Design and Analysis of Portable Lumber Mill

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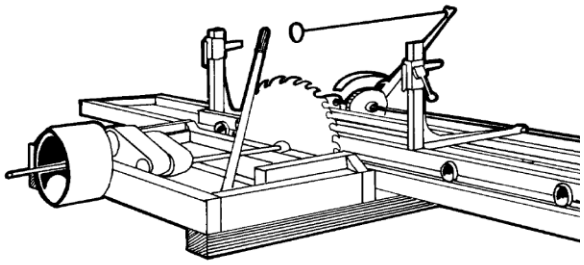
***Abstract*-Software is integrated in to our lives more frequently in each and every aspect of our lives. It grows rapidly in its size and functionality, so we need to develop more accurate, high-quality and reliable software to attain the software quality assurance more efficiently and proficiently. To estimate the quality of software artifacts and to stay behind its level far above the ground is much more complicated than to do them for the other developed goods.**

***Index Terms*-Software quality assurance, Software engineering.**

I. INTRODUCTION

Lumbermill is any sawing device that you can move without a great deal of difficulty from one site to another and that you use to convert logs into lumber. There are quite a few different types of mills (hereafter, we'll refer to a portable lumbermill as just a mill). These types include: chain lumbermills, circular mills with moving log carriages, circular mills with moving saw and stationary log, band mills with moving carriages, and band mills with moving



Portable lumbermills became popular in the United States starting in the 1970s, when the 1973 energy crisis and the back to the land movement had led to renewed interest in small woodlots and in self-sufficiency. Their popularity grew exponentially since 1982, when the first Wood-Mizer portable band lumbermill was invented.

Lumbermill process / Operation

A lumbermill's basic operation is much like those of hundreds of years ago; a log enters on one end and dimensional lumber exits on the other end. After trees are selected for harvest, the next step in logging is felling the trees, and bucking them to length. Branches are cut off the trunk. This is known as limbing. Logs are taken by logging truck, rail or a log drive to the saw mill. Logs are scaled either on the way to the mill or upon arrival at the mill. Debarking removes bark from the logs. Decking is the process for sorting the logs by species, size and end use (lumber, plywood, chips). A sawyer uses a head saw, head rig or primary saw to break the log into cants (unfinished logs to be further processed) and flitches (unfinished planks).

Depending upon the species and quality of the log, the cants will either be further broken down by a re saw Scheme of the water-driven Roman sawmill at Hierapolis, Asia Minor. The 3rd century mill is the earliest known machine to incorporate a crank and connecting rod mechanism.

Illustration of a human-powered lumbermill with a gang-saw published in 1582. or a gang edger into multiple flitches and/or boards. Edging will take the flitch and trim off all irregular edges leaving four-sided lumber. Trimming squares the ends at typical lumber lengths. Drying removes naturally occurring moisture from the lumber. This can be done with kilns or air-dried. Planning smoothes the surface of the lumber leaving a uniform width and thickness. Shipping transports the finished lumber to market

Project aims and objectives

This project focused on three objectives:

(a) To review the efficient cutting procedures, relating to the use of portable lumbermills
(b) To identify and evaluate the critical factors leading to the optimum performance of portable lumbermills; and
(c) To devise feasible strategies and communicate these to key stakeholders on how to increase the beneficial outcomes of portable lumbermills in the region.

II. LITERATURE REVIEW

The first portable lumbermills were the "One Man Farmer's Lumbermills." These mills featured large circular blades and were marketed during the early

twentieth century by companies like Sears, Montgomery Ward and JC Penney. These machines were all "private label" machines manufactured by the Belsaw Company. Many early sawmills were designed to be belt-driven from a steam traction engine (which could also be used to transport the saw). Prior to the advent of the portable 'mill, small-scale lumbermills were generally cobbled-together affairs constructed and operated by (almost always) two men with a penchant for tinkering. This was, and remains, a traditional occupation for Amish men; unlike most mechanical systems, small lumbermills typically do not use electricity.

More recently, with the invention of the Wood-Mizer in 1982, portable band saw mills represented a dramatic shift in design. Unlike traditional mills, they used a thin-kerfs blade of the type used on a band saw rather than a circular blade, which reduced weight and cost, and reduced the size and weight of the bearings and support blocks. The smaller kerfs on these blades dramatically increased the yield from a given log. Use of band blades also allowed for a different design where the *head*, consisting of the blade and a power source, moves back and forth while the log remains stationary. This is in contrast to traditional mills where the log moves on a trolley while the blade remains fixed. Aside from the original Wood-Mizer company, many companies now manufacture and sell personal and portable lumbermills. Larger mills have recently come on the market which is portable only in sections. These cut faster and can handle larger logs but do require additional set up.

