Abstract: This paper presents a Virtual Trial Room software using Augmented Reality which allows the user to wear clothes virtually by superimposing 3D clothes over the user. The user pose and depth is tracked using the Kinect sensor and virtual clothes are imposed over the tracked user. The clothing moves and folds accordingly to the movement of the user. The presented software uses 3D object files instead of 2D images.

Keywords: augmented reality, Microsoft Kinect sensor, 3D clothes.

I. INTRODUCTION

The two worlds the real world and the digital world. Human kind when first found the computers and started to work digitally. He have been seamlessly trying to connect the virtual world and the digital world. As a result of trying to bridge the gap between the virtual world and the real world many technologies came into existence. Some of the software’s which linked the virtual and real world are virtual reality, augmented reality and mixed reality. This lead too many technologies which help the people to experience both the virtual and reality at the same time.

The paper we present is actually based on a virtual reality software titled as “VIRTUAL TRAIL ROOM”. Virtual trial room is a software which allows the user to wear and see the dress virtually just by standing in front of the sensor.

Now-a-day’s people going to shopping malls and textile shops, before buying any clothes they have to try it in trial room and see whether the dress fits them exactly. So for this the people have to go to the trial room and wait for it to get free so that the user can move in and check his dress. The trial rooms available in most of the textile shops or shopping malls are very limited so
it is heavily populated. And also people have to wait a lot of time waiting for the trial room, waiting for trial room like that is a waste of time. Trial rooms are not that safe that no one can be sure that no hidden cameras. So it is a big safety issue for women who is changing dress in trial room. These are some of the security and difficulties which prevails in the existing traditional way of trial room experience.

In our Virtual trial room software the user can change his dress virtually using virtual clothes. The user has to stand in front of the Kinect sensor. The Kinect scans the human body from the environment using the skeleton tracking algorithm. The monitor which is connected with the Kinect sensor and the system processor displays the user and also the list of dresses which can be worn virtually. Live video streaming of the environment is scanned by the Kinect and displayed in the monitor. The monitor also displays the list of dresses which can be worn by the user. The user when selects the dress the dress is selected and it is worn by the user virtually. The dress is super imposed over the user by scanning the skeleton joints of the user. The dress fitted moves according to the movement of the user standing in front of the Kinect sensor.

Thus this virtual trial room software may bring a big change in today’s shopping experience. People no need to wait in front of the trial room for a long time to checkout their dresses and also they no need to be scared of hidden cameras. Because people can just change their clothes or try their dresses using this within a fraction of seconds. Here much of the user’s time is saved and also their effort is reduced much.

II. PRE-WORK

In journal [1] “Human Friendly Interface Design for Virtual Fitting Room Applications on Android Based Mobile Devices” is completely gives idea about the virtual fitting of garments over user. The application targets both mobile and computers. The proposed implementation is uses three-stage algorithms, they are- Face detection, Augmented Reality using marker and super imposing of cloths over the human image. This application can be used in any devices with a fine camera. In order to obtain the body shape several techniques are being used they are:1) Filtering with threshold [1], canny edge detection, K-means, and 2) Motion detection or skeleton detection wherein multiple frames were analyzed for any movement. [1] For face detection, Haar algorithm is being used, it uses digital image features for object recognition OpenCV is being added for rectangular features as well as improvements to make the algorithms faster for hardware implementation. An augmented reality marker is used to display (superimpose) the cloths over the users’ image. [1] The main objective to obtain a real time, platform independent application. Users are able to select sizes from XS to XL and choose between different cameras on the device to implement the VFR. In addition, the algorithm can track and scale the clothing according to user’s position and movement. The application needs each marker for each
garments and the dress only super impose on the user, it only shows the 2D image. It’s impossible to protect the markers. Count of markers increases with the count of dress. Storing and using of large number of marker is difficult.

“[2] Virtual Mirror with Virtual Human Using Kinect Sensor” proposes an image processing and a virtual dressing room application to help users to try virtual garments in front of a virtual mirror. A virtual representation of the dress appears in a virtual changing room. The user’s hand motions select the clothes from a list on the screen. Afterwards the selected virtual clothes appears on a humanoid model in the virtual mirror. The Kinect helps in scanning the user dimensions. For the purpose of aligning the 3D garments with the model, 3D locations of the joints are used for positioning, scaling and rotating. Computer graphics gives us the power to model and animate virtual humans. To simulate humans requires real-time visualization and animation, taking into account constraints on the data used for these virtual humans representing users. Here a 3D model of human being is being generated by scanning the user with the Kinect. [2] Using AGPL3.0 software the user is being scanned for creating the 3D model of user i.e. humanoid model and unity for generating 3D models of garments. The interaction of user with the system is being carried out by keyboard and mouse. Since the application is about 3D model of user, it doesn’t satisfy customer needs. The customer can’t experience live dressing concept. These concept can’t be helpful for the online shopping. The garments designed in unity can only be used in the application. The GUI (Graphical User Interface) of changing-room reading and interpreting the data arrived form keyboard, mouse, webcam or Kinect input unit’s enables users try garments on a created humanoid model.

