IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# AN ENHANCED VIRTUAL DRESSING ROOM

**Dr. Vidhya K,Shashikumar G B,Chaithra S M,Vanashree G S,Poornima**

[1]Assoc prof,[2,3,4,5]Students

[1]Information Science and Engineering

[1]East West Institute of Technology, Bangalore, Karnataka

*Abstract:* **In the twenty-first century, fashion has evolved into a way of life.Depending on physicalstature, gender, as well as social and geographic factors, the amount and style of clothingworn might vary. For the majority of individuals, the in-store buying experience is still whatcomes to mind when they think of shopping. Customers can try on clothing in real time, butthis process takes too long when there aren't enough trial rooms. Our goal is to create anengaging, interactive, and incredibly realistic virtual system that allows users or customers toselect from a wide variety of clothing designs before simulating those outfits on virtualpeople. In this paper,Deep neural network is used for pose detection and human parsing then Generative adversarial network is used for virtual dressing. TheVirtualstylingroomusinglivevideofeedprojectmayalterhowapersonshopsfor and tries on clothing. Customers can try on a wide range of itemswithoutactuallywearingthembyutilizingtheideaof"VirtualReality."Thebenefitofdoingthingsthiswayis that it would take less time and effort to physically try the garments on. This project aids inmarket management, reducing the requirement for customers to try on each and every articleof clothing. Additionally, retailers can save time and space by not keeping a large inventoryon hand.**

***Keywords- Virtual Reality, Deep Neural Network, Generative adversarial Network.***

## I. INTRODUCTION

Real world and virtual world are the two universes. When humans first discovered computers, they began tooperate digitally. He has been making an effort to smoothly integrate the digital and virtual worlds. Manytechnologieswheredevelopedinaneffortto closethegapbetweenthevirtualandphysicalworlds.Virtualreality,augmented reality, and mixed reality are three examples of software that connects the virtual and real world. It normally takes a lot of time to try on things in a store. Additionally, in situations like internet purchasing, itmight not even be able to try on clothing. By establishing a virtual changing room setting, we hope to improveaccessibility and time efficiency for trying on clothing. The alignment of the user and the cloth models withprecise location, scale, rotation, and ordering is the only issue. One of the first steps in solving the issue is identifying the user and their bodily parts. Several methods for body component detection and posture assessment have been put for thin the literature.Usersofonlineshoppingarebetterabletomanagecoststhankstotheuseof webcameras.

Thus, the buying experience of today might significantly change as a result of this virtual trial room software.Peopledon'tneedtobeafraidofhiddencamerasorstandinlineinfrontofthetrialroomforhourstocheckout theirclothes.Becauseusingthisonlytakesafewseconds,peoplecanquicklychangetheirattireortryongowns.Here, theuser saves asignificant amountof timeand exertion

This paper presents a Generative Adversarial Network, which first predicts the semantic layout of the reference image and then adaptivelydetermines the content generation or preservation according to the predicted semantic layout. Specially, the GAN consists of three major modules. The first one is the Semantic Generation Module (SGM), which uses the semantic segmentation of body parts and clothes to progressively generate the mask of the exposed body parts. The second part is the Clothes Warping

Module (CWM), which is designed to warp clothes according to the generated semantic layout.Finally, the Try on Module integrates the information from the synthesized body part mask, the warped clothing image, and the original body part image to adaptively determine the generation or preservation of the distinct human parts in the synthesized image.

## II. LITERATUREREVIEW

### A. Implementation of Virtual Fitting Room Using Image Processing by Srinivasan K, et.al

There has been a great increase in interests towards onlineshopping. In case of purchase of products like apparels which always require a sense of knowledge on how cloths would fit upon a person. This is the major reason why less number of apparels are being shopped online. Hence, a virtual dressing room which would make people know how cloths personally fits in would be a great luxury for the online sellers which could give a wide choice for customers. For online marketers, this would be a great tool for enhancing its market.

