

ARCE (Analyse Reinforced Concrete Element)

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



Figure 1: GNE

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Abstract

Design process of a reinforced concrete shell element involves two major steps: analysis and design. Development of the computerized linear elastic analysis techniques, such as the finite element method, has essentially solved the first part of the problem. Design, on the other hand, is not as easy to handle since the number of unknowns is larger than the number of available equations of statics. Due to this fact, many design methods have been developed by various researchers. This thesis attempts to compare the more important existing methods of analysis of orthogonally reinforced concrete shell elements with each other. A Windows-based computer program is written in Visual Basic to implement these methods and to facilitate the analysis.

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CHAPTER 1

INTRODUCTION TO ORGANISATION



Figure 1.1: Guru Nanak Dev Engineering College

I had my Six Weeks 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 Kms from Bus Stand and 8

Kms 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 Consultancy 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, State 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

REQUIREMENT ANALYSIS AND SYSTEM SPECIFICATION

2.1 Feasibility Study

Feasibility study is made to see if the project on completion will serve the purpose of the organization for the amount of work, effort and the time that spend on it. Feasibility study lets the developer foresee the future of the project and the usefulness. A feasibility study of a system proposal is according to its workability, which is the impact on the organization, ability to meet their user needs and effective use of resources. Carrying out a feasibility study involves information assessment, information collection and report writing. The information assessment phase identifies the information that is required to answer the three questions set out above. Once the information has been identified, you should question information sources to discover the answers to these questions Thus when a new application is proposed it normally goes through a feasibility study before it is approved for development.

A feasibility study is designed to provide an overview of the primary issues related to a business idea. The purpose is to identify any make or break issues that would prevent your business from being successful in the marketplace. In other words, a feasibility study determines whether the business idea makes sense. A thorough feasibility analysis provides a lot of information necessary for the business plan. For example, a good market analysis is necessary in order to determine the project's feasibility. This information provides the basis for the market section of the business plan.

The document provide the feasibility of the project that is being designed and lists various areas that were considered very carefully during the feasibility study of this project such as Technical, Economic and Operational feasibilities. Feasibility is defined as the practical extent to which a project can be performed successfully. To evaluate feasibility, a feasibility study is performed, which determines whether the solution considered to accomplish the requirements is practical and workable in the software. Information such as resource availability, cost estimation for software development, benefits of the software to the organization after it is developed and cost to be incurred on its maintenance are considered during the feasibility study. The objective of the feasibility study is to establish the reasons for developing the software that is acceptable to users, adaptable to change and conformable to established standards.

Objectives of feasibility study are listed below:

- To analyze whether the software will meet organizational requirements
- To determine whether the software can be implemented using the current technology and within the specified budget and schedule
- To determine whether the software can be integrated with other existing software.

2.1.1 Types of Feasibility

Various types of feasibility that are commonly considered include technical feasibility, operational feasibility, and economic feasibility.

2.1.1.1 Technical Feasibility

Technical feasibility is one of the first studies that must be conducted after the project has been identified. In large engineering projects consulting agencies that have large staffs of engineers and technicians conduct technical studies dealing with the projects. In individual agricultural projects financed by local agricultural credit corporations, the technical staff composed of specialized agricultural engineers, irrigation and construction engineers, and other technicians are responsible for conducting such feasibility studies. The Technical feasibility assessment is focused on gaining an understanding of the present technical resources of the organization and their applicability to the expected needs of the proposed system. It is an evaluation of the hardware and software and how it meets the need of the proposed system. This assessment is based on an outline design of system requirements, to determine whether the company has the technical expertise to handle completion of the project. When writing a feasibility report, the following should be taken to consideration:

- A brief description of the business to assess more possible factors which could affect the study
- The part of the business being examined
- The human and economic factor
- The possible solutions to the problem

The system must be evaluated from the technical point of view first. The assessment of this feasibility must be based on an outline design of the system requirement in the terms of input, output, programs and procedures. Having identified an outline system, the investigation must go on to suggest the type of equipment, required method developing the system, of running the system once it has been designed. Technical feasibility assesses the current resources (such as hardware and software) and technology, which are required to accomplish user requirements in the software within the allocated time and budget. For this, the software development team ascertains whether the current resources and technology can be upgraded or added in the software to accomplish specified user requirements. A Technical feasibility also performs the following tasks.