Design Methodlogy Of Portable Lumber Mill:

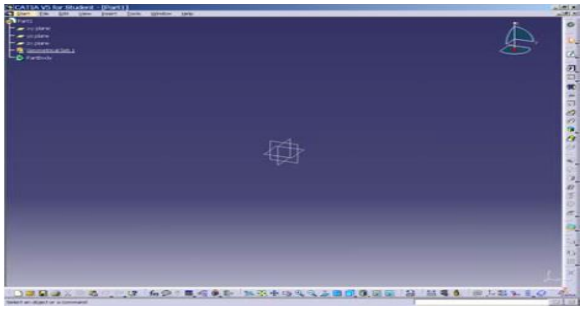
Introduction to CATIA

CATIA (Computer Aided Three-dimensional Interactive Application) is a multi-platform CAD/CAM/CAE commercial software suite developed by the French company Dassault Systems. Written in the C++ programming language, CATIA is the cornerstone of the Dassault Systems product lifecycle management software suite. CATIA competes in the high-end CAD/CAM/CAE market with Cero Elements/Pro and NX (Unigraphics).

The 3D CAD system CATIA V5 was introduced in 1999 by Dassault Systems. Replacing CATIA V4, it represented a completely new design tool showing fundamental differences to its predecessor. The user interface, now featuring MS Windows layout, allows for the easy integration of common software packages such as MS Office, several graphic programs or SAPR3 products (depending on the IT environment).

The concept of CATIA V5 is to digitally include the complete process of product development, comprising the first draft, the Design, the layout and at last the production and the assembly. The workbench Mechanical Design is to be addressed in the Context of this CAE training course

CATIA can be applied to a wide variety of industries, from aerospace and defense, automotive, and industrial equipment, to high tech, shipbuilding, consumer goods, plant design, consumer packaged goods, life sciences, architecture and construction, process power and petroleum, and services. CATIA V4, CATIA V5, Pro/ENGINEER, NX (formerly Unigraphics), and Solid Works are the dominant systems.



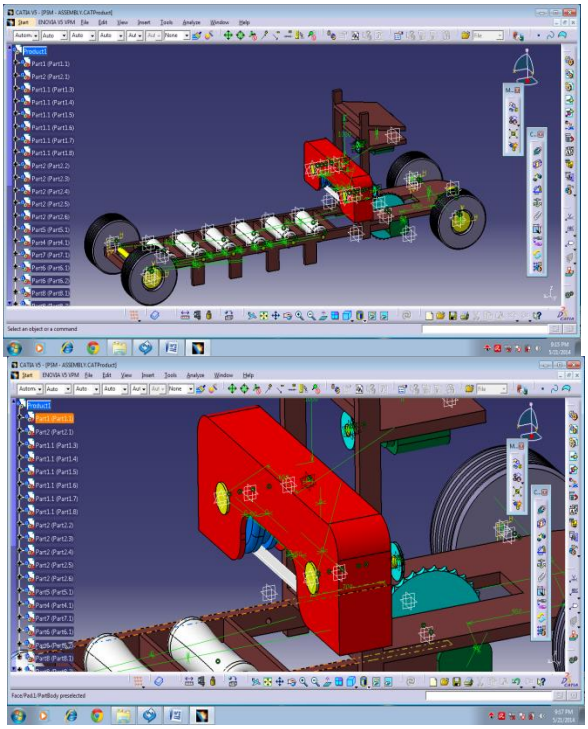
Home Page of CatiaV5

Modeling of Portable Lumber Mill in CATIA V5

This PORTABLE LUMBER MILL is designed using CATIA V5 software. This software used in automobile, aerospace, consumer goods, heavy engineering etc. it is very powerful software for designing complicated 3d models, applications of CATIA Version 5 like part design, assembly design.