### B. Image Processing Design Flow for Virtual Fitting Room Applications used in Mobile Devices by Cecilia Garcia, et.al.

The Virtual Fitting Room (VFR) application presented in this paper is a real-time human friendly interface, which allows trying new clothes using webcams or smartphones. We propose a three stage algorithm: detection and sizing of the user's body, detection of reference points based on face detection and augmented reality markers, and superimposition of the clothing over the user's image. The proposed algorithm is implemented as a universal Java applet using OpenCV library functions and it can run in real-time on existing mobile devices.

### C. A Virtual Trial Room using Pose Estimation and Homography by Mridul Pandey et.al

Rapid urbanization and digitization, increasing income and lifestyle changes of the middle class are leading to amajor revolution in the retail industry, especially shopping malls.Today almost every city in India has several shopping malls and with the increase in population, the queues for trying on clothes in these shopping malls are increasing rapidly. This paper is a research in overcoming this problem and enhancing the customer's shopping experience. We have built an android based mobile application along with the technologies of OpenCV and TensorFlow lite which will allow the customers to try on the clothes virtually without waiting in a queue for a long time. The application uses OpenCV to map the clothes onto the customer's body, the customer can then have a look at it and decide whether to buy the clothes or not. The results obtained show that the mapping is done accurately onto the user's body and that it can avoid the need to go to trial rooms. Thus our application provides a quick, easy, and accurate way to try clothes and thus we believe it will prove instrumental in shaping the retail industry.

### D. Virtual Dressing Room Using Deep Neural Networks by K.P.A.P.Dilshan, et.al

As the customer's experience in present fit-on rooms is considered as an essential part of the textile industry, these fit-on -rooms play a huge role in the textile shops. It is quite an arduous method and generates problem like long queues, having change clothes individually and privacy problems and wasting time. The proposed convolution neural network based virtual fitting room helps to prevent the above mentioned problems. It captures the customer's body by using web camera and display the customer's dressed body. The combination of CNN in deep learning and AR processes the body detection and generates the customers dressed object. The stereo vision concept is used as a task to accomplish taking body measurements. Customer can choose the clothes and the expected output delivers the most realistic dressed object to the customer.

## III. EXISTINGSYSTEM

Existing works can only detect very few types of clothing items. Besides they did poorly in changing the texture and style of the selected clothing items. The existing work uses Mask R-CNN to find the regions of different fashion items and

Neural Style Transfer to change the style of the selected fashion items. Existing efforts that use images to test have issues with the model's stability when processing pictures of individuals taken in various lighting situations, different environmental settings, and unique stances.

## IV. PROPOSED ARCHITECTURE

This project's primary goal is to generate photo realistic images with better quality and simplify the online buying experience for users. In order to savetime,itseekstodevelopan"VirtualReality"fittingroom.This givescustomersawaytotryondifferentclothingwithout actually touching it before making a purchase. decreases the necessity for manual or physical clothingputting on. It enables consumers to make wiser decisions.Deep Neural Network is used to detect the human pose by using a pre-trained model and highlight the human body parts by assigning the different colour. The Generative Adversarial Network Composed of three modules Semantic Generation Module (SGM), which uses the semantic segmentation of body parts and clothes to progressively generate the mask of the exposed body parts and the mask of warped clothing regions. Cloth Warping Module (CWM), which aims to fit the clothes into the shape of the target clothing region. Try On Module is used to warp the cloth on the person.