Your personal appearance defines who you are even before you describe yourself in front of anybody. You are in a meeting is very important to concern about your dressing. People nowadays take extra care to choose their clothes during shopping. The more you look unique the better you can describe yourself. [3] The proposed system is a virtual dressing application that enable user to trial the dresses virtually. The application displays output as the augmented image with superimposed clothes over the user’s body. Augmented reality is used to develop the system we need to create. Augmented reality is a technology that scans the real world environment and allows the user to combine the real world elements with the computer generated images. These computed generated images are used to describe additional information about the environment where it is used. For the suggestion based systems like virtual trail room we need to display the computer generated images as if it looks like the user actually wear the dress. Image processing is a technology that deals with the computational of the images to deliver the required results based on certain criteria. Here we uses this concept as the integration with the augmented reality to process the images of cloth to adjust their position above the user’s body. [2] Body parameters such as shoulder position and other joint position are considered. For a development
interactive mirror like one in a trial room we implement a sensor cum camera like Kinect device. Kinect is a hardware component consist of integrated camera and the sensor to track the movements of the user. It can be easily implemented and programmed by connecting it to the system. Unity gaming engine along with the help of the PhysX drivers allows additional physical properties to the rendered images. Extraction of User Based on Face Detection and Using HAAR Classifiers are the two methods used to track the user activities. In face detection it is mainly done by either comparing the skin tone with the image obtained or by encountering whether the face is in motion or not. [3] HAAR Classifiers involves implementation with the help of OpenCV (open computer vision). OpenCV is an open source development software which allows user to program in C, C++, Python, Java and can be executed in different operating systems like windows, Linux etc. There is a practically risk of high cost investment while we decide to implement a virtual trial setup in a shop. The cost of the Kinect sensor along with the display components ranges from 15000-25000 rupees. Above all major consideration here is “when the user moves or turn in front of the Kinect sensor it is very important for the system to adjust the cloth’s position over the human’s body”.

III. PROPOSED WORK

1. Setting Up The Room

For this project we have created an augmented reality software in which the user can try on virtual clothes. We use the Kinect sensor to capture the user’s pose tracking and depth sensing. For rendering the clothes in the user's environment we use the visual studio. For accurate fitting of clothes on the user, the size estimation technique is done using the Kinect.

2. User Tracking

The user stands in front of the Microsoft Kinect sensor. The Kinect sensor uses RGB color sensing and depth sensing to detect the human standing in front of the Kinect. The Kinect detects the joints which is visible for the Kinect and also predicts the join is invisible for the user. The joints and the skeleton points or mapped by the Kinect using Kinect coordinate mapping. All the skeleton joints which are detected and predicted by the Kinect is joined to form the full skeleton structure of the human and the human is detected.

3. Virtual Clothes

The virtual clothes which are worn by the user are 3D object file. This 3D .obj files are generated using skanect software. This skanect software is used to scan the 3D object from the environment using Kinect. This 3D objects are virtually placed over the user using sizing and fitting algorithm.
4. Interactive Cloth

The cloth which is fitted over the human body is fitted using the skeleton joints of the user. The size of the chest is measured by calculating the difference between the shoulders. And the height is calculated by the difference between the neck and the hip. The cloth moves according the movement of the skeleton joints of the user.

5. Skinned Cloth

The cloth is exactly fitted to the user by using skinning. Each vertex of the skeleton joint is mapped and exactly matched with the points of the 3d dress. Thus by the exact mapping of each vertex of the skeleton joints with the points of the 3d dress the dress id perfectly superimpose over the body of the user.

IV. FLOW DIAGRAM

A. 3D Image Scanning
B. Virtual Dress Fitting

1. Dress to be scanned

2. Scanning the dress using Kinect sensor

3. Sending the scanned points to the processing software

4. Scanned 3d output of the dress

5. 3d.obj file with texture
V. ALGORITHM

Customer standing to try virtual room

Kinect scanning the environment

Tracking the skeleton and coordinate mapping

Fitting the dress

Displaying the customer virtually wearing the dress
Detecting the body by Kinect is done by two methods the first method is done by detecting the depth and then infer their body position. First the depth map is calculated by the speckle pattern of the infrared position.

The Kinect detects the basic body parts of the human using the multiple training techniques which was already trained to the Kinect by Microsoft team. Thus by the training used the Kinect can detect the basic parts of the human system.

1000 trainings (pre trained) = detects the basic parts of the human body.

So since we have to fit the dress exactly to the human body we have to calculate and detect much more parts in the human body. For example if elbow has to be calculated the elbow can be detected using \( \frac{x+y}{2} \) midpoint algorithm.

To detect left Elbow (Example):

1. Shoulder x is first detected
2. Palm x is detected
Elbow = (Shoulder x + palmx)/2

This algorithm is used to detect much more parts of the body. This algorithm is used by us to detect the parts for perfect fitting of the dress.

To fit the dress exactly the size of the user has to be calculated. The chest size and the height of the user has to be calculated, this size variation can be calculated using the formula

\[
\text{Width} = \text{shoulder right} - \text{shoulder left}
\]

To fit the 3d cloth exactly to the height of the user the formula is calculated by using the neck and the hip center part of the detected human skeleton.

\[
\text{Height} = \text{neck} - \text{center hip}
\]

These are some of the formulas which are used to calculate the height and width of the detected skeleton. This formulas are used to fit the cloth with the actual height and width of the user tracked.

VI. CONCLUSION
This report presents a virtual reality application where the user can select the garments with respect to the user needs like color, size, fitting etc. can be known without using the trial room. Now a day’s most of the trial rooms are the risky place because of the hidden cameras and it takes a lots of time for selecting the proper garments. VTR application helps the user to select and wear the dress in lesser time without using the trial room. The application superimpose the 3D dress on the live user so that the user can select the dress in his/her skin tone, size and proper fitting. QR module has been added so that the customer can take the screen shots of the dress and it can be saved into his/her smart phones.

VII. REFERENCE


