problem sometimes. First, detection of the user and the body parts is one of the main steps of the problem. Several approaches are proposed for body part detection, skeletal tracking and posture estimation, and superimposing it onto a virtual environment in the user interface. The project is implemented in C programming environment for real time, kinect hacking application. Kinect driver's middle ware are used for various fundamental functions and for the tracking process in combination with Microsoft kinect.

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I. INTRODUCTION

It is a common behavior for people to try clothes before shopping in life. Several ways can perform this. In physical stores, customers can try physical clothes and engage in real interaction and fitting, but have to put on and off them, thus wasting valuable time and effort. It is difficult and even impossible for some people to try some special clothes. In online stores, customers can explore freely every clothes in digital images or 3D models, but cannot attain effects of trying on themselves. In 2D virtual dressing, customers can try freely every clothes' images, but not feel 3D fitting because of digital images from customers and clothes. 3D virtual dressing can afford 3D fitting between models of customers and clothes because both are 3D models. Customers in this way can freely try every clothes' models in 3D spaces, even set size, color and texture they preferred.

There is few work on real-time 3D virtual dressing because of difficulty in real time modeling and fitting between human bodies and clothes in 3D spaces. In fact, there are two ways of fitting clothes' models to users' models in 3D space. One is based on collision detection between surface models from users and clothes. It achieves higher fitting accuracy leading to a more realistic effect. However, it requires larger computation and is quite limited by computer performance.

II. RELATED WORK

In "Real time 3D virtual dressing base on user's skeleton (2017)", it presents real time 3D virtual dressing base on users skeleton are extracted and tracked in real-time to drive transformation and fitting of clothes models .The advantages of these work is human measurements generated according to users body stand in front of the

Kinect and the disadvantages s user should be apart from machine to maintain particular distance.
In "Skeleton based human action recognition using Kinect", it provide an application that uses gestures to interact with virtual object in the augmented reality application. It provide a way to use the gesture base interaction to manage operations in virtual environment and the advantage of this work is ,it supports skeleton tracking but the disadvantage is ,it may give incorrect measurement of height.
In "Virtual dressing room application Microsoft Kinect sensor (2019)" their proposed approach is mainly based on extraction of the user from the video stream alignment of models and skin color detection and the disadvantage of it is flexible and look real clothes model for user to wear and user can get detect in less time but the disadvantage is due to network issue soft copies of dresses will not going to impose on target image correctly.
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Ari Kusumaningsih and Eko Mulyanto Yuniarno [4],A virtual dressing room for Madura batik dress has been successfully developed. The proposed system has a purpose to make dressing rooms specialized for Madurabatik clothes supposed to create attention from customer and should contributes in improving sales performance and promote Madura's heritages as also. Efficient and fast computation methods needed to process numerous 3D models. So that, we don't have to use high performing computer for implementing this virtual dressing room. Pros:The distance of objects from the Kinect and tocompose a "depth map" of the image. Cons: Lighting conditions affected depth map. Cons: No provision for 3D viewing and sensitive to light conditions.

Ting Liu and Ling Zhi Li [5], work uses user extraction from Kinect video stream and avatar system for skeletal tracking to align the clothes' models with users. And a virtual dressing software prototype is developed allowing clothes' 3D models to overlay users and were convenient to view in front, side and back perspectives. Furthermore, improving clothes modeling approaches that achieve rapid reconstruction based on real clothes is also of great use. Pros: The user can view the real-time collocation effect with the change of hats' textures and clothes 'models. Cons: Only alignment of clothes according to body is used and dynamic movement is not considered
Stephen Karungaru and Kenji Terada [6], in this Project, they propose a method to acquire human body length / perimeter easily using Kinect. Experimental results con- firmed that human data can be acquired from Kinect sensor. We also confirmed problems in case of error in acquired data. Future issues include improving the accuracy of acquisition of person's data and the CG. Advantage: Most work is focused on acquiring human data. Disadvantage: No interactive activities are focused and as they say accuracy is low. Human data is acquired and not used

Dr. Anthony L. Brooks and Dr. Eva Petersson Brooks [7], the open-structured surveys received wide-ranging input from the public attending the live demonstrations at Malls and Messe events.13 wheelchair-bound individuals gave direct input as well as others who were either friends or associated with a wheelchair-bound person that they considered would benefit from a dedicated adaptation of the product. Yet that distance had to be shut enough to permit the person associate degree operable read of the interface management detail. Advantage: This technique/camera as the core of the VDR allows a person to be scanned and identified from the background for the superimposing of the apparel layer over the mirrored self Disadvantage: Complexity is more as VDR system is used.