- Analyzes the technical skills and capabilities of the software development team members
- Determines whether the relevant technology is stable and established
- Ascertains that the technology chosen for software development has a large number of users so that they can be consulted when problems arise or improvements are required.

Technical issues raised during the investigation are:

- Does the existing technology sufficient for the suggested one?
- Can the system expand if developed?

The project should be developed such that the necessary functions and performance are achieved within the constraints. The project is developed within latest technology. Through the technology may become obsolete after some period of time, due to the fact that never version of same software supports older versions, the system may still be used. So there are minimal constraints involved with this project. The system has been developed using Java the project is technically feasible for development.

2.1.1.2 Economic Feasibility

The purpose of the economic feasibility assessment is to determine the positive economic benefits to the organization that the proposed system will provide. It includes quantification and identification of all the benefits expected. This assessment typically involves a cost/ benefits analysis.

Economic feasibility is the cost and logistical outlook for a business project or endeavor. Prior to embarking on a new venture, most businesses conduct an economic feasibility study, which is a study that analyzes data to determine whether the cost of the prospective new venture will ultimately be profitable to the company. Economic feasibility is sometimes determined within an organization, while other times companies hire an external company that specializes in conducting economic feasibility studies for them.

The purpose of business in a capitalist society is to turn a profit, or to earn positive income. While some ideas seem excellent when they are first presented, they are not always economically feasible. That is, that they are not always profitable or even possible within a company's budget. Since companies often determine their budget's several months in advance, it is necessary to know how much of the budget needs to be set aside for future projects. Economic feasibility helps companies determine what that dollar amount is before a project is ultimately approved. This allows companies to carefully manage their money to insure the most profitable projects are undertaken. Economic feasibility also helps companies determine whether or not revisions to a project that at first seems unfeasible will make it feasible.

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on project, which will give best, return at the earliest. One of the factors, which affect the development of a new system, is the cost it would require. Economic feasibility determines whether the required software is capable of generating financial gains for an organization. It involves the cost incurred on the software development team, estimated cost of hardware and software, cost of performing feasibility study, and so on. For this, it is essential to consider expenses made on purchases (such as hardware purchase) and activities required to carry out software development. In addition, it is necessary to consider the benefits that can be achieved by developing the software. Software is said to be economically feasible if it focuses on the issues listed below.

- Cost incurred on software development to produce long-term gains for an organization.
- Cost required to conduct full software investigation (such as requirements elicitation and requirements analysis).
- Cost of hardware, software, development team, and training.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation.
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also all the resources are already available, it give an indication of the system is economically possible for development.

2.1.1.3 Behavioral Feasibility

Behavioral feasibility assesses the extent to which the required software performs a series of steps to solve business problems and user requirements. It is a measure of how well the solution of problems or a specific alternative solution will work in the organization. It is also measure of how people feel about the system. If the system is not easy to operate, than operational process would be difficult. The operator of the system should be given proper training. The system should be made such that the user can interface the system without any problem.

Operational feasibility is a measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development. The operational feasibility assessment focuses on the degree to which the proposed development projects fits in with the existing business environment and objectives with regard to development schedule, delivery date,Â€corporate culture, and existing business processes.

To ensure success, desired operational outcomes must be imparted during design and development. These include such design-dependent parameters such as reliability, maintainability, supportability, usability, producibility, disposability, sustainability, affordability and others. These parameters are required to be considered at the early stages of design if desired operational behaviors are to be realized. A system design and development requires appropriate and timely application of engineering and management efforts to meet the previously mentioned parameters. A system may serve its intended purpose most effectively when its technical and operating characteristics are engineered into the design. Therefore, operational feasibility is a critical aspect of systems engineering that needs to be an integral part of the early design phasesThis feasibility is dependent on human resources (software development team) and involves visualizing whether the software will operate after it is developed and be operative once it is installed. Operational feasibility also performs the following tasks.

