CAD Development

Submitted for partial fulfilment of the Degree
of
Bachelor of Technology
(Computer Science and Engineering)

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I, student of Guru Nanak Dev Engineering College, Ludhiana, have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

The author is highly grateful to Dr. M.S. Saini Director, Guru Nanak Dev Engineering College, Ludhiana for providing him with the opportunity to carry out his Six Weeks Training at Testing and Consultancy Cell, Guru Nanak Dev Engineering College, Ludhiana.

The author would like to whole heartedly thank Dr. H.S. Rai Dean, Testing and Consultancy Cell, Guru Nanak Dev Engineering College, Ludhiana who is a vast sea of knowledge and without whose constant and never ending support and motivation, it would never have been possible to complete the project and other assignments so efficiently and effectively.

Finally, the authors are indebted to all whosoever have contributed in this report work with Gurpinder Singh (D3 CSE) and all other trainees. Without their encouragement, it would not have been possible to complete this project in such an efficient manner.

Mandeep Singh

Abstract

CAD development project discuss the work done in computer-aided-design. Computer-aided design (CAD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. I explored LibreCAD Source Code. LibreCAD is Free and Open Source CAD Software. LibreCAD is a fully comprehensive 2D CAD application that you can download and install for free. There is a large base of satisfied LibreCAD users worldwide, and it is available in more than 20 languages and for all major operating systems, including Microsoft Windows, Mac OS X and Linux . Librecad is an application for computer aided design in two dimensions . With librecad you can create technical drawings such as plans for buildings, interiors, mechanical parts or schematics and diagrams. Basically, LibreCAD is used to make 2D design.

This project also includes work regarding qt creater to make a text editor. Qt Creator is a cross-platform C++, JavaScript and QML integrated development environment which is part of the SDK for the Qt GUI Application development framework.

Furthermore, this project involves hatching technique implementation using C++ and Cairo graphics library. Hatching is the technique to fill any closed contour with different patterns or colors and is used by many CAD softwares.

Also, this project is completely open source and the entire code is available to the user as and when required. There is also Complete developer's Documentation as well as User manual alongwith it that helps using it a lot easier.

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CHAPTER 1

INTRODUCTION TO ORGANISATION

GURU NANAK DEV ENGINEERING COLLEGE
Contemplate and reflect upon knowledge, and you will become a
www.gnde

Figure 1.1: Guru Nanak Dev Engineering College

I had my Six Weeks Industrial Training at TCC-Testing And Consultancy Cell, GNDEC Ludhiana. Guru Nanak Dev Engineering College was established by the Nankana Sahib Education Trust Ludhiana. The Nankana Sahib Education Trust i.e NSET was founded in memory of the most sacred temple of Sri Nankana Sahib, birth place of Sri Guru Nanak Dev Ji. With the mission of Removal of Economic Backwardness through Technology Shiromani Gurudwara Parbandhak Committee i.e SGPC started a Poly technical was started in 1953 and Guru Nanak Dev Engineering College was established in 1956.

NSET resolved to uplift Rural areas by admitting 70% of students from these rural areas ever year. This commitment was made to nation on 8th April, 1956, the day foundation stone of the college building was laid by Dr. Rajendra Prasad Ji, the First President of India. The College is now ISO 9001:2000 certified.

Guru Nanak Dev Engineering College campus is spread over 88 acres of prime land about 5 Km s from Bus Stand and 8 Km s from Ludhiana Railway Station on Ludhiana-Malerkotla Road. The college campus is well planned with beautifully laid out tree plantation, pathways, flowerbeds besides the well maintained sprawling lawns all around. It has beautiful building for College,Hostels,Swimming Pool,Sports and Gymnasium Hall Complex, Gurudwara Sahib, Bank, Dispensary, Post Office etc. There are two hostels for boys and one for girls with total accommodation of about 550 students. The main goal of this institute is:

- To build and promote teams of experts in the upcoming specialisations.
- To promote quality research and undertake research projects keeping in view their relevance to needs and requirements of technology in local industry.
- To achieve total financial independence.
- To start online transfer of knowledge in appropriate technology by means of establishing multipurpose resource centres.

1.1 Testing and Consutancy Cell

My Six Weeks Institutional Training was done by me at TCC i.e Testing And Consultancy Cell, GNDEC Ludhiana under the guidance of Dr. H.S.Rai Dean Testing and Consultancy Cell. Testing and Consultancy Cell was established in the year 1979 with a basic aim to produce quality service for technical problems at reasonable and affordable rates as a service to society in general and Engineering fraternity in particular.

Figure 1.2: Testing and Consultancy Cell

Consultancy Services are being rendered by various Departments of the College to the industry, Sate Government Departments and Entrepreneurs and are extended in the form of expert advice in design, testing of materials & equipment, technical surveys, technical audit, calibration of instruments, preparation of technical feasibility reports etc. This consultancy cell of the college has given a new dimension to the development programmers of the College. Consultancy projects of over Rs. one crore are completed by the Consultancy cell during financial year 2009-10.

Ours is a pioneer institute providing Consultancy Services in the States of Punjab, Haryana, Himachal, J&K and Rajasthan. Various Major Clients of the Consultancy Cell are as under:

- Northern Railway, Govt. of India
- Indian Oil Corporation Ltd.
- Larson & Turbo.
- Multi National Companies like AFCON & PAULINGS.
- Punjab Water Supply & Sewage Board
- Power Grid Corporation of India.
- National Building Construction Co.
- Punjab State Electricity Board.
- Punjab Mandi Board.
- Punjab Police Housing Corporation.
- National Fertilizers Ltd.
- GLADA, Ludhiana

CHAPTER 2 INTRODUCTION TO PROJECT

2.1 Introduction

The term computer graphics includes almost everything on computers that is not text or sound. Today almost every computer can do some graphics, and people have even come to expect to control their computer through icons and pictures rather than just by typing. Here in our lab at the Program of Computer Graphics, we think of computer graphics as drawing pictures on computers, also called rendering. The pictures can be photographs, drawings, movies, or simulations pictures of things which do not yet exist and maybe could never exist. Or they may be pictures from places we cannot see directly, such as medical images from inside your body. Computer graphics is now used in various fields; for industrial, educational, medical and entertainment purposes. The aim of computer graphics is to visualize real objects and imaginary or other abstract items. In order to visualize various things, many technologies are necessary and they are mainly divided into two types in computer graphics: modeling and rendering technologies.

2.2 Introduction to CAD

Computer-aided design (CAD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing.CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations. CAD is also used for the accurate creation of photo simulations that are often required in the preparation of Environmental Impact Reports, in which computer-aided designs of intended buildings are superimposed into photographs of existing environments to represent what that locale will be like were the proposed facilities allowed to be built. Computer Aided Drafting describes the process of creating a technical drawings with the use of computer software. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print or machining operations. CAD software uses either vector based graphics to depict the objects of traditional drafting, or may also produce raster graphics showing the overall appearance of designed objects.

Today there are very few aspects of our lives not affected by computers. Practically every cash or monetary transaction that takes place daily involves a computer. In many cases, the same is true of computer graphics. Whether you see them on television, in newspapers, in weather reports or while at the doctors surgery, computer images are all around you. A picture is worth a thousand words is a well known saying and highlights the advantages and benefits of the visual ation of our data. We are able to obtain a comprehensive overall view of our data and also study features and areas of particular interest. A range of tools and facilities are available to enable users to visualize their data, and this document provides a brief summary and overview. Computer graphics can be used in many disciplines. Charting, ations, Drawing, Painting and Design, Image Processing and Scientific Visualization are some among them. Computer graphics is concerned with all aspects of producing images using a computer. It concerns with the pictorial synthesis of real or imaginary objects from their computerbased models.

CAD often involves more than just shapes. As in the manual drafting of Technical and Engineering Drawings, the output of CAD must convey information, such as material, processes,dimensions and tolerances, according to applicationspecific conventions. CAD may be used to design curves and figures in twoDimensional(2D) space; or curves, surfaces, and solids in three dimensional(3D) space.CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetic, and many more. CAD is also widely used to produce Computer animation for special Effects in movies,advertising and technical manuals. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by engineers of the 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics (both hardware and software), and discrete differential geometry.The design of geometric model for object shapes, in particular, is occasionally called Computer Aided Geometric Design (CAGD).While the goal of automated CAD systems is to increase efficiency, they are not necessarily the best way to allow newcomers to understand the geometrical principles of Solid Modeling.

I explored LibreCAD's source code. LibreCAD is Free and Open Source CAD Software. LibreCAD is a fully comprehensive 2D CAD application that you can download and install for free. There is a large base of satisfied LibreCAD users worldwide, and it is available in more than 20 languages and for all major operating systems, including Microsoft Windows, Mac OS X and Linux (Debian, Ubuntu, Fedora, Mandriva, Suse ...). Librecad is an application for Computer Aided Design (CAD) in two dimensions (2d). with LibreCAD you can create technical drawings such as plans for buildings, interiors, mechanical parts or schematics and diagrams.

The app is great for industrial designers, but anyone who wants to learn how to make 2D CAD drawings will like this program. For a free software, LibreCAD gives you a lot of tools to work with. New users will be able to create basic drawings, while advanced users can make engineering plans with 5the software. Layers can be added, ideal for complex drawings. The provided tools are sufficient for producing high precision drawings. You can start drawings from scratch. But it is also easy to put in splines, ellipses, arcs, lines and circles. A single item can have several iterations. For instance, you have 4 modes for a rectangle parameter. The different shapes can be combined easily. LibreCAD also has a powerful zoom tool that lets you look at models at different distances. This is essential for designers who are going to make lifesize copies of a drawing. There are three tabs above the working area. The first tab is for changing color, useful for layer definition. The other tab is for changing size and the third for workspace customization.