Reizo NAKAMURA and Masaki IZUTSU [8], this paper show processes that estimate of body suite ssize.First,person recognition be got by Kinect. And, person area in the image be extracted using person recognition data. Next, user's mark points are extracted using contour tracing. The size of the body suites was presumed using it. Pros: Size estimated using the distance data of the number of frames that can be retrieved from two Kinect. Rea- sons to use two Kinect, this is for improving the accu- racy by using the information obtained from the other. Cons: As use of multiple Kinect's improves accuracy but increases cost also.

Poonpong Boonbrahma and Charlee Kaewrat [9], Using the physical parameter from our experiment, the appearance of the fabrics under simulation can be predicted. The simulation results will tell the distinction among customers sportin jean, satin, silk or cotton, which will be very useful for setting up the virtual fitting room. Pros: Simulation is done in different environments. Cons: Need more precision and actual experiments than just simulation in different environments are needed.

III. METHODOLOGY

Because of the increasing importance of Microsoft Kinect image sensor in the market, we used it and WFP to cap- ture the user physical measurements. Introduction to Kinect General components The components of Kinect for Windows are mainly the following, Kinect hardware: including the Kinect sensor and the USB hub, through which the sensor is connected to the computer Microsoft Kinect drivers: Windows 8 drivers for the Kinect sensor; Microsoft Kinect SDK V 1.0: core of the Kinect for the set of functionality and Windows API, supports. Kinect sensor mainly provides three streams: image stream, depth stream and audio stream, with detected range from 1.2 to 3.5 meters. At this stage, the first two streams would be utilized for development of human model, cloth simulation and GUI.

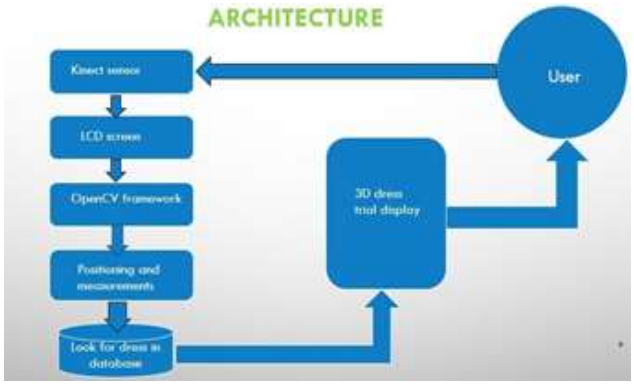

Fig. 1. Architecture Diagram.

Fig. 2. Kinect Sensor.

A. Skeleton Tracking Methodology

- Several coordinates of main body joints are recorded using Kinect sensor, and using these Coordinates height and width of user can calculate.
- To find the distance between two coordinates we have to use Euclidian distance formula • d= [(p1-q1)+(p2- q2)+(p3-q3)]
- Height = Shoulder Center .Position – posHip Cen- ter.postion
- Width = Right Upper Arm.postion – Left Upper-Arm.position
- Then, the height and width of user's body are used as user Height and user Widht to compute scale factors on 3 dimension.
- heightScale = userHeight /modelHeight
- = userWidth /modelWidth
- depthScale = (heightScale +widthScale)/2
- localScale = (modelBodyScale.x * widthScale , model- BodyScale.y* heightScale , modelBodyScale.z * depth- Scale)

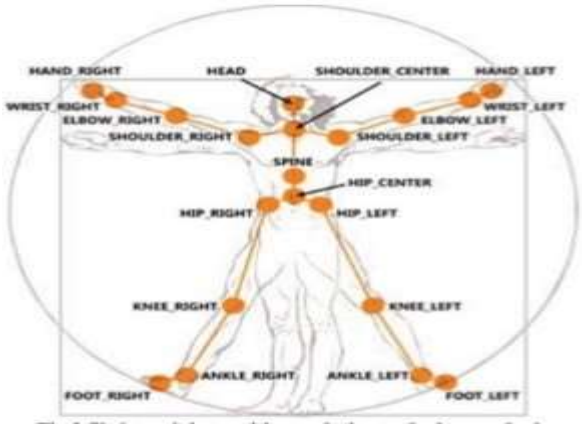

Fig. 3. Gesture.