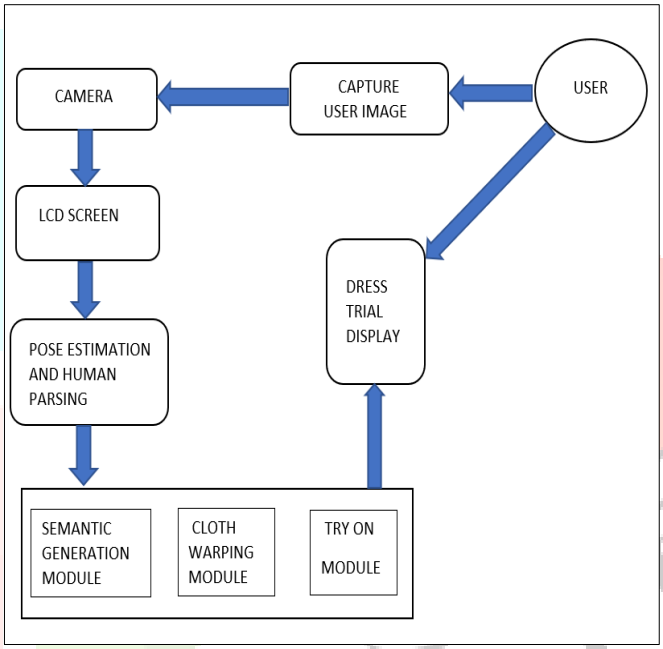


Fig 1: Proposed system Architecture

CONTROL FLOW:

The main steps in a systematic process are depicted graphically and sequentially in a system flow diagram. Asystem flow diagram demonstrates the types of data that will be input into and exported from the system, as well as their origin, destination, and storage locations. The control flow diagram for the virtual style room with alive video feed is shown in Figure

First The user must stand in front of the device's computer screen.Since it is a real time project we use OpenCV to capture the video then the user pose will be detected using pose estimation and this skeletal data is sent to human parsing module to give different colors to different body parts. Then this output is sent to Generative Adversarial network where it consist of Semantic Generation Module, Cloth Warping Module and Try On module . This modules process the image to obtain the output

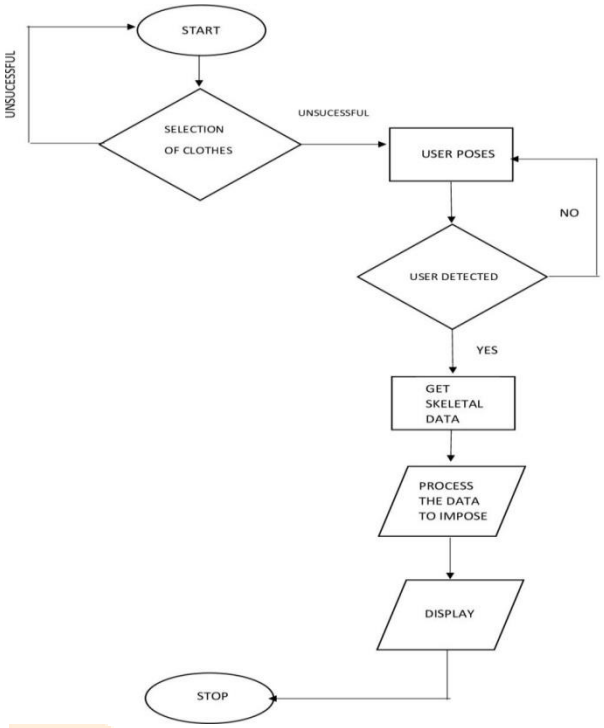


Fig 2:Flow diagram

## V. METHODOLOGY

In this paper,Deep neural network is used for pose estimation and human parsing then Generative adversarial network is used for virtual dressing.

**POSE ESTIMATION:**

This module talks about the first step of this application i.e. Pose Estimation. Pose estimation refers to using computer vision for detecting human beings in photographs and videos.

Here we are using CV2 for capturing the video and Deep Neural Network is used to detect the human pose by using a pre-trained model. Tensor Flow model reads the Network model stored in tensor flow frame work. blobfromimage( ) function is used pre-process the image to match our requirement. The pose estimation algorithm can calculate the location of main body joints in a particular photograph or a real-time footage.