LibreCAD also has grids which are extremely useful for those new to CAD. Once you have made the basic object, you can customize it in many ways. Scaling is particularly easy here. Also worth mentioning here is the ”Explode text into letters” effect. It is a special feature that will come in handy ations. LibreCAD allows you to put horizontal or vertical restrictions on completed models. Relative zeros may be locked, useful for ending and starting points. All in all, it is powerful, free CAD application. You can download, install and distribute LibreCAD freely, with no fear of copyright infringement.

2.2.1 Introduction to LibreCAD

LibreCAD is a fully comprehensive 2D CAD application that you can download and install for free. There is a large base of satisfied LibreCAD users worldwide, and it is available in more than 20 languages and for all major operating systems, including Microsoft Windows, Mac OS X and Linux (Debian, Ubuntu, Fedora, Mandriva, Suse ...). Librecad is an application for computer aided design (cad) in two dimensions (2d). with librecad you can create technical drawings such as plans for buildings, interiors, mechanical parts or schematics and diagrams.

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2.2.2 LibreCAD's features

- It's free no worry about license costs or annual fees.
- No language barriers it's available in a large number of languages, with more being added continually.
- GPLv2 public license you can use it, customize it, hack it and copy it with free user support 15and developer support from our active worldwide community and our experienced developer team.
- LibreCAD is an Open Source communitydriven project: development is open to new talent and new ideas, and our software is tested and used daily by a large and devoted user community; you, too, can get involved and influence its future development.
- LibreCAD is an Application for Computer Aided Design (CAD) in two dimension (2D). With LibreCAD you can create technical drawings such as plans for building, interiors, mechanical parts or schematics and diagrams.

2.2.3 How it started?

LibreCAD started as a project to build CAM capabilities into the community version of QCad for use with a Mechmate CNC router. LibreCAD is a version of QCad CE ported to Qt4. Since QCad CE was built around the outdated Qt3 library, it had to be ported to Qt4 before additional enhancements. This gave rise to CADuntu.

The project was known as CADuntu only for a couple of months before the community decided that the name was inappropriate. After some discussion within the community and research on existing names, CADuntu was renamed to LibreCAD.

Porting the rendering engine to Qt4 proved to be a large task, so LibreCAD initially still depended on the Qt3 support library. The Qt4 porting was completed eventually during the development of 2.0.0 series, thanks to our master developer Rallaz, and LibreCAD has become Qt3 free except in the 1.0.0 series.

2.2.4 Downloading Source Code

Fired up the terminal because you need to install the qt4 development libraries, tools, compiler and git.

```
$ sudo apt-get install g++ gcc make git-core libqt4-dev qt4-qmake libqt4-help qt4-dev-tools libboost-all-dev libmuparser-dev libfreetype6-dev
$ sudo apt-get build-dep librecad
```

Clone the git repository of LibreCAD in Desktop (You can use any Directory)

```
$ git clone https://github.com/gaganjyot/LibreCAD_3.git
```

Now you can run qmake (or qmake-qt4) to create a makefile and run make to compile LibreCAD. Make sure that you are in the folder (Librecad).

```
$ cd LibreCAD

$ qmake-qt4 librecad.pro

$ make
```

librecad.pro is a project file. qmake creates a makefile. Make command will compile the project. Compiling LibreCAD might take a while, depending on the speed of your computer, but just let it run until it finishes.

To finally run LibreCAD, execute the following commands:

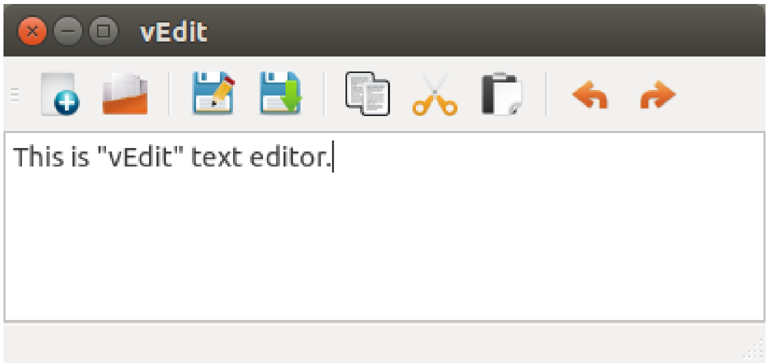
```
$ cd unix

$ ./librecad
```

CHAPTER 3

PROJECT WORK

3.1 Text Editor using Qt

This text editor is made using Qt. Qt is the C++ framework. It has most used features that a text editor have. As my 6 weeks training project, I worked in Qt creater and made a text editor. Qt Creator is a complete IDE for creating applications with Qt Quick and the Qt application framework.



This is "vEdit" text editor.

Figure 3.1: vEdit- The Text Editor

It has the following features:

- New File
- Open File
- Save File
- Save as File
- Copy
- Paste

- Cut
- Undo
- Redo

In this text editor we can make new text file and edit text. We can copy, cut and paste text easily. We can save and our text document in any location and open text document from any location.

3.1.1 Installation Guide

To install vEdit, you need to clone it from github.

- Go to terminal and type

  ```
  $ git clone http://www.github.com/mandeeps708/vEdit.git
  ```

- Now go to the directory vEdit by using:

  ```
  $ cd vEdit
  ```

- Now running qmake command:

  ```
  $ qmake vEdit.pro
  ```

- Now MakeFile will be generated. After that run make:

  ```
  $ make
  ```

- An executable file will be generated. Execute it using:

  ```
  $ ./vEdit
  ```

3.2 Adding Features to LibreCAD v3

During my 6 weeks training, I worked upon open source, learned a lot from it and in return contributed to it. LibreCAD v3 is written in C++ using Qt framework. It is a Qt application. With this project, I aimed at understanding C++ more clearly and deeply.

I added these features in LibreCAD v3's User Interface:

1. Open
2. Save
3. Save As

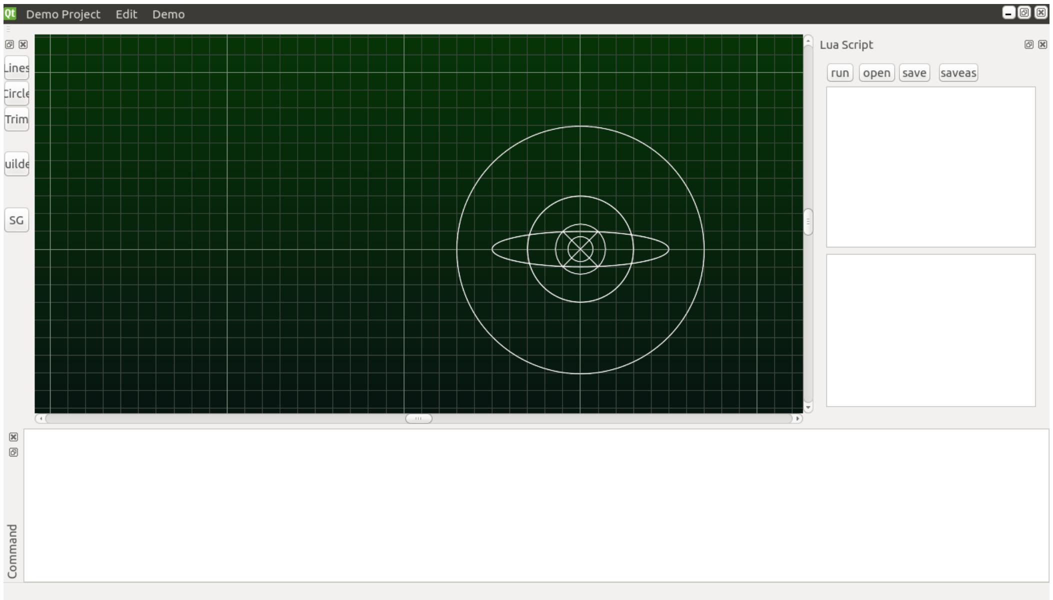
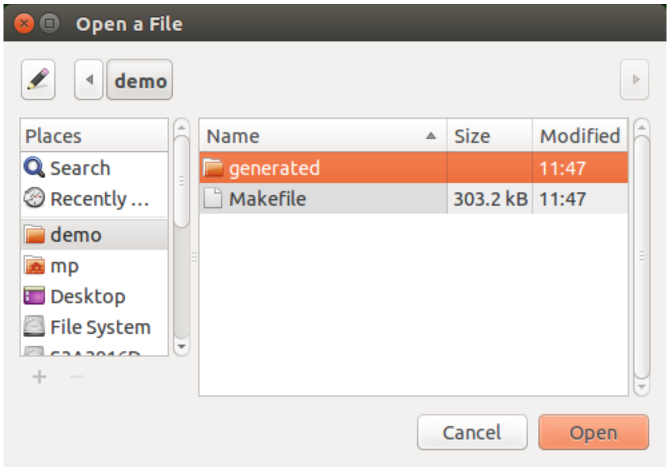


Figure 3.2: LibreCAD v3 Load/Save Feature

3.2.1 Open

In this, I added Open feature to LibreCAD v3. This adds a button to the User Interface. When it is clicked, it prompts for a file to be opened. Then choose existing file and click ”open”. The file will be opened.

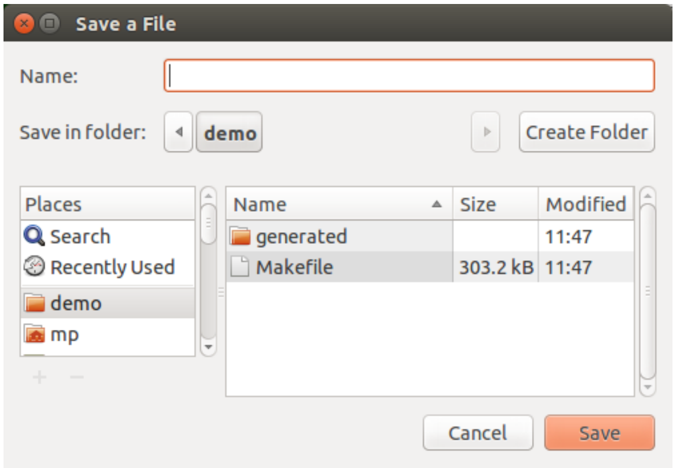


Name	Size	Modified
generated		11:47
Makefile	303.2 kB	11:47

Figure 3.3: Open a File Prompt Box

3.2.2 Save As

[!ht] In this feature, when user clicks on ”Save As” button, it prompts for a file location on which the file is to be saved.