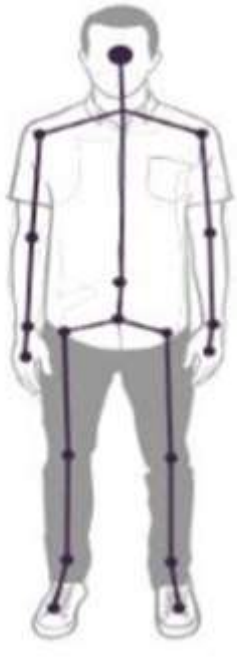
Fig. 4. Skeleton.

B. Pose Estimation Methodology

- Swipe Left: When user would swipe his right hand towards left hand it is left swipe. So when the distance between coordinates of right hand and left hand decreases from right.
- Swipe Right: It is same as Swipe left. It will also works for changing clothes.
- Raise Hand: When user will raises his right or left had then the distance between head coordinate and that particular hand will decrease. So the user will able to change the category of clothes Architecture overview.

IV. MATHEMATICAL MODEL

A. Input and output set

Let S be the Closed system defined as, S = Ip, Op, A, Ss, Su, Fi Where, Ip=Set of Input, Op=Set of Output, Su= Success State, Fi= Failure State and A= Set of actions, Ss= Set of user's states. Set of input=Ip= User real time streaming Distance from Kinect sensor Set of actions =A=F1,F2,F3,F4,F5,F6 Where,

- F1 = Authentication of system
- F2 = Fetching Kinect values
- F3 = User display in mirror
- F4 = If user selects particular products then system show to size of this products
- F5 = Gesture controls Set of user's states=Ss=
- initialization state
- gesture state
- selection of products
- check size
- stop Set of output=Op=
- Show user image on display of the device with clothes Su=Success state=
- initialization Success
- gesture control Success • Show super impose image Fi=Failure State=

- Kinect Failure
- Power Failure Set of Exceptions= Ex =
- Null Values Exception while showing state
- Bad light error while recording user

1) Functional Approach: Mean Shift Algorithm Kernel Density Estimator Formulae

- Pixel which are Univarite, independent and identically distributed.
- To clear image with perfect shape this function is used.
- Pixel act as input for the algorithm. u= co-ordinate of pixel form Kinect sensor ui= mean of the cluster h= smoothing parameter k= kernel or a non negative function

2) Flowchart Of System:

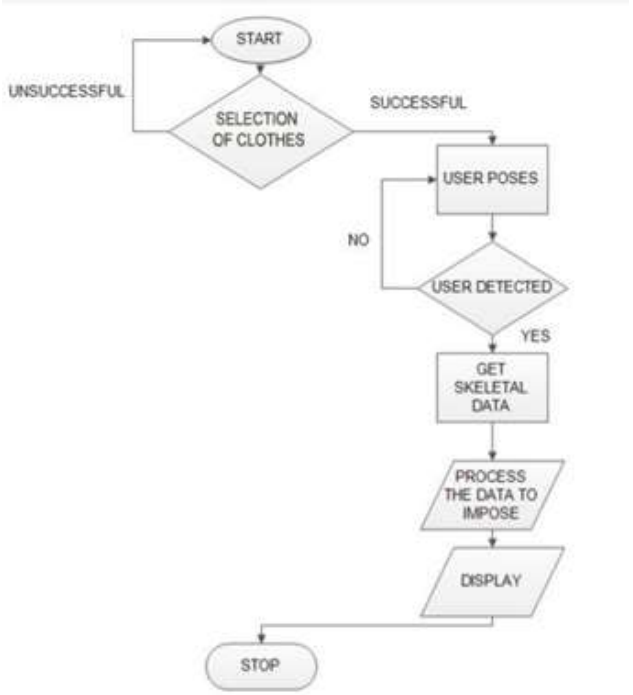

Fig. 5. Flowchart of System.

V. CONCLUSION

After applying the cloth model with the improved performance of joint position, this application will become an acceptable application to provide a virtual fitting room for user to utilize. Human measurement generated according to user body will stand in front of the Kinect. Flexible and look-real cloth model for user to wear. An easy control, user friendly and fashionable body motion based GUI for user will be generate. Many interesting and useful functionalities for user will use in our application.

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