- Determines whether the problems anticipated in user requirements are of high priority.
- Determines whether the solution suggested by the software development team is acceptable.
- Analyzes whether users will adapt to a new software.
- Determines whether the organization is satisfied by the alternative solutions proposed by the software development team.

This includes the following questions:

- Is there sufficient support for the users?

- Will the proposed system cause harm?
- The project would be beneficial because it satisfies the objectives when developed and installed. All behavioral aspects are considered carefully and conclude that the project is behaviorally feasible.

2.2 Software Requirement Analysis

Software requirement analysis is a process of gathering and interpreting facts, diagnosing problems and the information to recommend improvements on the system. It is a problem solving activity that requires intensive communication between the system users and system developers. System analysis or study is an important phase of any system development process. The system is studied to the minutest detail and analyzed. The system analyst plays the role of the interrogator and dwells deep into the working of the present system. The system is viewed as a whole and the input to the system are identified. The outputs from the organizations are traced to the various processes. System analysis is concerned with becoming aware of the problem, identifying the relevant and decisional variables, analyzing and synthesizing the various factors and determining an optimal or at least a satisfactory solution or program of action.

A detailed study of the process must be made by various techniques like interviews, questionnaires etc. The data collected by these sources must be scrutinized to arrive to a conclusion. The conclusion is an understanding of how the system functions. This system is called the existing system. Now the existing system is subjected to close study and problem areas are identified. The designer now functions as a problem solver and tries to sort out the difficulties that the enterprise faces. The solutions are given as proposals. The proposal is then weighed with the existing system analytically and the best one is selected. The proposal is presented to the user for an endorsement by the user. The proposal is reviewed on user request and suitable changes are made. This is loop that ends as soon as the user is satisfied with proposal.

Preliminary study is the process of gathering and interpreting facts, using the information for further studies on the system. Preliminary study is problem solving activity that requires intensive communication between the system users and system developers. It does various feasibility studies. In these studies a rough figure of the system activities can be obtained, from which the decision about the strategies to be followed for effective system study and analysis can be taken.

2.3 Software Requirement Analysis

A Software Requirements Analysis for a software system is a complete description of the behavior of a system to be developed. It include functional Requirements and Software Requirements. In addition to these, the SRS contains non-functional requirements. Non-functional requirements are requirements which impose constraints on the design or implementation.

- **Purpose:** ARCE (Analyse Reinforced Concrete Element) Tool is a web based software and the main purpose of this project is to:
 1. Many different types of structures and components of structures can be built using reinforced concrete including slabs, walls, beams, columns, foundations, frames and more.

2. Without reinforcement, constructing modern structures with concrete material would not be possible.
3. Help M.Tech and Civil Engineer to analysis structure.
4. Designing and implementing the most efficient floor system is key to creating optimal building structures. Small changes in the design of a floor system can have significant impact on material costs, construction schedule, ultimate strength, operating costs, occupancy levels and end use of a building.
5. Reduce the time for analysis.
6. Provide on-line way to analysis so that individual does not have to install anything.

- **Users of the System**

1. Client : Clients are the end users that benefit from this software. They just provide input and gets output. Client of this system:
 - (a) Researcher or student-: They have knowledge of working of procedures and what input is being provided.

2.3.1 Functional Requirements

- **Specific Requirements:** This phase covers the whole requirements for the system. After understanding the system we need the input data to the system then we watch the output and determine whether the output from the system is according to our requirements or not. So what we have to input and then what we'll get as output is given in this phase. This phase also describe the software and non-function requirements of the system.