Name	Size	Modified
generated		11:47
Makefile	303.2 kB	11:47

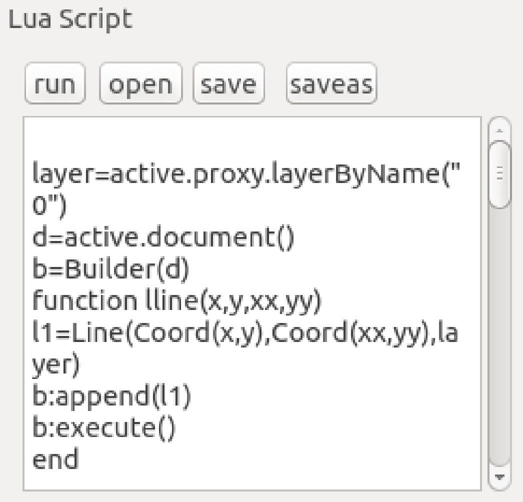
Figure 3.4: Save As Prompt Box

3.2.3 Save

In this feature, when user clicks on save button, it saves the script. It saves the changes to the existing file.

3.3 Design implementation using Lua scripting language

After working with libreCAD 3, I experimented with it by making some designs usign Lua scripting language. In this project, I made several lua scripts and run it in LibreCAD to make various design. I made design of water tank and varoius logos and some other impressive 2D design in LibreCAD using LUA scripting language. In LibreCAD v3, there is a dockable window for creating lua scipts:



```
layer=active.proxy.layerByName("
0")
d=active.document()
b=Builder(d)
function lline(x,y,xx,yy)
l1=Line(Coord(x,y),Coord(xx,yy),la
yer)
b:append(l1)
b:execute()
end
```

Figure 3.5: Lua Dockable window

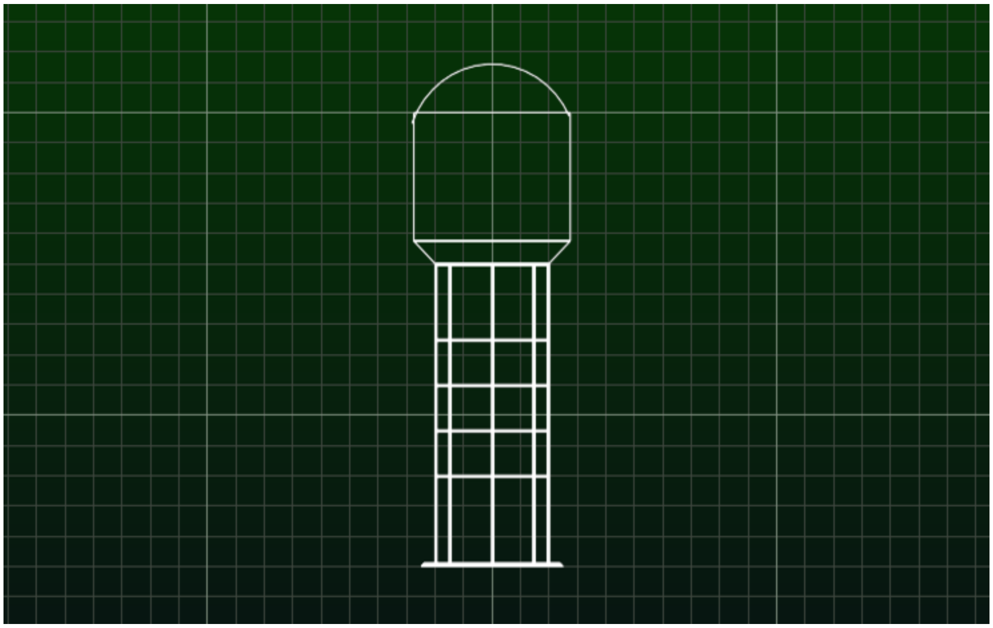


Figure 3.6: Water Tank Model

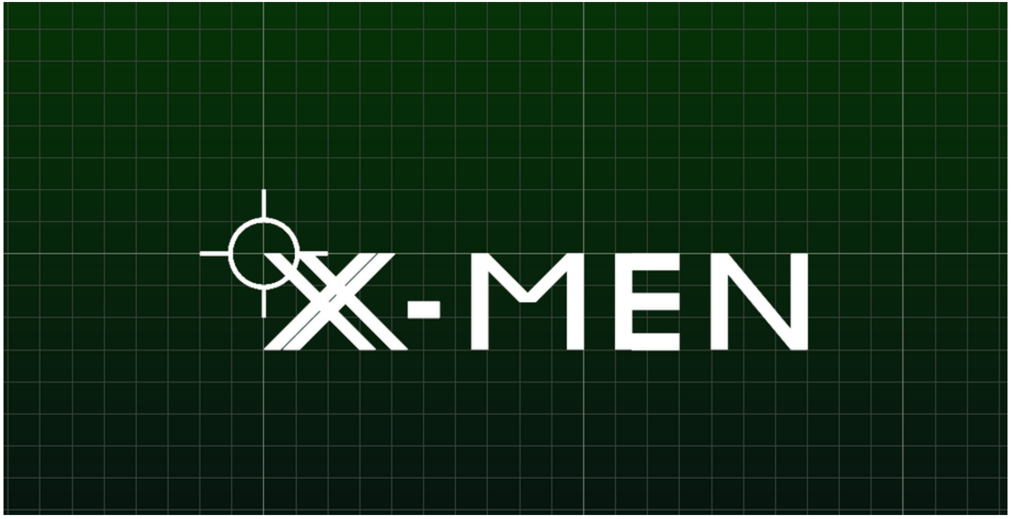


Figure 3.7: X-Men Logo

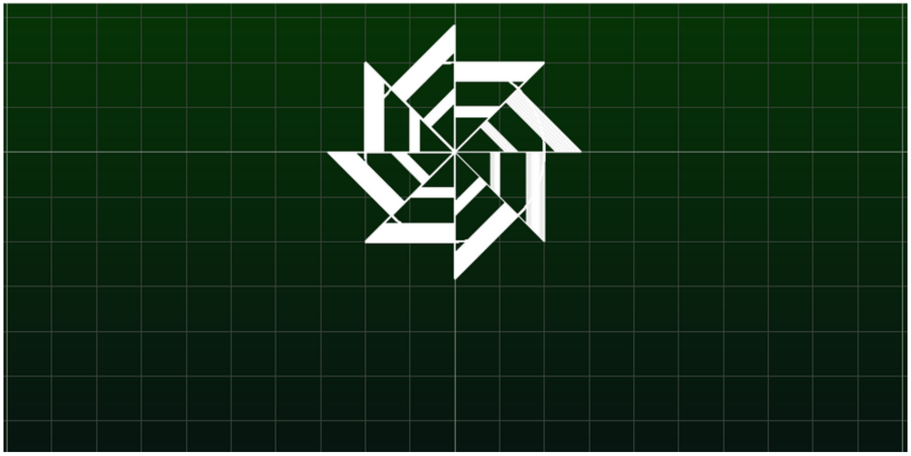


Figure 3.8: Sharp Design 2

3.4 Hatching

This project also involves hatching implementation. To accomplish this, C++ and a graphics library named ”Cairo” is used. Basically, Hatching is a pattern of lines and dots that fills an enclosed area. Hatching can be used simply for color. The colors can represent materials or uses in drawings and renderings. There aren’t any conventions for use of color in architecture. However, many other disciplines, such as urban planning and cartography, prescribe uses for colors in drawings and maps. During the training, I also worked on Hatching. Basically, I have used C++ and a graphics library called Cairo. In this project, I’ve implemented two types of hatching:

1. Solid fill
2. Pattern fill

3.4.1 Solid fill

- For Solid Fill, I made a C++ program named ”solid.cpp” with help of Cairo graphics library. When it is compiled using:
  $ g++ solid.cpp -o output -lcairo
- Then the executable will be created named ”output”. Execute it using:
  $ ./output
- Then a file will be created named ”hatch.svg” with the given color. We can simply open it in terminal using command:
  $ eog hatch.svg

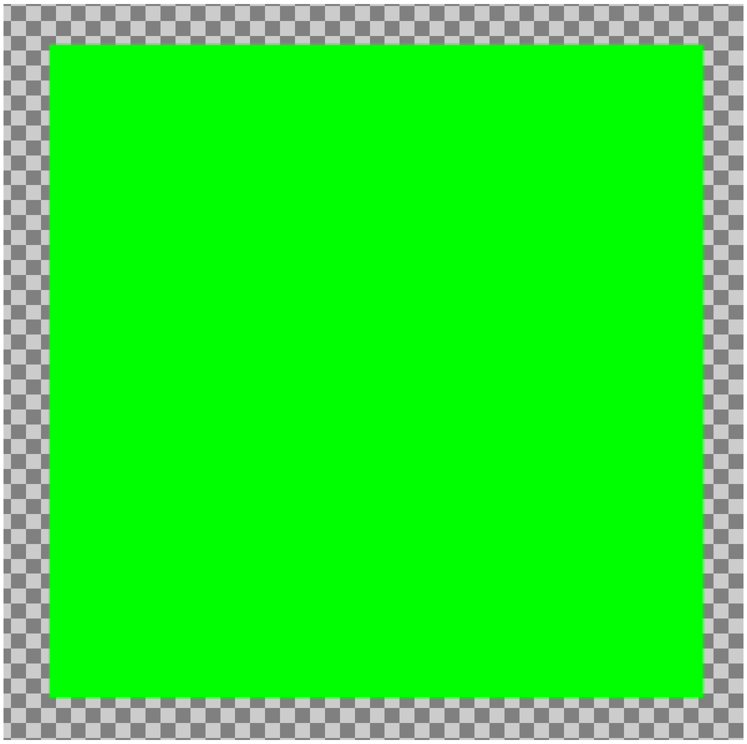


Figure 3.9: Solid Fill: hatch.svg

3.4.2 Pattern Fill

- For Pattern Filling, I made another program named ”pattern.cpp”. When it is compiled using:
  $ g++ pattern.cpp -o pexec -lcairo