The same CATIA V5 R19 3d model and 2d drawing model is shown below for reference. Dimensions are taken from. The design of 3d model is done in

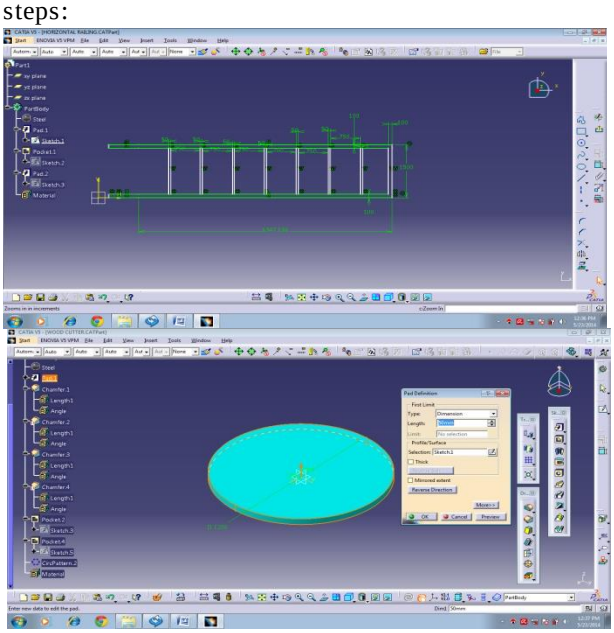
CATIA V5 software, and then to do test we are using below mentioned software's.



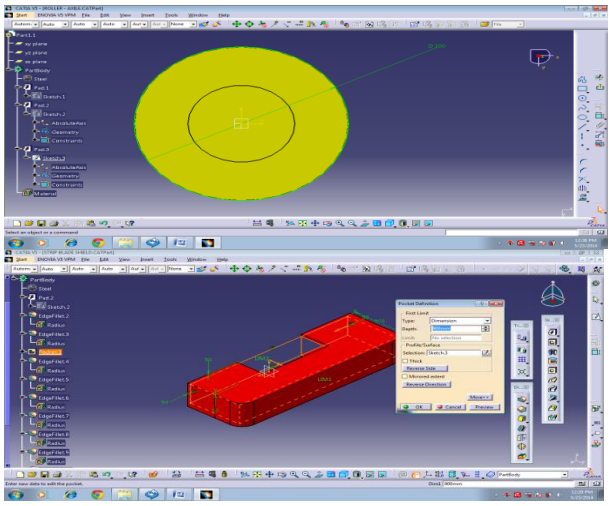
Model arrangement of cutting mechanism in CATIA-V5

Design Procedure of Portable Lumber Mill

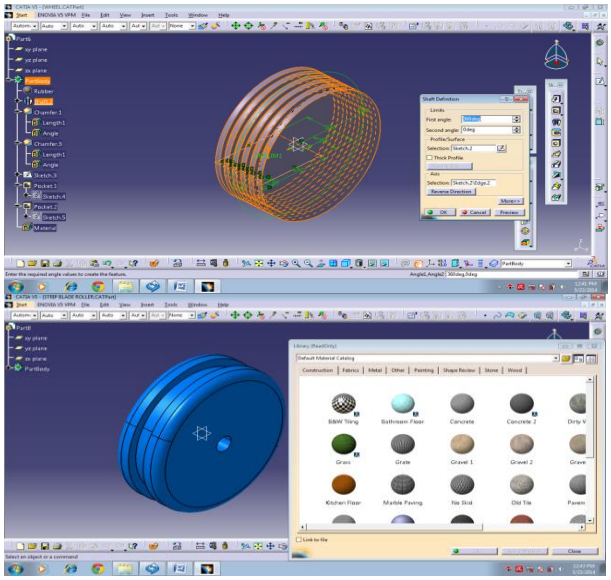
The Portable Lumber Mill is designed in the Catia V5 software by both the part modeling and Assembly modeling. This modeling is being done by following steps:



