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Augmented Panorama for Furniture Layout

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Abstract: In our day today life we have to arrange our work as well as the equipment or tools which are needed for certain operation. Similarly we have to clean our rooms make them tidy and neatly arranged so as to give a furnished, attractive look to our rooms and houses. We arrange our furniture in such a fashion that the room looks attractive as well as we get an ample amount of space for comfortable movement of the family members and the guests. Here we are going to propose an approach which will enhance augmented view of our rooms, we will superimpose the 3-D objects or the furniture images in our room virtually. This will give us a fair idea of how the room will look like when the furniture is placed in reality.

Keywords: Procedural Modeling, Object Layout, Data-Driven Modeling, Augmented Reality, Interaction Techniques, Tangible User Interfaces, Multimodal Input.

I. INTRODUCTION

Augmented Reality (AR) certainly will transform our vision for looking at the things which we come across in our day to day life. Consider that you are walking or driving you vehicle on a street. With augmented-reality glasses, which will eventually look much similar to a regular pair of glasses, informative directives will appear in your viewing region and voice instructions will coincide with whatever you see. These directives will be refreshed continuously to reflect the moments of your head. We propose a new approach of AR system for the furniture layout based on a planar object tracking. We use rooms as the planar objects, and then furniture CG models are super imposed in these rooms. Therefore, we are implementing this application which helps borrowers and buyers to select an area in the living rooms, offices, bedrooms, kitchens, and showrooms to align the furniture items. In this system, we propose to use augmented reality concept to operate the furniture layout in order to show the effectiveness of our proposed system. As we know, the furniture objects are 3-D objects in space. We are motivated to work on this project, as to overcome the difficulties faced by a customer while buying furniture items. Recently there is a lot of research going on in the field of Augmented Reality. Augmented reality is reliable technology to solve our problem.

The virtual superimposition of a 3-D furniture object in the real environment with 3D camera pose estimation and overlaying of 3D-virtual objects is the primary motivation for developing this project. After imposing the model it will appear as, it is actually placed into the real world.

II. LITERATURE REVIEW

Paper Title	Publi.	Year	Technical Detail
Advanced Interaction Techniques for Augmented Reality Applications	IEEE	2009	The Magic Cup application shows how using tangible AR design principles can produce a very intuitive user interface.
Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System	IEEE	2010	An AR conferencing system that allows virtual images of remote collaborators to be overlaid on the user's real environment.
Furniture Layout AR Application using Floor Plans based on Planar Object Tracking	IEEE	2012	Applying furniture layout AR system to floor plans as visual markers
Machine learning for high-speed corner detection	IEEE	2013	Present machine learning to derive a very fast, high quality corner detector.
Filling Your Shelves: Synthesizing Diverse Style-Preserving Artifact Arrangements	IEEE	2014	Present a data-driven method especially designed for artifact arrangement

III. OBJECTIVE AND STUDY

The main purpose of this project is to develop an application for trying different furniture items in furniture stores without using the usual means which is a very time consuming activity. Besides, this it might be easier to use this technique in Online Shopping as a option for user to try out the furniture items in their room they are thinking to buy and allow user to visualize the room how it will

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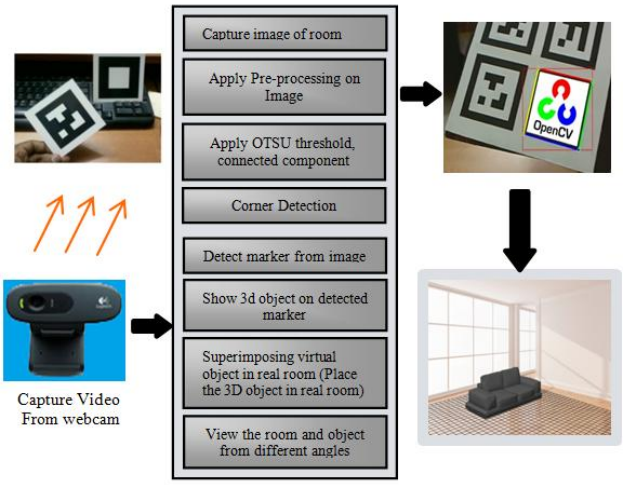
look after placing furniture in it. User can try out multiple combinations virtually, without physical movement of furniture items. Our motivation here is to increase the time efficiency and improve the accessibility of furniture try on by creating furniture layout augmented reality application.

