MULTI-USER TANGIBLE INTERFACE FOR PUBLIC PARTICIPATION DEVELOPMENT OF LOW-COST HOUSING PROJECT DESIGN AND PLANNING

Subtitle

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Abstract. This paper proposes the community-based computer aided design and cost estimation software development for low-cost housing project. The content attempts to create a new user interface system by participating access to multi-user tangible interface system for community members. To solve the problem of presentation media change form that watched through computer monitor or projector into conference surrounding creation about a requirements of collaborative design group on the surface using interactive drag and drop device according to suit the life style pattern of the housing. The method of design is as follow; developed using virtools® for design, planning and estimation overall project as define community planning, housing planning, construction, and appropriate financial capacity of the users that base on developed community sustainable.

1. Introduction

Housing design, planning and cost estimation are all concerned with designing process that lead to manage low-cost housing project for low-income earners to communicate some forms of prototype, construction cost and financial capacity, which help architect in understanding community members’ needs that match low-cost housing requirement. This process attempts to design collaboration between presentation and working to discussions immediately according to suit the community for stability of dwelling. The development software are create a new user interface system by participating access to muti-user tangible interface system for a part of represent perception and comprehend to design space planning, assembly tool and cost estimation.

However, designing itself is not only the question about the problem solving design media adapted in a design task. The development considers that designing as a kind of experimentation that consists in reflective
'conversation' with the materials of a design situation. Based on public participation and reasonable analysis, the computer aided design serve as an integrated design tools for design process, improve the communication and lower the budget. The impact of computer aided design is potential and effective.

2. Problem statement

2.1 HOW TO PROVE HOUSING STANDARD FOR LOW-INCOME EARNERS?

The standard must be designing in such a manner that it conveys the intentions of the low-income earners to the housing. This may appear to be an obvious statement, but specification writer must constantly bear in mind the fact that readers of specification will no have been party to the decision-making process that to lead the confusion. The users can the task participating to see what is required of them. The research mentioned earlier about the need to be able to express one’s intentions clearly, for which sufficient thought and sufficient knowledge of housing design prerequisites. In many respects, the use of ‘standard’ improvement has helped designer to computer aided development because the format is not already supplied. The writer then has the relatively simple task of drag and drops the clauses that do not apply and adding information as appropriate.

The improvement has way of working that it applies when designing, detailing and estimation specifications. In community where managerial control is not particularly good, this can and does lead to computer aided development of different forms, as the design by modular system to adjust conveniently. The medium is important to be communicating in describing requirement that developers work to improve housing standard of graphic representation and to a standard approach to public participation, possibility managed design and estimation analysis in unison.

2.2 HOW TO DEVELOP PUBLIC PARTICIPATION IN COMMUNITY?

The purpose of this study is to find out the relationship of comprehend and perception between the community and computer media. In this sense, base on seeing, designers see what is there, make a change in configuration of a design task, and adjust requirement intentions, thereby informing further designing. The development put emphasis on the interaction low-cost earners, because communication could not be actual requirement and computer aided is complicated of working. However, the designing used in there protocol experiment is only the sketch tool. In spite of the extensive utilization of computer media in design practice today, there are no related works discussing the performance of seeing visual apprehension, estimation feature with each other. During the collaborative design process, firstly understood the form of housing, then cost dealt with the material of construction and finally developed the form of estimate the price.
3. Requirement Analysis

3.1 INTERACTIVE COST ESTIMATION FOR DECISION SUPPORT SYSTEM

In construction, low-cost housing project is necessary to proceeding. Available as interactive cost estimation, it helps to make the low-income earners specifications relatively straightforward because prompts are given to assist the user’s discussion. Despite the design may need to low price housing that the cost is appropriate condition. Both the design and materials using, must to be in agreement with earnings that majority are simple and saving.

In situations where it has not been possible to define everything to be specified, the designer can include prime cost and provisional sums. Prime cost (PC) sums will be included in the architectural material to be obtained from a nominate supplier. This sum will be adjusted against the actual cost of the products selected. For example, walls suites or similar items are often included in the specification as a prime cost simply because the earner has not yet decided what style and color are required. Provisional sum are used to cover work and/or items for which insufficient information is available at the discussion stage and which measured or priced accurately, as such provisional sums are particularly useful for alteration works to access planning in housing unit or overall project.