**HUMAN PARSING:**

Human parsing is a fundamental visual understanding.Task, requiring segmenting human instances into ex-plicit body parts as well as some clothing classes at the pixel level. Here we have used a pre-trained model lip_jppnet_384 for human parsing and we have given different colors in RGB format to identify the different parts of the body.

**SEMANTIC GENERATION MODULE:**

The semantic generation module (SGM) is proposed to separate the target clothing region as well as to preserve the body parts (i.e., arms) of the person, without changing the pose and the rest human body details. Mask generation mechanism is adopted in this module to generate semantic segmentation of the body parts and target clothing region.For training SGM, both stages adopt the generative adversarial network (GAN), in which a U-Net structure is used as the generator while a discriminator given in pix2pixHD is deployed to distinguish generated masks from their ground-truth masks. For each of the stages, the GAN loss can be formulated as

$$L1=E_{x,y}[\log(D(x,y))]+E_{x,z}[\log(1-D(x,G(x,z)))]$$

where x indicates the input and y is the ground-truth mask.z is the noise which is an additional channel of the input sampled from a standard normal distribution.The overall objective function for each stage of the proposed try-on mask generation module is formulated as $L_m$.

$$L_m=\lambda_1 L_1+\lambda_2 L_2$$

whereL2isthepixel-wisecrossentropyloss,whichimprovesthequalityofsynthesizedmasksfromthegeneratorwithmoreaccuratesemanticsegmentationresults.$\boldsymbol{\lambda}_1$and$\lambda_2$arethetrade-offparametersfortwolossterms.

**CLOTHWARPINGMODULE(CWM ):**

Clothes warping aims to fit the clothes into the shape of the target clothing region with visually natural deformation according to human pose as well as to retain the characteristics of the clothes. L3 is proposed to serve as a constraint on TPS transformation by minimizing the metric distance of two neighbouring intervals for each axis and the distance between slopes, which maintains the col-linearity, parallelism,and immutability properties of affine transformation.

$$L_3=\sum_{p\in P} \boldsymbol{\lambda r}\ |||pp_0||_2-||pp_1||_2|+|||pp_2||_2-||pp_3||_2|$$

$$+\ \lambda_s\ (|S(p,p_0)-S(p,p_1)|+|S(p,p_2)-S(p,p_3)|),$$

where λr and λs are the trade-off hyper-parameters. where (i, j)∈ {(0, 1),(2, 3)}. The warping loss can be represented as $L_w$,which measures the loss between the warped clothing image$T_c^w$ and itsground-truth $I_c$,

$$|S(p, p_i) - S(p, p_j)| = |(y_i - y)(x_i - x) - (y_j - y)(x_i - x)|,$$

$$L_w = L_3 + L_4,$$

Where L4 =$||T_c^w - I_c||$ . The warped clothes are thenfed into the refinement network to further generatemore details, where a learned matrix $\alpha(0 \le \alpha_{ij} \le 1)$ is then utilized tofinally combine the two clothing images as the refined clothing image $T_c^w$ by

$$T_c^R=(1-\alpha)\odot T_c^W+\alpha\odot T_c^R$$

where ⊙ denotes element-wise multiplication. α is also restricted by a regularization term and the VGG loss is also introduced on$T_c^R$ and $T_c^W$.

**TRY ON MODULE:**

This is composed of two main steps. In particular, Step 1 is designed to fully maintain the non-targeted body parts as well as adaptively preserve the changeable body part (i.e., arms). Step2 fills in the changeable body part by utilizing the masks and images generated from previous steps. The composited body mask $M_c^w$composed by the original body part mask $M_w$ the generated body mask $M_a^G$which is the region for generation, and the synthesized clothing mask $M_c^S$.

$$M_a^G=M_w^S\odot M_C,$$

$$M_c^w=(M_a^G+M_w)\odot(1-M_c^S),$$

$$L_w=L_w\odot(1-M_c^S),$$

where ⊙denotes element-wise multiplication, $L_w'$ is the original image I subtracting clothing region $M_c$.