IV. DATA AND METHODOLOGY

We propose a new approach of AR system for the furniture layout based on a planar object tracking. We use rooms as the planar objects, and then furniture CG models are super imposed in these rooms.
Therefore, this system helps borrowers and buyers to select some mansion or apartment rooms. In this system, we propose to use augmented reality concept to operate the furniture layout to show the effectiveness of our proposed system.

V. SYSTEM ARCHITECTURE



VI. MODELLING

A. Marker Detection Algorithm

1. Image Acquisition:
We present a digital image processing algorithm to detect visual code marker. The aim for designing the detection algorithm is to detect the code markers on an image which is captured by means of a camera. The visual code marker is used to represent 2-D array. The array consists of finite elements say n x n and each element is black or white. The array consists of 11x11 elements and each element is either black or white.

2. Steps to be followed before processing:

2.1 Primary digital image processing:
1. We attempt to minimize the noise to a greater extent.
2. Make some enhancements in the features of the object, so that the image can be easily understood.
3. Apply the techniques and methodologies such as edge extraction, smoothing, threshold etc.
4. Partition the image into segments.

4.1 We have to separate the objects from that of the image background.

4.2 Partition the image typically based on colour segmentation, region growing, and edge linking.
3. Reject the potential markers and highlight the non-obvious markers:

3.1 Extract Regions of Interest:
As we have to detect the visual code markers, a detailed inspection of the image has to be done to find the suspicious regions that may contain a marker. However depending on the quality of the image captured, it's a complex task to detect the markers from various background environments.
We consider a medium quality image as typically of 640 × 480 pixels. In the testing and evaluation phase, we don't use a colour image as a standard attribute because the colour varies depending on the amount of light reflected from it. For the purpose of marking the region of interest (ROI), a slight change in the brightness of the marker is implemented. As noted from the observations, a code marker has robust and sturdy edges as compared with the other noisy objects in the background.
Further the image is smoothed followed by canny edge detector that highlights the edges of the code markers. A threshold is set for an edge detector to discard the items having softer edges.

3. Partitioning:
Partitioning is a significant task in the complete algorithm. The accomplishment or breakdown of the algorithm depends only on the partitioning of the visual code markers.
From the outcome of the previous step, each region of interest is then conceded to acquire a binary image. An image is partitioned under different schemes and constraints.
"Adaptive Threshold" was the first step for the segmentation algorithms. The contradictory effects of lighting and luminance of the camera causes specific regions on the image to be darker as compared with the other side while same colours may illustrate various brightness effects.

3.1 Global search for visual code markers:
Subsequent to the above process of partitioning and segmentation, an identification module inspects the image and calculates the Euclidean distance between the upper-left corner and the bar settings.
At this stage, we have to note that, in case if the total count of markers is found less than three(the maximum limit), for an image a universal hunt for markers is performed to get convinced that no any markers failed to spot in the step generating regions of interest images. The regions of interest search scheme is the most appropriate, a standard image can be generated within 7 seconds, for which we can bear the expenses and perform another global search on the image to certify that nothing is overlooked at the ROI generation step.

4. Identification and decoding of markers:

Step1: Search for long guide bars.
Step2: Investigate the short guide bars and cornerstone.

Step3: Examine for the remaining two cornerstones.
Step4: Store the gathered facts and look for next.

5. Calculations of the marker pose:

5.1 Plotting the image coordinate with code marker coordinates.
The transform method is implemented to design and compare the image coordinates with code marker coordinates. A set is created of elements comprising of the marker coordinates that are found. There always exists a one is to one mapping between the image code marker coordinate system and the standard code marker coordinate system.
It demonstrates the coordinate system in the standard image coordinate system. The pixel positions of the shorter bar and three cornerstones are significant to derive the transform between them.

Code element	Image coordinate	Code coordinate
Upper left cornerstone	$(x0, y0)$	(0, 0)
upper right cornerstone	$(x1, y1)$	(10, 0)
second guide bar	$(x2, y2)$	(8, 10)
lower left cornerstone	$(x3, y3)$	(0, 10)

VII. CONCLUSION

We would like to conclude that we are learning to develop a Furniture Based Augmented Reality application for the commercial as well as for the domestic purpose. We are eager to learn and enlighten our own knowledge from this domain of Augmented Reality. It is said that the eagerness and will to learn and apply modern techniques on a particular project domain surely invents new technology for the betterment of the mankind.

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