- **Input Requirements of the System**

1. Length
2. Breadth
3. Grade of steel
4. Grade of concrete
5. Diameter

- **Output Requirements of the System**

1. Final output after iterations.
2. Output after calculations.

- **Special User Requirements**

1. Diameter of reinforcement
2. no of bars

- **Software Requirements**

1. Web Languages: php
2. Database: Mysql
3. Documentation: Doxygen 1.8.3
4. Text Editor: Vim
5. Operating System: Ubuntu 14.04 or up
6. Revision System: Git

2.3.2 Non functional requirements

1. Scalability: System should be able to handle a number of users. For e.g., handling around thousand users at the same time.
2. Usability: Simple user interfaces that a layman can understand.
3. Speed: Processing input should be done in reasonable time i.e. we can say maximum 24 hrs.

2.4 History Regarding ARCE

The analysis and design of thin-walled reinforced concrete members have been a topic of research for a long time. The works on this subject can be divided into three groups. The first is the membrane reinforcement; i.e., reinforcement for in-plane shear and axial forces. The state of stress on a typical membrane element which is subjected to in-plane stress resultants f_x , f_y and v_{xy} . The second is the slab element which is subjected to out-of-plane moment triad. The last one is the reinforcement for combined bending and in-plane forces. Although bending is not always absent, most of the work has focused on the in-plane forces because the design of reinforcement for the combined membrane and bending state of stress is a complex problem for which a general satisfactory solution is still the subject of research.

2.5 Feasibility Study

Feasibility analysis involved a thorough assessment of the operational and technical aspects of the proposal. Feasibility study tested the system proposal and identified whether the user needs may be satisfied using the current software and hardware technologies, whether the system will be cost effective from a business point of view and whether it can be developed with the most up to date technologies.

2.5.1 Operational Feasibility

Operational feasibility is a measure of how well a project solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development. All the operations performed in the software are very quick and satisfy all the requirements.

2.5.2 Technical Feasibility

Technological feasibility is carried out to determine whether the project has the capability, in terms of software, hardware, personnel to handle and fulfill the user requirements. The assessment is based on an outline design of system requirements in terms of Input, Processes, Output and Procedures. Automated Building Drawings is technically feasible as it is built up using various open source technologies and it can run on any platform.

2.5.3 Economic Feasibility

Economic analysis is the most frequently used method to determine the cost/benefit factor for evaluating the effectiveness of a new system. In this analysis we determine whether the benefit is gained according to the cost invested to develop the project or not. If benefits outweigh costs, only then the decision is made to design and implement the system. It is important to identify cost and benefit factors, which can be categorized as follows:

- Development Cost
- Operation Cost

This System is Economically feasible with 0 Development and Operating Charges as it is developed in Qt Framework and libdxfrw library which is open source technology and is available free of cost on the internet.

2.6 Facilities required for proposed work

2.6.1 Hardware Requirements

- Operating System: Linux/Windows
- Processor Speed: 512KHz or more
- RAM: Minimum 256MB

2.6.2 Software Requirements

- Programming Language: php

2.7 Methodology

- Studying various methods available to solve different problems of numerical analysis.
- Deciding various input and output parameters of methods.
- Making the approach modular
- Generating documentation

2.8 Project Work

Studied Previous System:

Before starting the project,

Learn ARCE:

Before starting with project, we have to go through the basics of ARCE, such that there should not be any problem proceeding with project.

Get Familiar with Different methods and their algorithms:

We have gone through algorithms of these algorithms. Then implementation becomes easy

Functions:

The user has been provided some test functions which he can use to test various.

Experimental outputs:

There are various experimental techniques for analysis of concrete elements manually. Firstly study about all those techniques.

Input:

Input values are taken from user or default values defined in the file are used.

Output:

The iterations are performed and it returns the output with the expected precision.

2.9 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 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.

Doxygen is a documentation generator, a tool for writing software reference documentation. The documentation is written



Figure 2.1: Doxygen logo

within code, and is thus relatively easy to keep up to date. Doxygen can cross reference documentation and code, so that the reader of a document can easily refer to the actual code.

Doxygen supports multiple programming languages, especially C++, C, C#, Objective-C, Java, Python, IDL, VHDL, Fortran and PHP.[2] Doxygen is free software, released under the terms of the GNU General Public License.