- Then an executable file will be created named ”pexec” in the current directory. Execute it using command:
  $ ./pexec

- Then a file will be created named ”hello.png” which contains the hatched object. Open this file using:
  $ eog hello.png

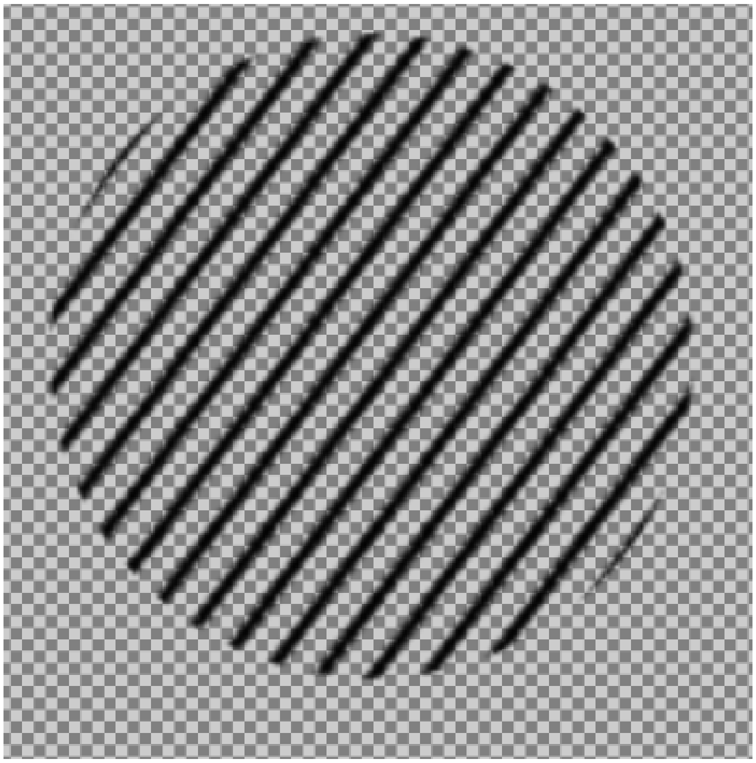


Figure 3.10: Pattern Fill: hello.png

CHAPTER 4

TECHNOLOGIES USED

4.1 Introduction to Qt

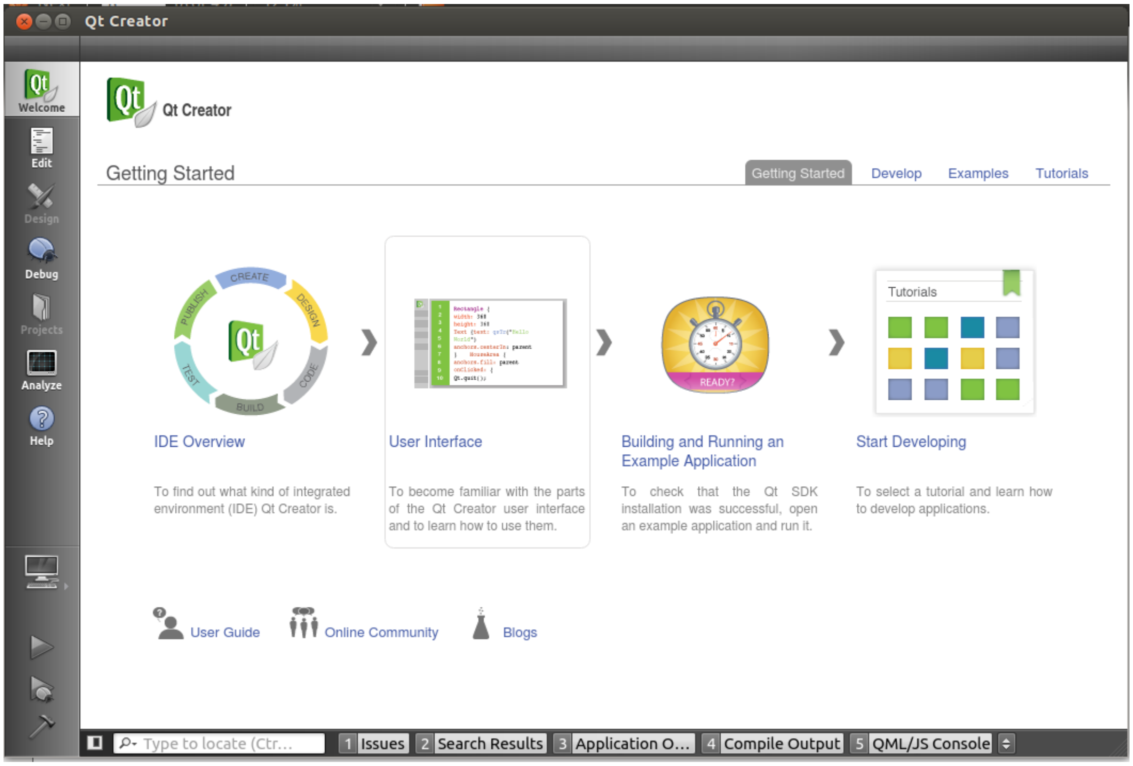
Qt Creator is a complete IDE for creating applications with Qt Quick and the Qt application framework. Qt is designed for developing applications and user interfaces once and deploying them across several desktop and mobile operating systems. One of the major advantages of Qt Creator is that it allows a team of developers to share a project across different development platforms (Microsoft Windows, Mac OS X, and Linux) with a common tool for development and debugging. In addition, UI designers can join the team by using Qt Quick tools for creating fluid user interfaces in close cooperation with the developers. The main goal for Qt Creator is meeting the development needs of Qt Quick developers who are looking for simplicity, usability, productivity, extendibility and openness, while aiming to lower the barrier of entry for newcomers to Qt Quick and Qt. The key features of Qt Creator allow UI designers and developers to accomplish the following tasks:

- Get started with Qt Quick application development quickly and easily with examples, tutorials, and project wizards.
- Design application user interface with the integrated editor, Qt Quick Designer, or use graphics software to design the user interface and use scripts to export the design to Qt Quick Designer.
- Develop applications with the advanced code editor that provides new powerful features for copleting code snippets, refactoring code, and viewing the element hierarchy of QML files.
- Build and deploy Qt Quick applications that target multiple desktop and mobile platforms, such as Microsoft Windows, Mac OS X, Linux, Symbian, MeeGo, and Maemo.
- Debug JavaScript functions and execute JavaScript expressions in the current context, and inspect QML at runtime to explore the object structure, debug animations, and inspect colors.
- Profile your Qt Quick applications with the QML Profiler. You can inspect binding evaluations, signal handling, and painting operations when running QML code. This is useful for identifying potential bottlenecks, especially in the evaluation of bindings.

- Deploy applications to mobile devices and create application installation packages for Symbian and Maemo devices that can be published in the Ovi Store and other channels.
- Easily access information with the integrated contextsensitive Qt Help system.
- It has differents modes such as Welcome, edit debug, design,analyze and help

4.2 Working with Qt Creator

Qt Creator meets its design goals of simplicity, easeofuse, and productivity by relying on the concept of modes. These adapt the user interface to the different application development tasks at hand. When developers start Qt Creator, it opens to the Welcome mode, where they can open tutorials and example projects or start the project wizard to create their own projects.



To find out what kind of integrated environment (IDE) Qt Creator is.

To become familiar with the parts of the Qt Creator user interface and to learn how to use them.

To check that the Qt SDK installation was successful, open an example application and run it.

To select a tutorial and learn how to develop applications.