## VI. REQUIREMENT SPECIFICATION

A. Hardware Requirements:

i. Processor: Intel(R) Core(TM) i5-10210U CPU

ii. Hard Disk: 250 GB

iii. Monitor

iv. RAM: 8 GB

B.Software Requirements:

i. Programming Language: Python

ii. Packages Used: Argparse, numpy, cv2, tkinter, shutil, sqlite3.

iii. Datasets: VITON, CP-VITON

## VII. RESULTS AND DISCUSSION

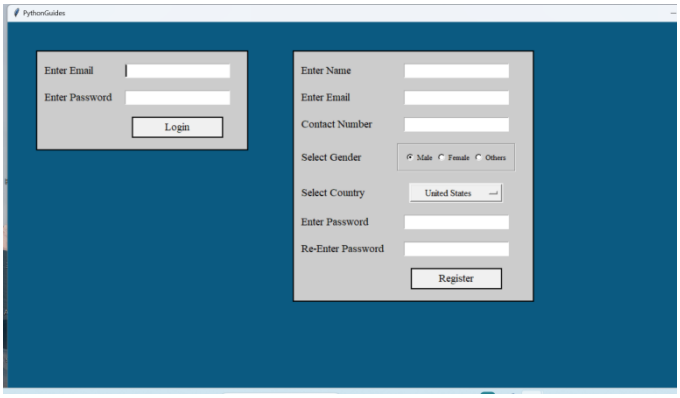


Fig 2: Login and Register Page

AGUI application as been developed in which the user has to sign in by entering their user name and password or the user can register providing all his details. All the details provided will be stored using sqlite3. After sign in this page will direct you to the.


Fig 3: Main Page

The above page Represents the main page where the user can choose the dress for virtual try on. The user can check how the dress look like by providing live video or the user can upload image to check how the dress looks. The user can select the dresses to store them in the cart and they can view the dresses stored in the cart


Fig 4: Selected of cloths and uploaded image


Fig 5: Output of uploaded image

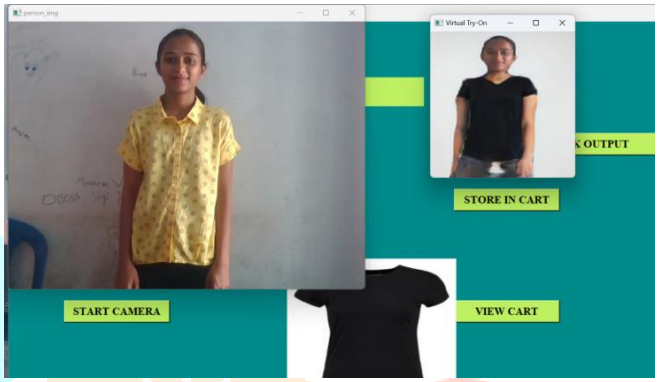


Fig 6: Output of camera image

## VIII. CONCLUSION

In this work, we proposed Generative Adversarial Network which aims at generating photo-realistic try-on results while preserving both the characteristics of clothes and details of the human identity (posture, body parts, and bottom clothes). We presented three carefully designed modules, *i.e.*, Semantic Generation Module (SGM), Clothes Warping Module (CWM), and Try On Module (TOM). We came to the conclusion that this exercise really saves time. It doesn't demand extra work. Anyone who isnot technically savvy can use this virtual machine. It doesn't call for a lot of technical expertise. It is henceaccessible.Overall, the suggested virtual dressing roomappearsto beasolid option for virtual clothing fitting.

## FUTURE ENHANCEMENT

The application is currently designed to allow users to try on virtual garments and we can enhance this application by adding extra features like wishlist dress price, order dress bill generation. We can build another application just for the owner or shopkeeper. The owner or shopkeeper will receive dailyinformation from this programme on how many individuals tried on items, how many bought them, etc.

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