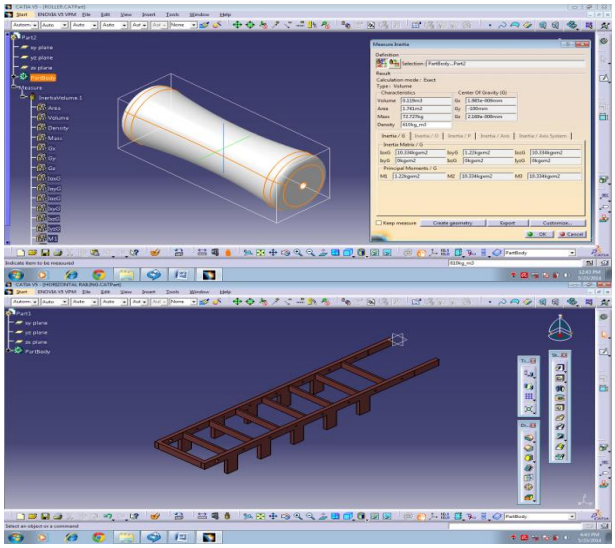
Using Pad Command for thickness



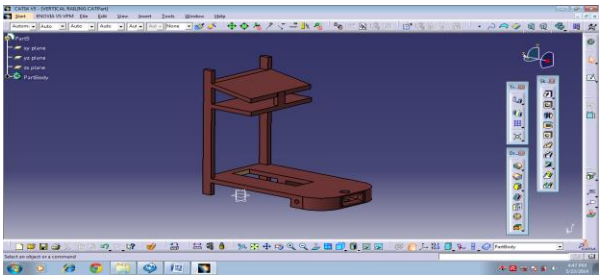
Using Pocket Command for thickness



Applying Material properties



Horizontal Railing

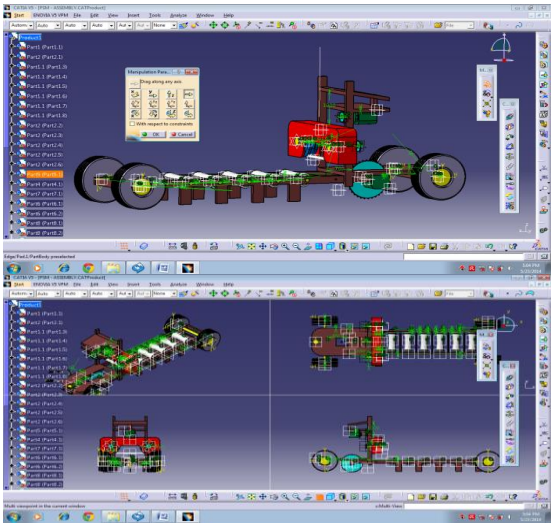


Vertical Railing

Assembly Modeling of PORTABLE LUMBER MILL

In this modeling each and every component get assembled together with the means of constraints, coincidence, contact, offset, angle, fix component, flexible, manipulate, etc.

Manipulate: This command is used to manipulate / turn / rotate the component in any requried direction as per the need / suitable constraints are to be applied on the component.



Using Multi View Command

clearly each component in assembly is having minor displacement.

The final result positive manner .There is no

S.No	Component	Material	No.'s Used	Mass	Density	Area	Volume	Possions Ratio
01	ELECTRIC ENGINE	M.S	01	835.6	7860	1.38	0.106	0.27
02	ELECTRIC ENGINE-LONG SHAFT	M.S	01	836.4	7860	1.522	0.11	0.27
03	HORIZONTAL RAILING	M.S	01	4296	7860	18.22	0.547	0.27
04	PULLEY - BELT	Fabric	02	0.033	200	0.1	1.66e-004	0.27
05	PULLEY	M.S	03	11.626	7860	0.168	0.001	0.27
06	ROLLER - AXILE	M.S	06	26.854	7860	0.282	0.003	0.27
07	ROLLER	Timber	06	72.727	610	1.741	0.119	0.27
08	STRIP BLADE AXILE	M.S	02	57.102	7860	0.365	0.007	0.27
09	STRIP BLADE ROLLER	M.S	02	1353.36	7860	2.311	0.172	0.27
10	STRIP BLADE SHIELD	M.S	01	3014.8	7860	13.461	0.384	0.27
11	STRIP BLADE	M.S	01	125.5	7860	1.598	0.016	0.27
12	VEHICILE LINK - HOOK	M.S	01	151.2	7860	0.503	0.019	0.27
13	VERTICAL RAILING	M.S	01	9033.7	7860	24.08	1.149	0.27
14	WHEEL - AXILE	M.S	01	408.7	7860	1.93	0.052	0.27
15	WHEEL - FRONT AXILE	M.S	01	464.35	7860	2.12	0.059	0.27
16	WHEEL	Rubber	04	531.8	910	6.74	0.584	0.27
17	WOOD CUTTER	M.S	01	352.53	7860	2.011	0.045	0.27
18	ASSEMBLY	M.S	-	46570.2	7860	111.9	5.925	0.27

CONCLUSION

Mobile Lumber milling seems to fit well with commercial logging operations in enhancing the usage of wood and the reduction of waste. In this model number of different operations can be done in one machine with good efficiency.

But it was observed that there is still a need to modify opinions among logging companies as well as lumber/saw millers to make this kind of cooperation known and to get it implemented.

In above figures, the displacement of the complete components is meshed and solved using Ansys and displacement is very less. This is showing us that problem in the designs of the machine. Final assembly is designed and it is done without failure.

Preservative treatment for the saw timber can present rather serious environmental problems if done in the forest without suitable field operations; should be developed.

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