Figure 4.1: Welcome screen of Qt Creator

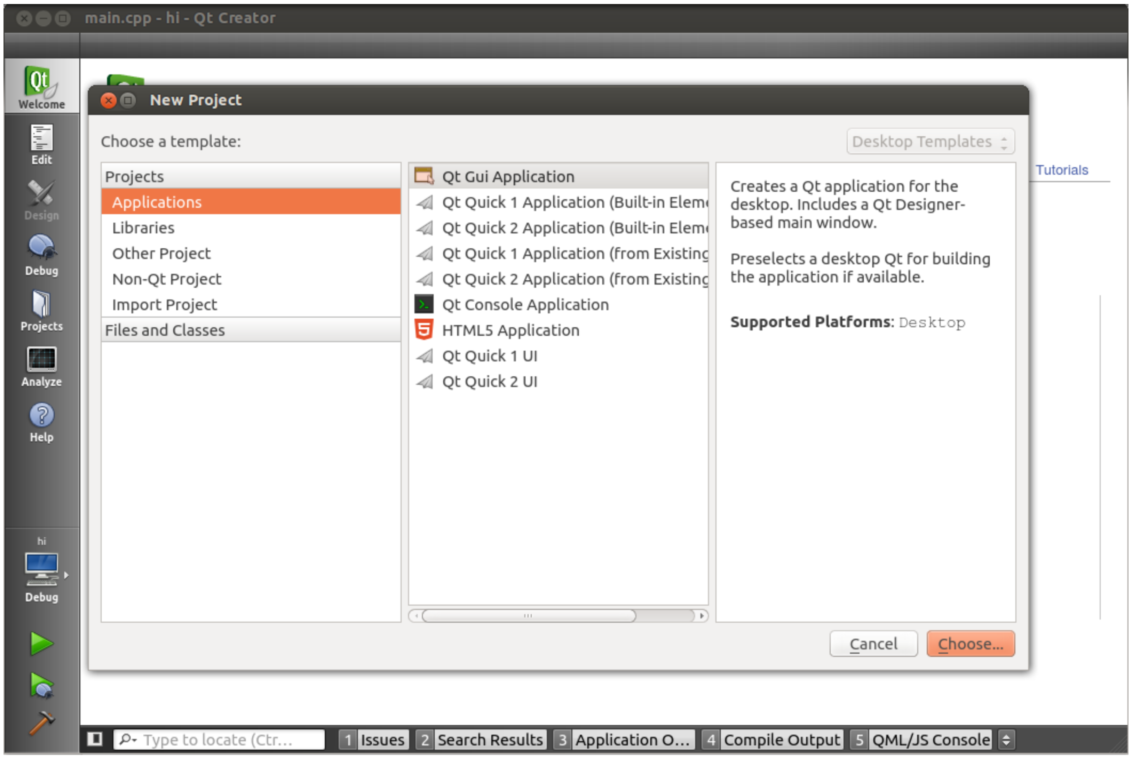
Each mode has its own view that shows only the information required for performing a given task, and provides only the most relevant features and functions related to it. As a result, the majority of the Qt Creator window area is always dedicated to actual application development tasks. Users can employ the mode selector to switch to a Qt Creator mode. The following image displays an example application in Edit mode and Design mode.

Figure 4.2: Welcome mode in Qt

Figure 4.3: Edit mode in Qt

4.2.1 Creating Projects

To be able to build and run applications, Qt Creator needs the same information as a compiler would need. This information is specified in the project build and run settings. Setting up a new project in Qt Creator is aided by a wizard that guides the user stepbystep through the project creation process. In the first step, the user selects the type of project from the categories. When creating Qt Quick Projects, the user can select either Qt Quick UI or Qt Quick Application. A Qt Quick UI project contains a single QML file that defines the main view of the application. UI designers can use it to create an application user interface and review it in the QML Viewer, without



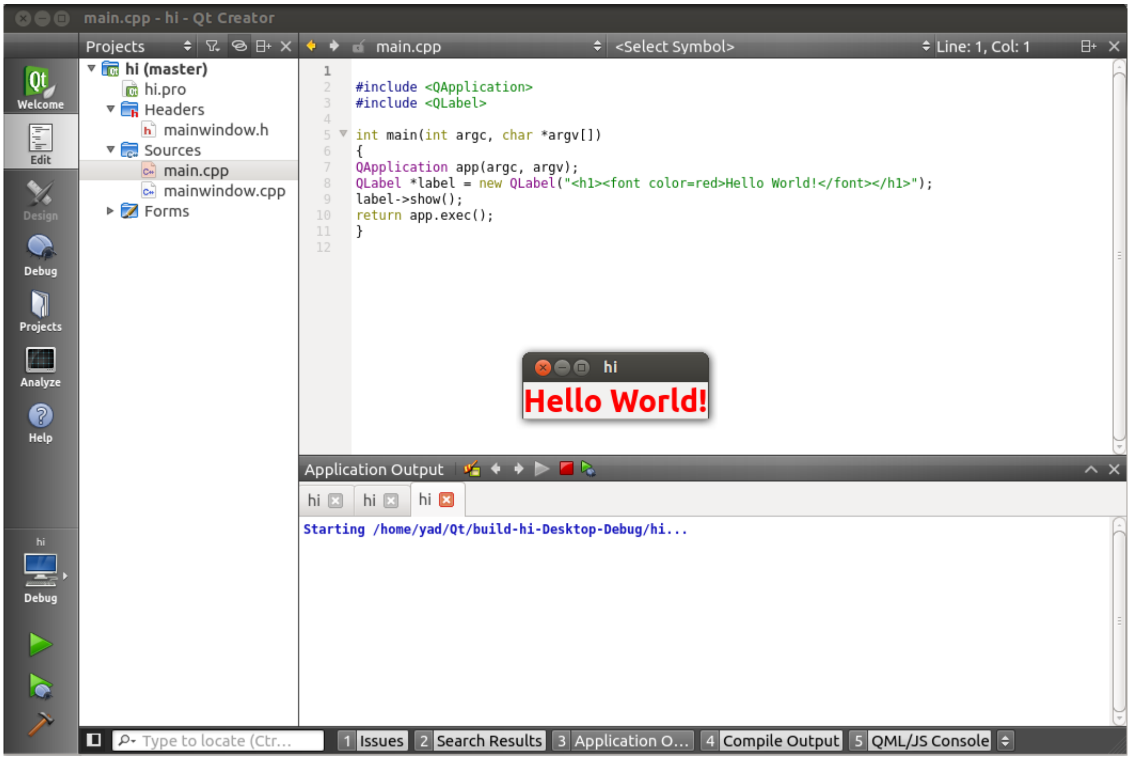
Creates a Qt application for the desktop. Includes a Qt Designer-based main window.

Preselects a desktop Qt for building the application if available.

Supported Platforms: Desktop

Figure 4.4: New file or project in Qt

having to build the application. UI designers do not need to have the development environment installed on their computers to create and run this type of projects. Developers can build Qt Quick applications and deploy them on mobile target platforms. For example, they can create signed Symbian Installation System (SIS) packages or Debian packages for this type of project. Developers can use readymade Qt Quick Components for Symbian and MeeGo Harmattan that allow them to create applications with a native look and feel for the selected mobile platform. The components are delivered as part of Qt SDK. A Qt Quick UI project can be easily converted into a Qt Quick application by using the Qt Quick application wizard to import the main QML file in the Qt Quick UI project. The wizard prompts developers to enter the settings needed for a particular type of project.



```cpp

#include <QApplication>
#include <QLabel>

int main(int argc, char *argv[])
{
QApplication app(argc, argv);
QLabel *label = new QLabel("<h1><font color=red>Hello World!</font></h1>");
label->show();
return app.exec();
}

```

```
Starting /home/yad/Qt/build-hi-Desktop-Debug/hi...
```

Figure 4.5: Project to print hello word

When the steps have been completed, Qt Creator automatically generates the project with required headers, source files, user interface descriptions and project files, as defined by the wizard. Not only does the wizard help new users get up and running quickly, it also enables more experienced users to streamline their workflow for the creation of new projects. The convenient user interface makes it easier to ensure that a project begins with the correct configuration and dependencies. Specifically, the Qt Quick application wizard allows developers to create projects that they can deploy on mobile devices with a click of the run button.

4.2.2 Using Qt Quick Toolbars

When users edit QML code in the code editor, they specify the properties of QML components. For some properties, such as colors and font names, this is not a trivial task. For example, few people can visualize the color. To easily edit these properties, users can employ the Qt Quick Toolbars. When a component is selected in the code and a toolbar is available, a light bulb icon appears. Users select the icon to open the toolbar. Qt Quick Toolbar indicator and Qt Quick Toolbar for rectangles. It is used for inserting text, images, and animation. Qt Quick Toolbars are available for editing the properties of the following QML elements: Rectangles Text Images Animation

4.2.3 Deploying Applications to Mobile Devices

Qt Creator deploy configurations handle the packaging of the application as an executable and copying it to a location developers want to run the executable at. The files can be copied to a location in the file system of the development PC or a mobile device. To deploy files on mobile devices, developers must either connect the devices to the development PC or use the installation packages generated by Qt Creator. Qt Quick UI projects must be converted into Qt Quick applications for deployment on mobile devices. Qt Creator allows developers to create installation packages for Symbian, MeeGo, and Maemo devices that are suitable for publishing on Ovi Store.

