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Smart Space Utilization using Smart Phones

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Abstract —*In this project, we implementing a novel technique to scan and verify the measurementof an user defined space from a distance.By using a sets of image processing algorithm we are going to measure the dimension of a user defined space with its calculated dimension with an real life products (e.g. furniture products, electronic products, etc) which are been data mined from e-commerce website.With the help of mobile camera the image will be captured from which the user will select the desired space with endpoints.This desired space with be then used as the input data to our application. This project will convert a 2-dimensional input image to an 3-dimensional image for placing the virtual products selected by the user with help of e-commerce website or website portals.*

Keywords-*Area Measurement using Mobile camera,Distance Measurement, Camera Calibration, Personalised Recommendation,Android E-Commerce.*

I. INTRODUCTION

To develop an Android-platform based image processing application that is able to calculates the dimensions of user selected area from android mobile camera and shows the recommended objects on the user selected area of captured image virtually on the mobile screen.The use of E-Commerce websites is booming than the conventional methods. After buying the products from E-Commerce websites, customer face problems of products been too large or too small for the allocated area. This problem motivate us to create an application which gives the predefined knowledge to the user of products.

II. GOALS AND OBJECTIVES

- We are working to calculate the dimension of an user selected area with endpoints via Smart Phone camera.
- We are implementing image processing for displaying product's image over the user selected area.
- We have provided to user, the ease in which the user can buy products like furnitureproducts, electronic products etc. from e-commerce web portals usingour application.

III. EXISTING SYSTEM

Existing system consist of hardware of high end cameras or lasers by which distance is being measured. Our proposed system will generate measurements using low end cameras (i.e. Mobile phone cameras). Existing system lacks the user interface and connectivity to the wide range of E-Commerce websites. Our proposed system will create user friendly interface and connect the portal to E-Commerce websites for wide range of options to choose from. The cost expected for the existing system is much more than our proposed system, due to the use of high end cameras and lasers.

IV. DISADVANTAGES OF EXISTING SYSTEM

Existing system can only used to calculate the distance between the camera and object. Accuracy of the image processing and distance calibration is low. Few of the existing systems are only applicable for small area. Existing system may require multiple images to calculate the distance between two objects. Existing system lack the accuracy and may take more time to calculate the average measurement. Existing system requires to capture image from a specific angle for proper measurements.

V. PROPOSED SYSTEM

In this project, we are implementing a novel technique to scan and verify the measurement of an user defined space from a distance. By using image processing algorithms we are going to measure the dimension of a user defined space and with the help of data mining techniques we will suggest user to fill that user defined space with its calculated dimensions with an real life products (e.g. Furniture products, electronic products, etc.) Which are been data mined form the e-commerce websites. With the help of mobile camera the image will be captured from which the user will select the desired space with endpoints. This desired space will be then used as the input data to our application. This project will

convert a 2 dimensional input image to an 3 dimensional image for placing the virtual products selected by the user with help of e-commerce website or website portals.

5.1. Methodology

Computer stereo vision is used in robotic navigation to check depth of any object, but it needs two cameras. In the base paper, use of a single camera is applied instead of two different cameras. As the distance between camera and object is unknown, the measurement is done with the help of phone's inertial sensors. In diagram, the difference in image location is called as Disparity. The distance between two cameras is known as Base-Line. Based on disparity Base line, distance is been calculated.

Recording the same image from 2 different location using only one camera can create the same disparity also known as Single-Camera Stereo Vision. In single camera approach camera's translational rotational movements are required to calculate position, which in turn can be achieved by inertial sensors. This disparity is calculated and recorded for a 3D scene. This is difficult to calculate and this is known as correspondence problem.

5.2. Stereo-triangulation :-

Stereo Triangulation is a technique to calculate distance between the optical axes of cameras must be parallel. Difference of objects positioning images due to changed in sight, which must be matched from 2 images at a time that are projections of the same points in 3D.

