Build-IT - An Interactive Web Application for 3D Construction, Interior & Exterior Design

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Abstract— **Using 3D building models is extremely helpful throughout the architecture engineering and construction (AEC) lifecycle. Such models coupled with virtual walk through can enable customers to decide and be satisfied with their dream building. Manually creating a polygonal 3D model of a set of floor plans is nontrivial and requires skill and time. This project introduces and reviews a mechanism for applying interior and exterior design constructs after the conversion of 2D drawings into 3D Building Information Model (BIM).This research demonstrates an automated 3D model reconstruction of real world object from an un-calibrated image sequence targeting the same scene; which can be used for interior and exterior design. There are many key techniques in 3D reconstruction from image sequences, including feature matching, fundamental matrix estimation, projective reconstruction, camera self-calibration, dense stereo matching and Euclidean reconstruction. The effectiveness of the algorithms was evaluated in the experiments with many real image sequences.**

KeyWords: 3D reconstruction, Fundamental Matrix, Self-Calibration, Dense Matching, Three – Dimensional, Two-Dimensional.

I. INTRODUCTION

Many factors have to be considered when planning to build a house as the entire family gets involved in designing their house to fit the needs of all occupants. First architect has to draw the house or building plan according to client's requirements. Two dimensional (2D) drawings are conventionally used in this phase. Yet; it is difficult to be satisfied with looking at 2D plans where 2D drawing technology outputs a collection of lines and text on page [7]. These drawings are produced by highly trained professionals called Draftsmen under the guidance's of an architect. Draftsmen used to sketch the building plan on a paper previously. But with increasing computer literacy, draftsmen now use highly sophisticated architectural products such as Auto CAD [1] and 3D Home architect for the purpose of producing structural sketches. In contrast to 2D drawings these three dimensional (3D) drawings are very clear and detailed. The enrichment of 3D drawing makes better structured information available. Yet, understanding and using the previously mentioned products require specialized knowledge and cost is very high [5].

Thus, many architects and companies still use 2D drawings because they have realized 3D drawings take time and money. Making 2D drawings is fast and easy, but the output is still a 2D sketch which does not readily work with the downstream systems. It is difficult for a lay person looking at 2D drawings to understand and be satisfied of the design and accept it. Because 2D drawings do not contain all detailed information needed to construct a building [7]. In fact majority of the houses/buildings need 3D drawings for clarity and better planning.

When 2D structural sketches are produced for an architect, if client is not satisfied with looking at it, a second or even a third must be drawn, where each drawing involves an additional cost; until both parties are satisfied with the end result [20][4]. It is inconvenient, because if any terms changed, draftsman have to modify each of the other drawings that were affected to take the change into account. These unnecessary expenses may in fact force the client to settle with a structural sketch that does not meet his/her requirements completely. These unnecessary disappointments and needless expenses could be avoided if a user friendly 3D visualizer was in existence which any layperson can understand and use to create and view a detailed 3D building plan [2].

In addition to construction of their personalized space, many clients would consider interior and exterior designing of the space as a key concern. There are some products such as Inventor Fusion, Auto CAD, Autodesk Revit Architecture and Revit MEP [1] used in computer aided design (CAD) and BIM used to design the interior of a constructed space. But these are highly sophisticated software tools that are impractical for day-to-day usage due to the high cost of these tools. In fact, these tools are meant to be used by trained professionals with excellent computer skills and a thorough knowledge of the software. Therefore these tools are used only in very large scale building projects and their benefits are unattainable for most common place clients who may wish for aid in designing the interior or exterior of their building.

It will be useful and highly commercially viable to build an automated 3D reconstruction tool which enables creation and manipulation of polygonal 3D models of objects such as a sofa and view the object in alternate positions to change