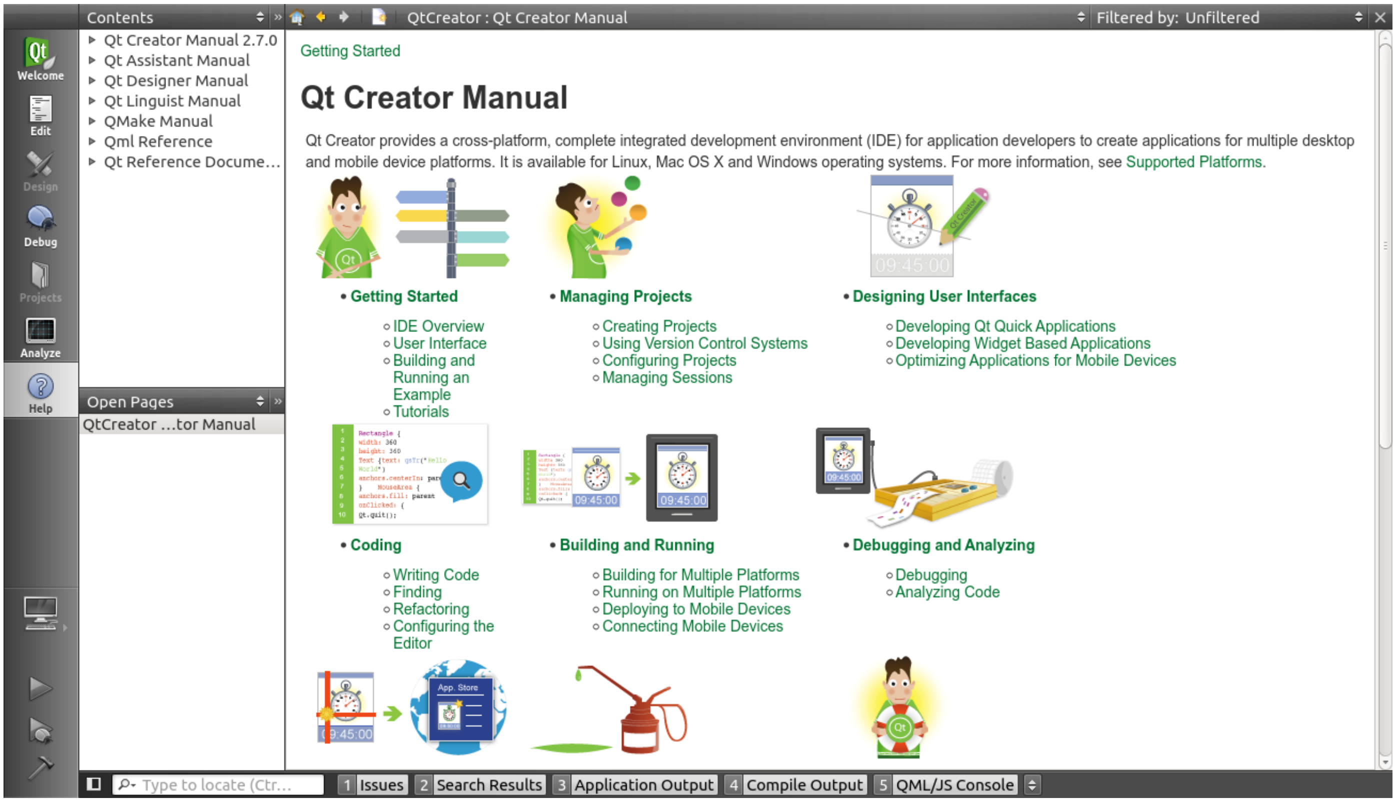
4.2.4 Getting Help

From time to time, developers may need further information about a certain QML element, Qt class, function, or other part of the Qt API. All the Qt documentation and examples are accessible via the Qt Help plugin in Qt Creator. To view the documentation, the Help mode is used, where most of the window is devoted to the help text. While working with source code in Edit mode, the user can access context sensitive help by moving the text cursor to a Qt class or function and then press the F1 key. The documentation is displayed within a panel on the right side of the code editor, as shown in the following figure.

Qt Designer is a powerful crossplatform GUI layout and forms builder. It allows you to rapidly design and build widgets and dialogs using onscreen forms using the same widgets that will be used in your application. Forms created with Qt Designer are fullyfunctional, and they can be previewed so that you can ensure that they will look and feel exactly as you intended.

4.2.5 Features and Benefits

- Design user interfaces quickly with drag and drop functionality
- Customize widgets or choose from library of standard widgets
- Instantly preview forms in native look and feel
- Generate C++ or Java code from your interface prototypes
- Use Qt Designer with Visual Studio or Eclipse IDEs
- Build fullyfunctional user interfaces with Qts signals and slots


Getting Started

Qt Creator Manual

Qt Creator provides a cross-platform, complete integrated development environment (IDE) for application developers to create applications for multiple desktop and mobile device platforms. It is available for Linux, Mac OS X and Windows operating systems. For more information, see Supported Platforms.

Figure 4.6: Displaying context sensitive Qt Help information

4.3 Introduction to LaTeX

LaTeX, I had never heard about this term before doing this project, but when I came to know about its features, found it excellent. LaTeX (pronounced /letk/, /letx/, /ltx/, or /ltk/) is a document markup language and document preparation system for the TeX typesetting program. Within the typesetting system, its name is styled as LaTeX.

Within the typesetting system, its name is styled as LaTeX. The term LaTeX refers only to the language in which documents are written, not to the editor used to write those documents. In order to create a document in LaTeX, a .tex file must be created using some form of text editor. While most text editors can be used to create a LaTeX document, a number of editors have been created specifically for working with LaTeX.

LaTeX is most widely used by mathematicians, scientists, engineers, philosophers, linguists, economists and other scholars in academia. As a primary or intermediate format, e.g., translating DocBook and other XML-based formats to PDF, LaTeX is used because of the high quality of typesetting achievable by TeX. The typesetting system offers programmable desktop publishing features and extensive facilities for automating most aspects of typesetting and desktop publishing, including numbering and cross-referencing, tables and figures, page layout and bibliographies.

LaTeX is intended to provide a high-level language that accesses the power of TeX. LaTeX essentially comprises a collection of TeX macros and a program to process LaTeXdocuments. Because the TeX formatting commands are very low-level, it is usually much simpler for end-users to use LaTeX.

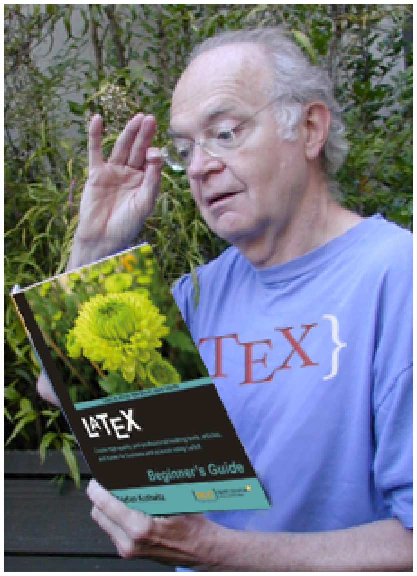


Figure 4.7: Donald Knuth, Inventor Of TEX typesetting system

4.3.1 Typesetting

LATEX is based on the idea that authors should be able to focus on the content of what they are writing without being distracted by its visual presentation. In preparing a LATEX document, the author specifies the logical structure using familiar concepts such as chapter, section, table, figure, etc., and lets the LATEX system worry about the presentation of these structures. It therefore encourages the separation of layout from content while still allowing manual typesetting adjustments where needed.

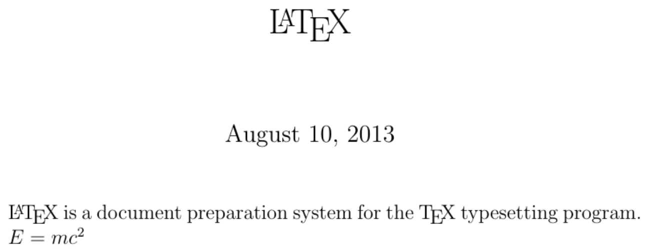
```
\documentclass[12pt]{article}
\usepackage{amsmath}
\title{\LaTeX}
\date{}
\begin{document}
  \maketitle
  \LaTeX{} is a document preparation system
  for the \TeX{} typesetting program.
   \par
   $E=mc^2$
\end{document}
```

4.3.2 Installing LATEX on System

Installation of LATEX on personal system is quite easy. As i have used LATEX on Ubuntu 13.04 so i am discussing the installation steps for Ubuntu 13.04 here:

- Go to terminal and type

```
$ sudo apt-get install texlive-full
```



LaTeX

August 10, 2013

LaTeX is a document preparation system for the TeX typesetting program.
$E = mc^2$

Figure 4.8: LaTeX output of above program.

- Your Latex will be installed on your system and you can check for manual page by typing.

  $ man latex
  in terminal which gives manual for latex command.

- To do very next step now one should stick this to mind that the document which one is going to produce is written in any type of editor whether it may be your most common usable editor Gedit or you can use vim by installing first vim into your system using command.

  $ sudo apt-get install vim

- After you have written your document it is to be embedded with some set of commands that Latex uses so as to give a structure to your document. Note that whenever you wish your document to be looked into some other style just change these set of commands.

- When you have done all these things save your piece of code with .tex format say test.tex. Go to terminal and type

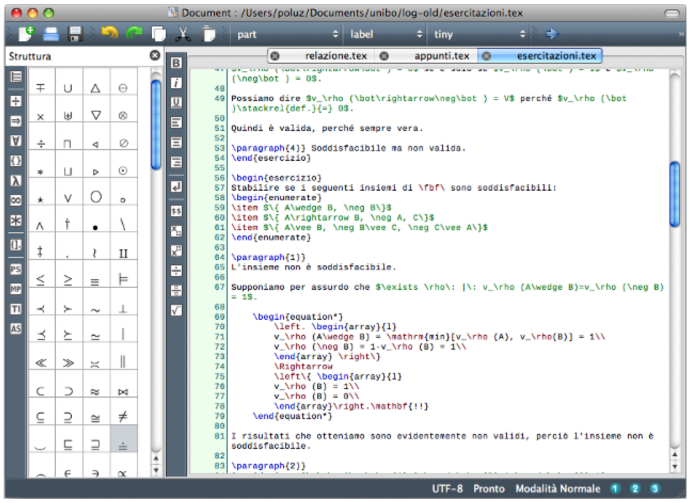
  latex path of the file test.tex Or pdflatex path of the file test.tex
  eg: pdflatex test.tex
  for producing pdf file simultaneously.
  After compiling it type command

  $ evince filename.pdf
  eg: evince test.pdf
  To see output pdf file.

