COMPARATIVE STUDY OF CAD SOFTWARE USE FOR ARCHITECTURAL DESIGNS

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ABSTRACT

With the advancement of the technology, software applications have been used to create two dimensional (2D) drawings as well as three dimensional (3D) models. They are named as Computer Aided Design (CAD) software. This study is focused on the CAD software used in architectural designs. Although there are several CAD software available, in Sri Lanka, Architects, Engineers and Designers are mostly adapted to AutoCAD. However, very few studies have been executed to investigate about alternative CAD software. The main objectives of this study are introduced alternative CAD software tools for AutoCAD and discuss the features of each to relate to AutoCAD. Five CAD software are used for this study to compare with AutoCAD, namely FreeCAD, LibreCAD, Archimedes, CADEMIA and DraftSight. Comparison is done by considering eight factors. Those factors are Latest Release Date, 2D 3D or Specialty Fields, Platform, License, Support AutoCAD DXF, Import, Export and Price. Secondary data and primary data was used for this study. Usability test was design for collect data. Further this paper discuss the similarities, special features and limitations.

Key words: Computer Aided Design, architectural design, 2D design, 3D modelling, AutoCAD, alternative CAD software

1. INTRODUCTION

Software plays an important role in almost all aspects of daily life. It can be defined as the instructions, which provide functionality of the program that requires performing a specific type of data processing in a professional manner to accomplish a task. From the 1980s through 1990s, significant evolution occurred by replacing the board drawing with a newly developed system called CAD (Computer Aided Drafting) [1].

CAD is the use of computer technology for design and its documentation. It assists in the creation, modification, analysis or optimization of a design. CAD software replaces manual drafting with an automated process. CAD or computer-aided drafting and design (CADD) can be defined as the use of computer systems to assist in the creation, modification, analysis or optimization of a design [2]. Prior to the advent of CAD software, the development of any type of design or prototype was done manually. As such, development was typically tedious and time-consuming. CAD software increases the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing [3]. CAD output is in the form of electronic files for print, machining, or other manufacturing operation. In early stage of CAD software development focused on 2D drawings. From few years back there is rapid development for 3D CAD in the field of engineering and architecture [4]. Two dimensional (2D) and three dimensional 3D drawings can be generated using CAD. Those are 2D vector-based graphics or 3D modeling of solid surfaces [3]. It can used to design 2D floor plans and visualize the space with in 3D in the field of Architecture.

The usage of CAD software are rapidly increased due to several reasons. Mainly it increase the productivity of the designers, improve the quality of the design and improve the communication through the documentation.

AutoCAD is the world's most popular computer-aided drafting package for the personal computer. It is a fully functional 2D and 3D CAD program [5][1]. But there are number of Free & Open Source (FOS) and propriety CAD software. Each of them has different strong points enabling drafters and users to be more productive. The objectives of this study are introduced alternative CAD software tools for AutoCAD and discuss the features of each to relate to AutoCAD.

2. METHODOLOGY

Secondary data was used in this study. Data was collected from the user manuals and developers and vendors web sites of the selected software. For this study five software were selected. Namely: FreeCAD, LibreCAD, Archimedes, CADEMIA and DraftSight. These software compare with AutoCAD related to selected factors, which identified from the expert opinion. Those factors are Latest Release Date, 2D 3D or Specialty Fields, Platform, License, Support AutoCAD DXF, Import, Export and Price. Usability test was done to collect data.

2.1. FreeCAD

FreeCAD is a 3D CAD software. It is an Open Source (LGPL License) software. FreeCAD is aimed directly at mechanical engineering and product design but also fits in a wider range of uses around engineering, such as architecture or other engineering specialties. As with many modern 3D CAD modelers it has many 2D components in order to sketch 2D shapes or extract design details from the 3D model to create 2D production drawings, but direct 2D drawing is not the focus [6]. This has open-source libraries. Among them are OpenCascade, a powerful CAD kernel, Coin3D, an incarnation of Open Inventor, Qt, the world-famous UI framework, and Python [7]. Figure 1 show the screen shot of the FreeCAD interface.

2.2. LibreCAD

LibreCAD is a free Open Source 2D CAD drawing tool. It was developed as a division of QCad Community Edition. The GUI of LibreCAD is based on Qt4 libraries. Most of the interface and handle concepts are analogous to AutoCAD [8]. Figure 2 show the screen shot of LibreCAD

2.3. Archimedes

The Archimedes Project started as a collaboration between a group of programmers and architecture students at the University of São Paulo, in Brazil, in 2005 [9]. Objective of this project was to create software better suited for architecture than other available CAD software. Archimedes uses its own XML-based open format, which resembles SVG. It does not yet include support for other CAD formats [10]. Figure 3: show the interface of Archimedes.

2.4. CADEMIA

CADEMIA was originally designed at Bauhaus University in Weimar for teaching and research purposes. CADEMIA-Community is free and open source version. In March 2013 the first commercial product, CADEMIA-Professional, was introduced after that development of CADEMIA-Community ended in March 2013 with version 4. The source code is not available [11].