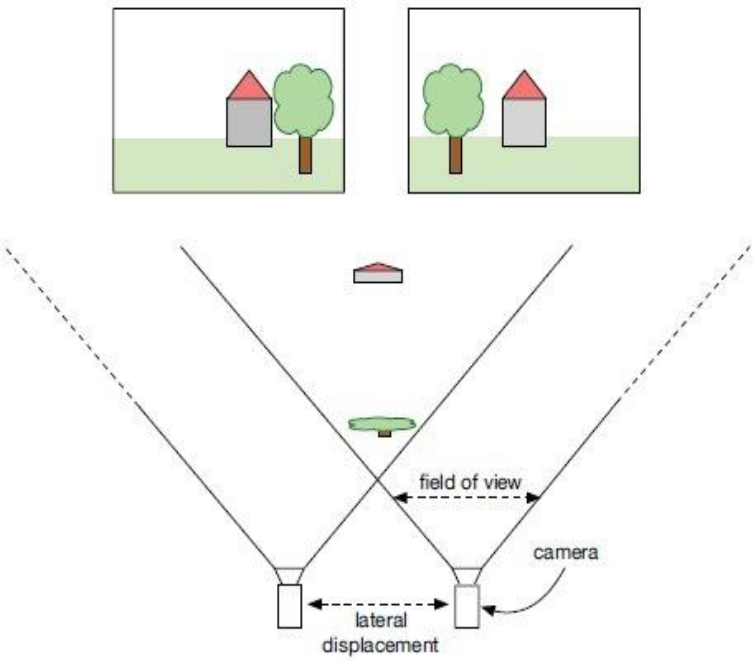

Fig. 1 Architecture of used system

The above figure shows Triangulation Technique.

$$\text{Triangulation} = \frac{b}{z} = \frac{b-(d+d')}{z-f} = \frac{d+d'}{f}$$

Where;
f = focal length
d = Disparity i.e. (D = d+d0)
b = baseline
d = distance between optical centers of two displaced camera

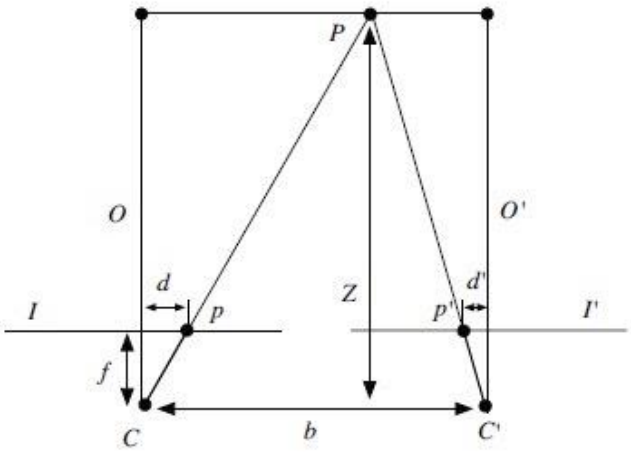

Fig. 2 Geometrical Diagram

Therefore,

$$z = \frac{f * b}{D}$$

Where,

f = distance from lens to digital camera

Depth resolution can be calculated using triangulation equation,

$$R = z1 - z2$$

Where,

$$z1 = \frac{f*b}{d1} \qquad z2 = \frac{f*b}{d1+rm}$$

d1 = discrete disparity
rm = width of one pixel in metric unit

5.3. Outcome :-

Dimension of user selected area is displayed on the mobile screen, and after selecting the object category by the user the virtual model of selected object will display on the selected area of image.

VI. THE ADVANTAGES OF PROPOSED TECHNIQUE CAN BE SUMMARIZED AS FOLLOWS

The proposed system give a visual view of the object selected in the environment in which it will be placed. With the use of E-Commerce websites, automatic suggestions for the smart space will be suggested. Due to this utilization of the space will be effectively done. Proposed system can be used for both indoor and outdoor objects, but the system will be more effective for indoor decors.

VII. DISADVANTAGE OF PROPOSED TECHNIQUES

Due to failure of internet connection half of the work can be done i.e. calibration and measurement of the object, but the connectivity to E-Commerce websites cannot be done

VIII. CONCLUSION

As we have come to know that E-commerce websites have N number of products but the user cannot view the product virtually in his desired place which leads to the consumer returning or replacing the product many times. Our

application helps the consumer to virtually visualize the product which the user selects in the required area and select the products wisely.

IX. FUTURE SCOPE

Future scope of our application will be to merge the application with Augmented Reality, this will help the consumer to view the product in more efficient way in high resolution. Multiple objects can be viewed at same time in a single frame giving the perfect matching sense to the user.

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