4.3.3 Graphical Editors for LaTeX

LaTeX is not restricted to command line only there are so many graphical based editors available to be used. These GUi based editors provide an easy interface to user so as to do typesetting in an efficient manner. Some of them are listed below:

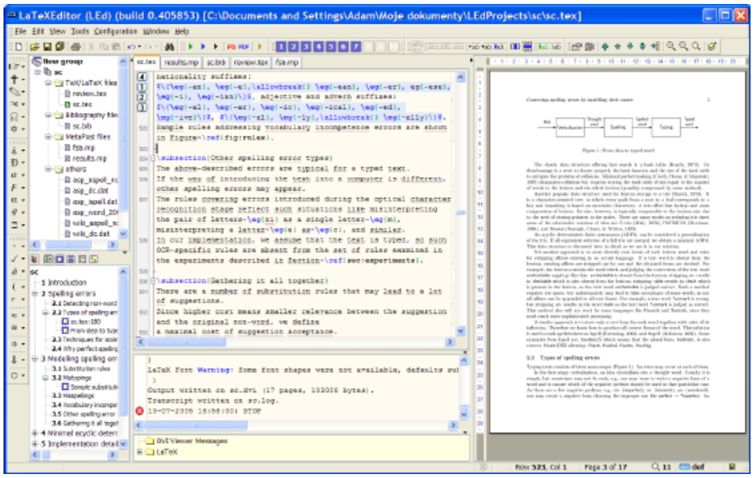
- Texmaker



```
(\neg\bot ) = 0$.

Possiamo dire $v_\rho (\bot\rightarrow\neg\bot ) = V$ perché $v_\rho (\bot
)\stackrel{def.}{=} 0$.

Quindi è valida, perché sempre vera.

\paragraph{4)} Soddisfacibile ma non valida.
\end{esercizio}

\begin{esercizio}
Stabilire se i seguenti insiemi di \fbf\ sono soddisfacibili:
\begin{enumerate}
\item $\{ A\wedge B, \neg B\}$
\item $\{ A\rightarrow B, \neg A, C\}$
\item $\{ A\vee B, \neg B\vee C, \neg C\vee A\}$
\end{enumerate}

\paragraph{1)}
L'insieme non è soddisfacibile.

Supponiamo per assurdo che $\exists \rho\: |\: v_\rho (A\wedge B)=v_\rho (\neg B)
= 1$.

    \begin{equation*}
        \left. \begin{array}{l}
        v_\rho (A\wedge B) = \mathrm{min}[v_\rho (A), v_\rho(B)] = 1\\
        v_\rho (\neg B) = 1-v_\rho (B) = 1\\
        \end{array} \right\}
        \Rightarrow
        \left\{ \begin{array}{l}
        v_\rho (B) = 1\\
        v_\rho (B) = 0\\
        \end{array}\right.\mathbf{!!}
    \end{equation*}

I risultati che otteniamo sono evidentemente non validi, perciò l'insieme non è
soddisfacibile.

\paragraph{2)}
```

Figure 4.9: Texmaker, A Graphical LATEX Editor

- LEd



```
nationality suffixes:
$\{\eg{-an}, \eg{-e},\allowbreak{} \eg{-ean}, \eg{-er}, eg{-ese},
\eg{-i}, \eg{-ian}\}$, adjective and adverb suffixes:
$\{\eg{-al}, \eg{-ar}, \eg{-ic}, \eg{-ical}, \eg{-ed},
\eg{-ive}\}$, $\{\eg{-al}, \eg{-ly},\allowbreak{} \eg{-ally}\}$.
Sample rules addressing vocabulary incompetence errors are shown
in Figure~\ref{fig:rules}.

\subsection{Other spelling error types}
The above-described errors are typical for a typed text.
If the way of introducing the text into a computer is different,
other spelling errors may appear.
The rules covering errors introduced during the optical character
recognition stage reflect such situations like misinterpreting
the pair of letters~\eg{ni} as a single letter~\eg{m},
misinterpreting a letter~\eg{e} as~\eg{c}, and similar.
In our implementation, we assume that the text is typed, so such
OCR-specific rules are absent from the set of rules examined in
the experiments described in Section~\ref{sec:experiments}.

\subsection{Gathering it all together}
There are a number of substitution rules that may lead to a lot
of suggestions.
Since higher cost means smaller relevance between the suggestion
and the original non-word, we define
a maximal cost of suggestion acceptance.
```

```
)
LaTeX Font Warning: Some font shapes were not available, defaults sub
 )
Output written on sc.dvi (17 pages, 103008 bytes).
Transcript written on sc.log.
13-07-2008 18:58:00: STOP
```

Figure 4.10: LEd, A Graphical LATEX Editor

And many more but the preferred method to produce LATEX document is through console mode only.

4.3.4 Pdfscreen LATEX

There are some packages that can help to have unified document using LATEX. Example of such a package is pdfscreen that let the user view its document in two forms-print and screen. Print for hard copy and screen for viewing your document on screen. Download this package from www.ctan.org/tex-archive/macros/latex/contrib/pdfscreen/.
Then install it using above mention method.

Just changing print to screen gives an entirely different view. But for working of pdfscreen another package required are comment and fancybox.

The fancybox package provides several different styles of boxes for framing and rotating content in your document. Fancybox provides commands that produce square-cornered boxes with single or double lines, boxes with shadows, and round-cornered boxes with normal or bold lines. You can box mathematics, floats, center, flushleft, and flushright, lists, and pages.

Whereas comments package selectively include/excludes portions of text. The comment package allows you to declare areas of a document to be included or excluded. One need to make these declarations in the preamble of your file. The package uses a method for exclusion that is pretty robust, and can cope with ill-formed bunches of text.

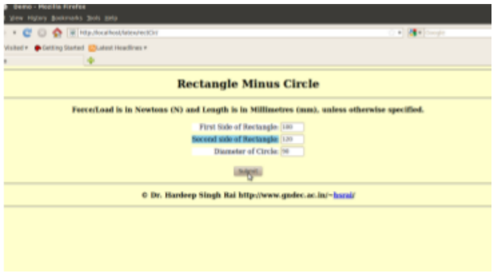
So these extra packages needed to be installed on system for the proper working of pdfscreen package.

4.3.5 Web based graphic generation using LaTeX

LaTeX is also useful when there is need of generating the graphics from browser. For example to draw a circle by just entering its radius in html input box. So this kind A of project can be conveniently handled using LaTeX. Basic idea behind this generation process is that when user clicks on submit button after entering radius a script will run that enter the radius in already made .tex file and recompiles it on server and makes its pdf and postscript file. After that user can view those files by clicking on link provided to view the files. See some screen shots of such a graphic generation project made by Dr. H.S. Rai:

So here in the above input page which is also the index page user can enter input for length of rectangle, breadth of rectangle and for radius of circle after that user can submit the values. After the values get submitted a script get runs by php code at server side. This script first enters the dimensions of rectangle and circle that were selected by user in to an already existing .tex file and replace with the older dimensions there. After that script recompiles the the tex file and make it available for user.

In above figure it gets clear that .tex file has been compiled and pdf and postscript files are available to user and user can download the graphics so produced. Hence graphics can be generated in LaTeX through web interface.



Rectangle Minus Circle

Force/Load is in Newtons (N) and Length is in Millimetres (mm), unless otherwise specified.

First Side of Rectangle: 180
Second side of Rectangle: 120
Diameter of Circle: 90

© Dr. Hardeep Singh Rai http://www.gndec.ac.in/~hsrai/

Figure 4.11: Web based graphic generation using LaTeX(input page)

4.4 Introduction to Lua scripting language

Figure 4.12: Lua Logo

Lua is a powerful and fast programming language that is easy to learn and use and to embed into your application. Lua is designed to be a lightweight embeddable scripting language and is used for all sorts of applications from games to web applications and image processing.

Lua combines simple procedural syntax with powerful data description constructs based on associative arrays and extensible semantics. Lua is dynamically typed, runs by interpreting bytecode for a register-based virtual machine, and has automatic memory management with incremental garbage collection, making it ideal for configuration, scripting, and rapid prototyping.

4.4.1 Installation of Lua

Lua is implemented in pure ANSI C and compiles unmodified in all platforms that have an ANSI C compiler. Lua also compiles cleanly as C++. The current version is lua-5.2.3. Just download the source from the lua.org/download and then follow the steps for building it

```
$ curl -R -O http://www.lua.org/ftp/lua-5.2.3.tar.gz
$ tar zxf lua-5.2.3.tar.gz
$cd lua-5.2.3
$make
```

4.4.2 Why choose Lua?

- **Lua is a proven, robust language**
  Lua has been used in many industrial applications (e.g., Adobe's Photoshop Lightroom), with an emphasis on embedded systems (e.g., the Ginga middleware for digital TV in Brazil) and games (e.g., World of Warcraft and Angry Birds). Lua is currently the leading scripting language in games. Lua has a solid reference manual and there are several books about it.

Several versions of Lua have been released and used in real applications since its creation in 1993. Lua featured in HOPL III, the Third ACM SIGPLAN History of Programming Languages Conference, in June 2007.

- **Lua is fast**
  Lua has a deserved reputation for performance. To claim to be ”as fast as Lua” is an aspiration of other scripting languages. Several benchmarks show Lua as the fastest language in the realm of interpreted scripting languages. Lua is fast not only in fine-tuned benchmark programs, but in real life too. Substantial fractions of large applications have been written in Lua.

- **Lua is portable**
  Lua is distributed in a small package and builds out-of-the-box in all platforms that have a standard C compiler. Lua runs on all flavors of Unix and Windows, on mobile devices (running Android, iOS, BREW, Symbian, Windows Phone), on embedded microprocessors (such as ARM and Rabbit, for applications like Lego MindStorms), on IBM mainframes, etc.

- **Lua is embeddable**
  Lua is a fast language engine with small footprint that you can embed easily into your application. Lua has a simple and well documented API that allows strong integration with code written in other languages. It is easy to extend Lua with libraries written in other languages. It is also easy to extend programs written in other languages with Lua. Lua has been used to extend programs written not only in C and C++, but also in Java, C#, Smalltalk, Fortran, Ada, Erlang, and even in other scripting languages, such as Perl and Ruby.

- **Lua is powerful (but simple)**
  A fundamental concept in the design of Lua is to provide meta-mechanisms for implementing features, instead of providing a host of features directly in the language. For example, although Lua is not a pure object-oriented language, it does provide meta-mechanisms for implementing classes and inheritance. Lua's meta-mechanisms bring an economy of concepts and keep the language small, while allowing the semantics to be extended in unconventional ways.

- **Lua is small**
  Adding Lua to an application does not bloat it. The tarball for Lua 5.2.3, which contains source code and documentation, takes 246K compressed and 960K uncompressed. The source contains around 20000 lines of C. Under Linux, the Lua interpreter built with all standard Lua libraries takes 182K and the Lua library takes 244K.