2.9.1 Features of Doxygen

- Requires very little overhead from the writer of the documentation. Plain text will do, Markdown is support, and for more fancy or structured output HTML tags and/or some of doxygen's special commands can be used.
- Cross platform: Works on Windows and many Unix flavors (including Linux and Mac OS X).
- Comes with a GUI frontend (Doxywizard) to ease editing the options and run doxygen. The GUI is available on Windows, Linux, and Mac OS X.
- Automatically generates class and collaboration diagrams in HTML (as clickable image maps) and \LaTeX (as Encapsulated PostScript images).
- Allows grouping of entities in modules and creating a hierarchy of modules.
- Doxygen can generate a layout which you can use and edit to change the layout of each page.
- Can cope with large projects easily.

2.9.2 Installation of Doxygen

Doxygen can be installed using following commands:

```
$ git clone https://github.com/doxygen/doxygen.git
$ cd doxygen
$ ./configure
$ make
```

2.10 Introduction to L^AT_EX

L^AT_EX, I had never heard about this term before doing this project, but when I came to know about it's features, found it excellent. L^AT_EX is a document markup language and document preparation system for the T_EX typesetting program. Within the typesetting system, its name is styled as L^AT_EX.



Figure 2.2: Donald Knuth, Inventor Of T_EX typesetting system

Within the typesetting system, its name is styled as L^AT_EX. The term L^AT_EX 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 L^AT_EX, a .tex file must be created using some form of text editor. While most text editors can be used to create a L^AT_EX document, a number of editors have been created specifically for working with L^AT_EX.

L^AT_EX 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, L^AT_EX is used because of the high quality of typesetting achievable by T_EX. 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.