2.5. DraftSight

DraftSight is 2D CAD software application. The user interface is quite similar to AutoCAD. The standalone, single-user version of DraftSight is free until a user saves or prints a document for the first time.

3. RESULTS

For this study five CAD software were compare with AutoCAD. The result of this analysis is shown in table1. Five software has latest releasing versions. Only FreeCAD provide 3D drawing models. Other four software provide 2D drawing. All selected software can be installed in Window, Mac and Linux platforms. FreeCAD has been issued under Lesser General Public License (LPGL) and source code is available. LibreCAD has been issued under the GNU General Public License (GNU GPL). Archimedes is also issued source code. Therefore those software can be changed or improved by the users if they interest. CADEMIA and DraftSight are proprietary software. Used has to pay for purchased them. AutoCAD also a proprietary software. All the software are supported to AutoCAD DXF format except Archimedes. All import and export file type are display in the table 1 related with five software.

4. CONCLUSION

CAD Software is an extremely powerful tool and can be create 2D and 3D designs in order to serve the intended purpose of any project. This study focused on alternative CAD software used in architectural designs. Five software were selected for this study. Other than the Archimedes, those software can save in AutoCAD DXF file formats. They have more user friendly interfaces. All of them can be used in Windows, Mac OS X and Linux operating systems. The most important feature is three of the five selected software are freely download and used. Not only that those three software provide the source code. Therefore if user interest, they can be modified them according to user requirements.

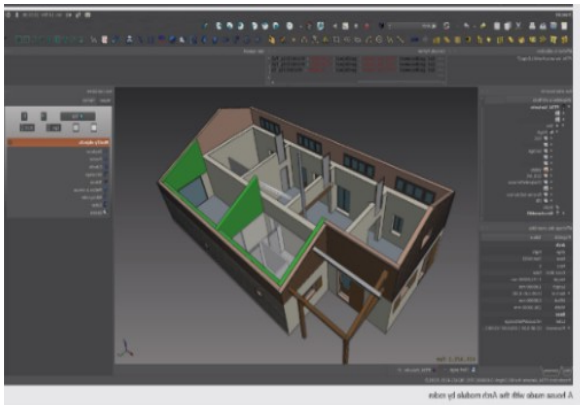

Figure 1: FreeCAD interface

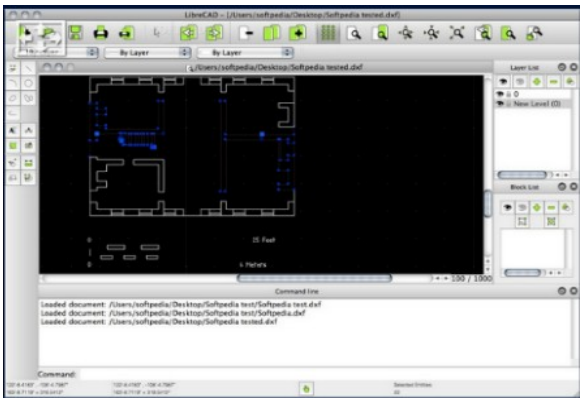

Figure 2: LibreCAD interface

Table1: Comparison of CAD software

	FreeCAD	LibreCAD	Archimedes	CADEMIA	DraftSight	AutoCAD
Latest Release Date	July 1, 2014, 0.14	June 7, 2014, Version 2.0.4	Version 0.66.1.	version 1.3.1	October 2014: DraftSight 2015	March 27, 2014, Release 2015
2D 3D	3D	2D	2D	2D	2D	2D, 3D
Platform	Window, Mac, Linux	Window, Mac, Linux	Window, Mac, Linux	Window, Mac, Linux	Window, Mac, Linux	Window, Mac
License	LPGL Source code available	GNU GPL Source code available	Source code available	Proprietary	Proprietary	Proprietary
Support AutoCAD DXF	Yes	Yes	Not yet	Yes	Yes	Yes
Imports file types	IGES, STEP, BRep, OBJ, DXF, SVG, U3D	DXF	-	-	DWG, DXF, BMP, JPEG, PNG, GIF, TIF/TIFF	DXF,DWG, DWS, DWT, WMF, SAT, 3DS, FBX,DGN
Export file types	IGES, STEP, BRep, OBJ, DXF, SVG, U3D	DXF, JPEG, PNG, SVG,BMP	SVG	-	DWG, DXF, JPEG, PNG,TIF/TIFF, PDF, WMF,SVG, STL, SLD	3DS,DXF, DWG, PDF, DWF,FBX, BMP, DGN
Price	free	Free	Free	Not free	Not free	Not free

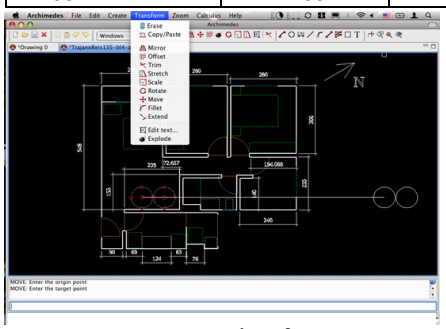

Figure 3: Archimedes interface

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