- **Lua is free**
  Lua is free open-source software, distributed under a very liberal license (the well-known MIT license). It may be used for any purpose, including commercial purposes, at absolutely no cost. Just download it and use it.

4.5 Introduction to Cairo Graphics Library

Cairo is a library for creating 2D vector graphics. It is written in the C programming language. Bindings for other computer languages exist. Python, Perl, C++, C#, Java. Cairo is a multiplatform library, it works on Linux, BSDs, and Mac OS.

Figure 4.13: Cairo Logo

Cairo supports various backends:

- X Window System
- Win32 GDI
- Mac OS X Quartz
- PNG
- PDF
- PostScript
- SVG

This means that we can use the library to draw on windows on Linux/BSDs, Windows, Mac OS and we can use the library to create PNG images, PDF files, PostScript files, and SVG files.

4.6 Introduction to Github

GitHub is a Git repository web-based hosting service which offers all of the functionality of Git as well as adding many of its own features. Unlike Git which is strictly a command-line tool, Github provides a web-based graphical interface and desktop as well as mobile integration. It also provides access control and several collaboration features such as wikis, task management, and bug tracking and feature requests for every project.

GitHub offers both paid plans for private repto handle everything from small to very large projects with speed and efficiency. ositories, and free accounts, which are usually used to host open source software projects. As of 2014, Github reports having over 3.4 million users, making it

Figure 4.14: Github Logo

the largest code host in the world.

GitHub has become such a staple amongst the open-source development community that many developers have begun considering it a replacement for a conventional resume and some employers require applications to provide a link to and have an active contributing GitHub account in order to qualify for a job.

The Git feature that really makes it stand apart from nearly every other Source Code Management (SCM) out there is its branching model.

Git allows and encourages you to have multiple local branches that can be entirely independent of each other. The creation, merging, and deletion of those lines of development takes seconds.

This means that you can do things like:

- Frictionless Context Switching.
  Create a branch to try out an idea, commit a few times, switch back to where you branched from, apply a patch, switch back to where you are experimenting, and merge it in.

- Role-Based Codelines.
  Have a branch that always contains only what goes to production, another that you merge work into for testing, and several smaller ones for day to day work.

- Feature Based Workflow.
  Create new branches for each new feature you're working on so you can seamlessly switch back and forth between them, then delete each branch when that feature gets merged into your main line.

- Disposable Experimentation.
  Create a branch to experiment in, realize it's not going to work, and just delete it - abandoning the workwith nobody else ever seeing it (even if you've pushed other branches in the meantime).

Notably, when you push to a remote repository, you do not have to push all of your branches. You can choose to share just one of your branches, a few of them, or all of them. This tends to free people to try new ideas without worrying about having to plan how and when they are going to merge it in or share it with others.

There are ways to accomplish some of this with other systems, but the work involved is much more difficult and error-prone. Git makes this process incredibly easy and it changes the way most developers work when they learn it.

4.6.1 What is Git?

Figure 4.15: Git Logo

Git is a distributed revision control and source code management (SCM) system with an emphasis on speed, data integrity, and support for distributed, non-linear workflows. Git was initially designed and developed by Linus Torvalds for Linux kernel development in 2005, and has since become the most widely adopted version control system for software development.

As with most other distributed revision control systems, and unlike most clientserver systems, every Git working directory is a full-fledged repository with complete history and full version-tracking capabilities, independent of network access or a central server. Like the Linux kernel, Git is free and open source software distributed under the terms of the GNU General Public License version 2 to handle everything from small to very large projects with speed and efficiency.

Git is easy to learn and has a tiny footprint with lightning fast performance. It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like cheap local branching, convenient staging areas, and multiple workflows.

4.6.2 Installation of Git

Installation of git is a very easy process. The current git version is: 2.0.4. Type the commands in the terminal:

```
$ sudo apt-get update
```

```
$ sudo apt-get install git
```

This will install the git on your pc or laptop.

4.6.3 Various Git Commands

Git is the open source distributed version control system that facilitates GitHub activities on your laptop or desktop. The commonly used Git command line instructions are:-

4.6.3.1 Create Repositories

Start a new repository or obtain from an exiting URL

$ git init [project-name]
Creates a new local repository with the specified name

$ git clone [url]
Downloads a project and its entire version history

4.6.3.2 Make Changes

Review edits and craft a commit transaction

$ git status
Lists all new or modified files to be committed

$ git diff
Shows file differences not yet staged

$ git add [file]
Snapshots the file in preparation for versioning

$ git reset [file]
Unstages the file, but preserve its contents

$ git commit -m ”[descriptive message ”]
Records file snapshots permanently in version history

4.6.3.3 Group Changes

Name a series of commits and combine completed efforts

$ git branch
Lists all local branches in the current repository

$ git branch [branch-name]
Creates a new branch

$ git checkout [branch-name]
Switches to the specified branch and updates the working directory

$ git merge [branch]
Combines the specified branchs history into the current branch

$ git branch -d [branch-name]
Deletes the specified branch

4.6.3.4 Save Fragments

Shelve and restore incomplete changes

$ git stash
Temporarily stores all modified tracked files

$ git stash pop
Restores the most recently stashed files

$ git stash list
Lists all stashed changesets

$ git stash drop
Discards the most recently stashed changeset

4.6.3.5 Synchronize Changes

Register a repository bookmark and exchange version history

$ git fetch [bookmark]
Downloads all history from the repository bookmark

$ git merge [bookmark /[branch]]
Combines bookmarks branch into current local branch

$ git push [alias [branch]]
Uploads all local branch commits to GitHub

$ git pull
Downloads bookmark history and incorporates changes

CHAPTER 5

PROJECT LEGACY

5.1 Technical and Managerial Lesson Learnt

I learned a lot by doing this project . During this period I got to learn a vast number of technologies. These are listed below :

- **Operating system**: Ubuntu
- **Languages used**: C++, Lua
- **Framework**: Qt
- **Typesetting**: LaTex
- **Other Learnings**: Internet Relay Chat(IRC), Wordpress

So during this project I learned all the above things. Above all I got to know how Softwares are developed from the scratch. Planning, designing, developing code, working in a team, testing etc. These are all very precious things I got to learn during this period.

5.1.1 Ubuntu: An open source OS

During my training, I also got familiar with a great and open source Operating System, Ubuntu. Firstly, it was quite difficult for a regular MS Windows user to port to Ubuntu. I did all of my project work using this vast operating system. Ubuntu (/ubuntu/ oo-BOON-too) is a Debian-based Linux operating system, with Unity as its default desktop environment. It is based on free software and named after the Southern African philosophy of ubuntu (literally, ”human-ness”), which often is translated as ”humanity towards others” or ”the belief in a universal bond of sharing that connects all humanity”.

Ubuntu's goal is to be secure ”out-of-the box”. By default user's programs run with low privileges and cannot corrupt the operating system or other user's files. For increased security, the sudo tool is used to assign temporary privileges for performing administrative tasks, which allows the root account to remain locked and helps prevent inexperienced users from inadvertently making catastrophic system changes or opening security holes.

5.1.2 Internet Relay Chat

Internet Relay Chat (IRC) is an application layer protocol that facilitates transfer of messages in the form of text. The chat process works on a client/server model of networking. IRC clients are computer programs that a user can install on their system. These clients are able to communicate with chat servers to transfer messages to other clients. It is mainly designed for group communication in discussion forums, called channels, but also allows one-to-one communication via private message as well as chat and data transfer, including file sharing. Client software is available for every major operating system that supports Internet access.IRC is an open protocol that uses TCP and, optionally, TLS. An IRC server can connect to other IRC servers to expand the IRC network. Users access IRC networks by connecting a client to a server. There are many client implementations, such as mIRC, HexChat and irssi, and server implementations, e.g. the original IRCd. Most IRC servers do not require users to register an account but a user will have to set a nickname before being connected.

IRC has a line-based structure with the client sending single-line messages to the server,receiving replies to those messages and receiving copies of some messages sent by other clients. In most clients, users can enter commands by prefixing them with a '/'. Depending on the command, these may either be handled entirely by the client, or passed directly to the server, possibly with some modification.

The basic means of communicating to a group of users in an established IRC session is through a channel. Channels on a network can be displayed using the IRC command LIST, which lists all currently available channels that do not have the modes +s or +p set, on that particular network. Users can join a channel using the JOIN command, in most clients available as /join #channel-name. Messages sent to the joined channels are then relayed to all other users.

I used "Xchat IRC" client for IRC during my training to communicate with the Open Source communities whenever I found some error during my work or for some extra knowledge. I communicated with several IRC channels including #librecad, #greatdevelopers etc. XChat is a graphical IRC Client with a GTK+ GUI. It's special features include the multiple server/channel windows, dialog windows, plugin API.

5.1.3 Shell Scripting

Because all my project work was being done in Ubuntu (i.e. a Linux distribution), I came to know the power of Bash(Terminal). We can simply call it a "Shell". It is a great tool to work faster. With terminal, the efficiency of work increases. Ubuntu uses the Bash(Bourne Again Shell) as default shell. During training, I came to know about the new commands daily. Working with CLI(Command Line Interface) is a fun.

5.2 Future Scope

The future of GUI programming in my opinion is Qt programming, which involves the efficiency and low levelness of C++ as its a C++ framework but also has all the qualities that a modern programming language has. It gives you a way to easily develop applications and GUIs which using C++ was earlier not possible. Open source is always growing field I have a vision that

LibreCAD will someday be as famous as other CAD programs such as Autocad. This is the dawn of Open Source Softwares and we still have to grow a lot. I have added some new features and in LibreCAD, the LibreCAD is going to improve day by day. LibreCAD is completely scalable so I can also add as many features as I want. Future scope is bright as I believe that this is just the beginning and there is allot more to learn and implement.

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