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

2.10.1 Typesetting

In preparing a L^AT_EX document, the author specifies the logical structure using familiar concepts such as chapter, section, table, figure, etc., and lets the L^AT_EX 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.
\end{document}
```

2.11 Introduction to Github



Figure 2.3: Github Logo

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 repo 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 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 cre-

ation, 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 Code lines.**
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 Work flow.**
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 work with 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.

2.11.1 What is Git?



Figure 2.4: 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 client–server 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.

2.11.2 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.

2.11.3 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:-

2.11.3.1 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

2.11.3.2 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 commit -m "[descriptive message]"

Records file snapshots permanently in version history

2.11.3.3 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 branch -d [branch-name]

Deletes the specified branch

2.11.3.4 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 bookmark's branch into current local branch

\$ git push [alias [branch]]

Uploads all local branch commits to GitHub

\$ git pull

Downloads bookmark history and incorporates changes

3.1 Introduction to ARCE (Analyse Reinforced Concrete Element)

ARCE
means
Analysis of Reinforced
Concrete Elements
by allacronyms.com



Figure 3.1: ARCE

The design process for a civil engineering structure involves two major steps: analysis and detailing. Analysis is the determination of the internal forces induced in the structure by the applied loads and/or environmental agencies. If the structure is complex, the common practice is to dismember it into simpler elements and to determine the distribution of the applied loads among and within these elements. Regardless of the complexity of the structure, engineers can analyze it by using one of the available and appropriate methods of analysis. The advent of fast and powerful computers and the development of numerical techniques have made the analysis of highly complex structures possible and feasible.

Phonegap

My project also works like an app. I used phonegap for this purpose. I didn't want to keep you waiting for all the good stuff, so I published some key resources to get you going. If you are new to PhoneGap, we recommend beginning by working through our Getting Started Guide. We've also put together a helpful tutorial on extending our "Hello World" example app. These should get you going, and keep your eyes peeled for new material to come soon. This link is regarding some guidelines for phonegap <http://docs.phonegap.com/getting-started/1-install-phonegap/desktop/> I am giving here the link of tutorial regarding to become more familiar with phonegap <http://docs.phonegap.com/tutorials/develop/hello-world-explained/> For more information refer to my blog <https://gagan95.wordpress.com/>

There is a screenshot for for the app that I had made using phonegap.

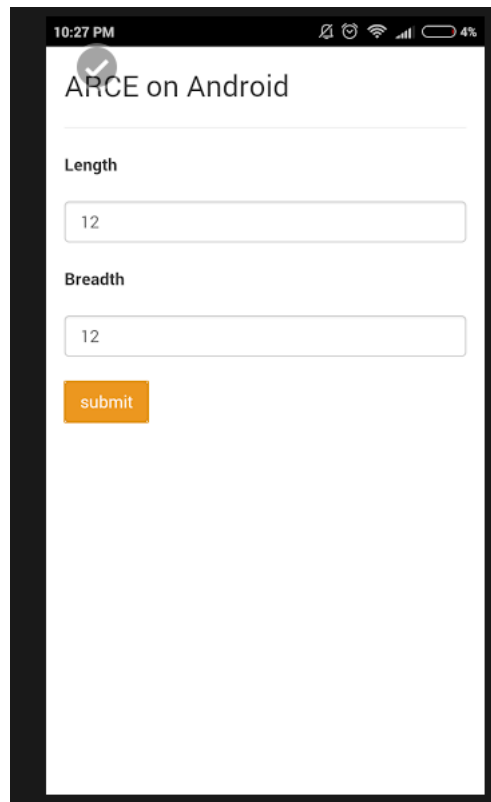


Figure 3.2: App output

CHAPTER 4

EXPERIMENTAL RESULTS AND COMPARISON

4.1 Experimental Results

I had tried my project on different server also i.e Experimental Server here. I had tried it on both ubuntu 14.04 and 15.10. It works fine on both versions.

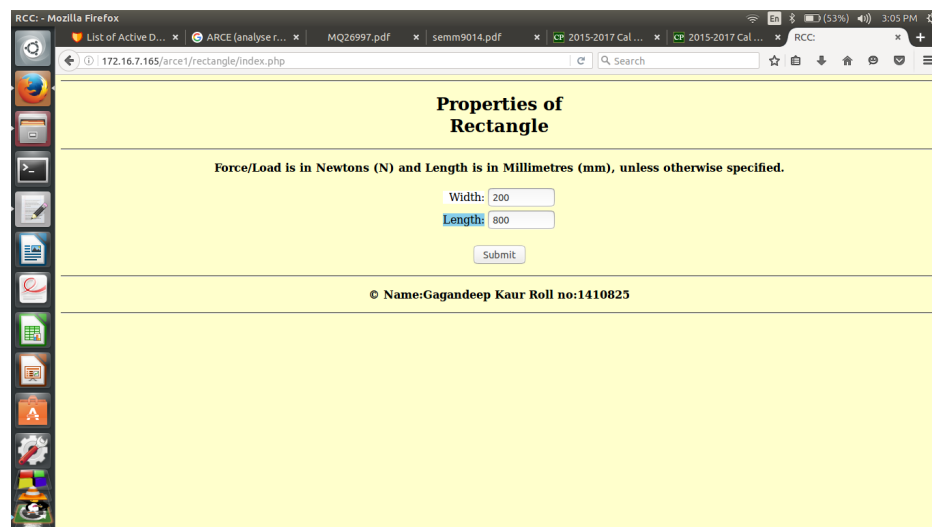


Figure 4.1: ARCE (Analyse Reinforced Concrete Element)

You may refer to my blogs also for detailed information. Here is the url: <https://gagan95.wordpress.com/>

5.1 Future Scope

ARCE (Analyse Reinforced Concrete Element) is open source. Due to the lack of enough and systematic experimental results, which could be used as reference value for comparison, one of the computer oriented methods will be used for this purpose. This will enable us to test a large number of cases without the need for expensive and time consuming experimental work. Although it is shown that the modified compression field theory gives accurate results, a considerable amount of time will be expended to validate a program written in the current study and to justify it's results as reference for comparison of other methods.

5.2 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:** php, HTML and Markdown
- **Framework:** Reveal.js
- **Typesetting:** LaTeX
- **Other Learnings:** 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.

- [1] \LaTeX Beginner's Guide By Stefan Kottwitz
- [2] My Blog, <http://gagan95.wordpress.com>
- [3] My Github Profile, <https://github.com/Gagandeepkaur123/>
- [4] Online Sources