Virtual Room Visualizer

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Abstract

While choosing new tiles for your home, it’s great and useful to be able to visualize what the tiles will actually look like in a room. “Virtual Room Visualizer” is an advanced and an innovative online design tool. This distinctive home decoration tool helps you visualize the products (tiles) in real home settings and aids to reduce the customer decision and purchase time. Image processing is used in this online tool to process the input image by detecting the objects, classifying it, and distinguish it from the background. The problem in the existing system is a user cannot visualize the tiles design in their own room. Another challenge faced in the existing system is accuracy in detecting the objects, occlusion etc., In Image processing domain multi component object detection is an efficient method to detect n numbers of objects in an image which makes it convenient for the customers who use this tool which is a drawback in the existing tool.

Keywords: Image Processing, Multi-component object detection, Occlusion, Object detection

I. INTRODUCTION

The aim of this project is to develop an online tool to visualize our own room with default customized tile or user defined tiles. The domain which is used to create this tool is “Image Processing”, Image processing is used in this online tool to process the input image by detecting the objects, classifying it, and distinguish it from the background. Image processing is one of the useful domain for computer vision based application. This online tool uses Opencv library which has many algorithms in it which is useful in detecting objects in scale and rotation invariant cases. Firstly to detect an object in an image a computer should employ machine learning first, because the computer should learn that this particular area of pixels with some properties is the object that is to be detected. Before going to object detection methods we should know about the following: Training images are the pictures which the detector customs to study info. Query images are the pictures from which the detector, once learning, is made-up to detect object. In general, our aim in such tryouts would be to attain robust object recognition even when the object in a query image is at a different size or viewpoint than the training images. These are called scale in-variance and rotation in-variance respectively.

Recognition of objects is considered as difficult one in image processing. A number of object recognition algorithms have been proposed to address this problem. The object detection methods whose main objective is to classify an object into one of the several predefined categories. The goal of object detection is to distinguish objects from the background. Detecting the objects against cluttered, noisy backgrounds and other objects under different lights and contrast environments is one of the interesting tasks. Appropriate feature depiction increases performance by discerning the object from the background or other objects in different lightings and situations.

II. CHALLENGES FACED IN OBJECT DETECTION

There are various difficulties in object recognition in various circumstances.

A. Lightening:

The lightening conditions may differ in various weather conditions. Whatever the may be lightening the system has to detect the object in all images.

B. Positioning:

The positioning of the image may vary but it should not affect the object. Incase template matching is used, the system must handle such images uniformly.
C. Rotation:
Rotation of the images may occur and the system must be capable of handling such difficulty. Object detection includes detecting objects and recognizing patterns in an image. Some of the object detection methods use the temporal information computed from analyzing a sequence of frames in order to reduce the number of fake detections and increase accuracy rates.

III. VARIOUS METHODS IN OBJECT DETECTION

A. Multi-component object detection method:
Multi-component object detection method detects n number of objects in an image using various properties of an image. This method involves calculating the image optical flow field and doing clustering processing according to the optical flow distribution characteristics of the image. This method can get the complete movement information of an object and it is useful for detecting the moving object from the background with the accuracy, it has few disadvantages including a lot of calculations, sensitivity to noise, poor anti-noise performance, which make it not appropriate for real-time object detection.

B. Haar cascade classifying method:
This is a standard method in Open CV to detect objects is to use its ready-made objdetect module. After training with thousands of positive and negative images for days on end, you can get a classifier file which contains all the training information. Load it into your program and you are ready to detect your object. This method is well-tested, works fast, and is scale invariant. But it is not rotation invariant and it requires long training.

C. Hough transforms method:
This method is used in finding some useful points in images which have an easy-to-read texture in their respective localities. A useful interest point is one which is invariant to changes in illumination and camera viewpoint. The following detectors are used in detecting interesting points in an image they are: Moravec detector, Harris detector, KLT detector, SIFT detector. It involves building a representation of the scene known as the background model and finding deviations from the model for each inbound frame in the images. Any important change in an image region from the background model is noted down as a moving object. The pixels in the regions of the experiencing change are marked as moving objects and reserved for further processing.

The above mentioned methods has advantages in its own way. Haar cascade method is chosen as the efficient method for object detection which as its method in open cv library. Haar cascade uses SURF method which is an efficient one to detect objects with any positioning, color or depth.

D. Architecture Diagram:

![Fig. 1: simple architecture diagram of the tool.](image-url)
IV. REAL TIME IMPLEMENTATION

A. Modules description:

1) Customer registration
   a) Enter the required details.

2) Customer login
   a) Enter username and password
   b) User can access previously done designs

3) Design screen
   a) Select one of the home elements (i.e., bedroom, bathroom, kitchen)
   b) Customer can either upload a picture or select one of the available default customized layouts.
   c) Select the tile design that you wish to visualize in your room.
   d) Save the work for future reference.

   The frontend language used for this tool is html, css, jquery, javascript and off course opencv library for getting the data about the objects present in the image. The backend language used for this tool is php in MySQL database.

   When the user uploads the picture of their room this tool first detects the objects using the classifier data given by the opencv library. Opencv library uses surf method to detect the objects in the image.

   A short explanation of what SURF does is -
   - Find interest points in the image by means of Hessian matrices
   - Define the positioning of these points
   - Usage of basic Haar wavelets in a correctly oriented square region all over the place the interest points to find intensity gradients in the X and Y directions.
   - As the square region is divided into 16 squares for this, and each such sub-square yields 4 features, the SURF descriptor for every interest point is 64 dimensional.
   - For a description of the 4 features, please refer the paper - they are basically sums of gradient changes.

   After getting the classifier data (i.e. the info of those objects which must be in static mode) detect the floor and wall areas using colordepth function in opencv library and change that area dynamically according to the tiles design selected.

V. CONCLUSION

Object detection is very important in image processing and computer vision for detecting objects in an image. This object detection system is most widely used in business and government applications for processing images to detect fraud activities. Object detection is also important in online tools as there is a need for detecting multiple objects with accuracy which the existing systems failed to do. This feature of detecting objects in an image helps to increase the efficiency and accuracy of the system which thereby makes the system a hit in the market. Object detection is the main necessity in image processing domain. It uses various methods like multi-component object detection which detects multiple objects in an image and makes it easy for the system to classify objects and distinguish it from the background which is the main feature of this online design tool. This is done by feeding the object specification to the database and making it static and then changing the interesting areas (floor or wall) to dynamic according to the selected product (tiles).

REFERENCES