3.2 MODULAR SYSTEM FOR LOW-COST ARCHITECTURAL MATERIAL

When dealing with alterations to existing housing, it is sometime easier to subdivide the requirement according to reasonable of the housing and according to acceptable low-cost architectural materials. By composing the modular system in this manner, connected with a particular space and material are described together and is generally preferred by the low-cost earners. On larger alteration projects, it may be easier and more efficient to use a mixture of both methods, with new work classified by work section and alteration work by architectural material. The layout of the modular system for alteration work will depend upon the size and complexity of the task and the format adopted by design to best suit project after estimate the price preliminary.

The supplement has helped users to alter material necessary for configuration adjustment, it is accommodate to user because changing the form related using quantity material.

3.3 NEW INTERFACE SYSTEM FOR NON-CAD USER

With the growth of computer architectural usage, increase in computer power and more sophisticated software, the potential for managing the specification, such as AutoCAD, 3DsMax, Autodesk Revit and SketchUp. The software format tend to follow the same layout as drafting, designing, modelling and rendering, but have advantage of being able to import information. The difference of this title has the possibility of computer aided design for using low-cost housing project that change presentation by a user
interface system for non-cad user. Software capabilities aside, there are three essential requirements: computer aided assembly, space planning and cost estimation, it is compatible with software used by other participants in design process. Efficiency can be increased through the use of specification working software but only if it is simple and quick to use. Specification working involves the transfer of information and to easier this is to import complete the task expediently.

Figure 1. Integrated system requirement.

4. Software Implement

4.1 SIMPLIFIED USER INTERFACE DESIGN

The interface are developed using virtools®, is designed integrating system database and 3D model to access the task easily. It can be mainly divided into four parts: 1) viewing part, 2) structure, 3) material, and 4) estimation.

First, part is design for controlling the 3D view consisting of object groups, related tasks, and perspective of tasks as well as provides the part generating function and the simulation function. The view generating function aims to generate the relation between the object group and related task and the simulation function are intent on simulating 3D object. These two functions are the main objective of this tool.

Secondly, the structure is designed for construct the housing component to a user when its generate model is being simulated. Moreover it also enables a user develop a new or modify a modular. There is a function provided in an application to group the 3D entities, as shown in figure 1. The
users can assign name, code and the other properties for helping a user to select 3D objects, there is a useful function to drag and drop.

![Figure 2. Simplified user interface design.](image)

The third, the material is mapping texture application. The main purpose of using them is to display 3D object and define properties.

Finally, the estimation is designed to work completely with others. For guide when a user specifies a building expenses.

### 4.2 INTEGRATED REAL-TIME COST ESTIMATION

This section discussed to cost estimation. Incorporating with a list of tasks as well as providing materials price and quantity of application, the integrated real-time cost estimation is elaborate as follow:

1. This system in the ability of calculation of building cost to be performed by the products; the 3D object and documentation are generated using an existing property respectively.
2. The 3D entities that are classified in the work groups are indicated such as walls, column, floors and etc, that related to the construction activities represented in 3D model obviously.
3. To estimate the price for actual construction, users have to requirement revision from adjustment to material reasonable alternation.

### 4.3 MUTI-USER TANGIBLE INTERFACE

This development is inspired by a presentation on the public participation context that architect and earners can design corporative. That is, the writers propose a tangible user interface for CAD using to visualize the overall project and simplified design.

The implementation is designed image processing sensor, which is essentially an interactive with touch screen panel. Designers work on the surface using interactive drag and drop device, as shown in figure 3. More importantly, users can share the idea and acquire a sequence of housing design displays.
4.4 WEB-BASED DATABASE MANAGEMENT SYSTEM

The target is distributed a possibility to form a standard of construction for the other earners through members can collaborate without limitation. The needs in terms of reflective design process to establish an environment interactive communication system for the collaboration of problems with the distributed design, as shown in figure 4.

The reason for virtools® is used for systems development because database management standard is concerned with the modular system which the practical related CAD, feature is used xml file in the part of 3D entities. Decrease the problem of file converter.
5. Conclusion and Future Work

The application tangible user interface developed in this research supports convenient architectural presentation for low-income earners. Advantages of software development on the possible of users to both communicate with other and requirements of housing reasonable. In the process separated development two parts: reduced design method complication for architect and users can design collaboration, and helps the earners to have altered suit for housing both acceptable cost and design.

Choosing available virtools® as base engine for application that can used to integrate construction processes and estimate the price. This allows users to visualize and analyze together among understanding of construction sequence. There is demonstrated how the tangible interface can afford correlations of multiple representations, encourage share awareness. The important is provided prototype standard design system for low-cost housing by into public organization using that technical will be resolved in future work.

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References: