# DEVELOPMENT OF COMPUTER ASSISTED JIG SAW MACHINE

[1]Prajakta H. Dahake, [2]Vivek V. Patil

Dept of Mechanical Engineering,
Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur
E mail: [1]praju_dahake1@yahoo.co.in

**Abstract- This paper involves the development of automated jig saw machine. The jig saw machine is used for cutting the wooden planks so as to get intricate profiles on it. In the conventional machine the operator has to cut desired profile on wooden sheets by providing manual feeding against the direction of reciprocating saw. Sometimes this operation results into serious accidents, inaccuracy in profiles, time consumption as well as loss of raw material. Hence in order to reduce the limitations of conventional machine a new concept is proposed here in which the efforts of operator is replaced by computer controlled signals.**

**Index Terms- Automated Jig Saw, CNC Jig Saw, Interfacing, Jig Saw.**

## I. INTRODUCTION

In the conventional Jig Saw wood cutting machine, the cutting operation is done by manual feeding of wooden plank against the direction of saw. For this a very skilled labor is required for cutting desired profile of wood. Also continuous monitoring of cutting operation is essential otherwise the operator may suffer from injuries or several accidents. Also it is very time consuming process. Hence the aim of this project is to replace manual feeding of wooden plank with automatic feeding so that the operator can operate the machine very easily and safely.

The objective of this paper is to develop a prototype model of Computerized Controlled Jig Saw Wood Form Cutting Machine which can cut the "S" Curve on wooden plank by controlling the movement of feed table. The project also aims to achieve the precise and smooth cutting surface on the wooden plank which otherwise is very time consuming activity when carried out manually.

## II. METHODOLOGY

For developing a prototype of computer assisted jig saw form cutting machine, a literature review has been done and the basic parameters required for development has been studied. The whole work is divided into three steps. At the first stages wood plank size is decided and subsequently on the basis of plan size various specifications of machine components are decided like frame size, lead screw size, motor selection, cutter assembly etc. and accordingly machine prototype is developed. In the second step, the user interface and cutting profile programmes are designed. In the third step, a communication link known as interfacing is formed between computer and jig saw machine. This link consists of motor drives to pass the signal from computer to machine tool to have a desired "S" curve cut on wooden plank.

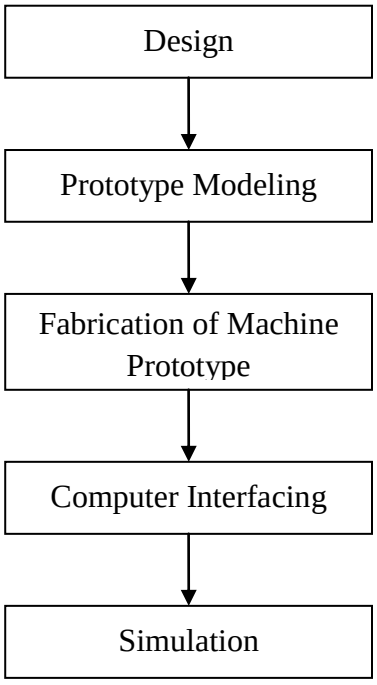


**Fig. 1. Process flow**

## III. MACHINE ELEMETS

The various machine elements of the proposed concept are

[1] Machine Structure
[2] Wood feed table (T - slot table)
[3] C-Clamps
[4] X-Y table assembly
- Lead screw
- Reciprocating nut on lead screw
- Bearings
- Guide ways
- Supporting plates

[5] Cutter column
[6] Portable jig saw machine
[7] Stepper motors(inductive type)
[8] Coupling
[9] Motor Drives
- Opto-coupler
- Relays
- Transistor n-p-n
- Heat sink Transistor
- Resistors
- D-Type connectors

[10] Computer System

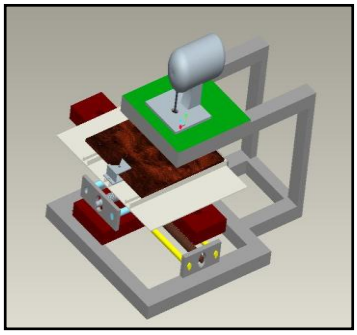

**Fig 2. Prototype of computer assisted jig saw machine**

## IV. COMPUTER INTERFACING

Computer Interfacing is a boundary across which two independent system meet and act on or communicate with each other. In computer interfacing there are several types of interfaces:

1) User Interface:

2) Software Interface:

3) Hardware Interface:

This project consists of all interfaces. The user interface and software interface are created through visual basic language. The data transfer is done by using parallel port.

On the user interface, directly commands are placed like current profile, X motor pulse rating, Y motor pulse rating, start, stop, setting, updation of curve, delay timer port selection etc. It also consists of preview of cutting profile in graphical mode.

The software interface includes programming of above commands. This programming is designed by using visual basic software language. Since the role of each command starts according to timing or requirement, it is called as event oriented programming.

Once the data for cutting profile is generated, it is passed to the machine through user selected port. There are three port options of parallel port are provided on user interface namely LPT1 38C, LPT2 378 and LPT3 278. These ports can be selected according to user opinion or it can be selected automatically. In most of the computer system LPT 378 bits port is available Hence the automatic selection is set in such a way that it will select LPT 378 port for maximum times.

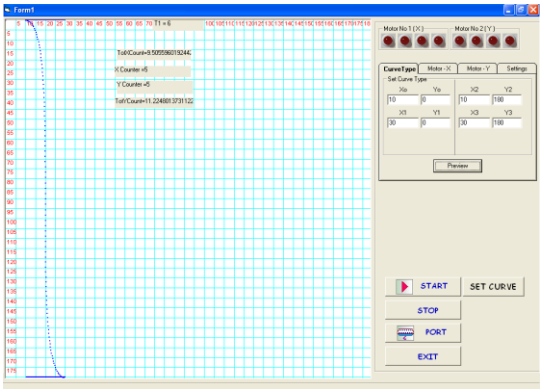


**Fig. 3 Simulation Window**

## V. TESTING RESULTS

For checking the accuracy of cutting profile, the template profile is compared with the curve profile obtained by this machine. The verification of this profile is done by following two methods. The first one includes visual inspection and second method includes comparison and calculation procedure of inspection.

The first method is not very accurate. The result of inspection may include some error. Hence second method is adopted. In second method, the number of coordinate points is fixed on template profile and it is compared with same coordinate points of new curve profile. The difference is identified and the average of accuracy is calculated.

**Fig. 4 Final Profile**

The "Fig 4" consists of two cutting profiles. The wood sheet profile is matched with white colored template. The cutting profile is checked at various coordinate points.

At coordinate point (50,55) mm

Variation in profile 2 mm

At coordinate point (35,55) mm

Variation in profile 1 mm

At coordinate point (15,55) mm

Variation in profile 1 mm

Average variation = 2 mm

## VI. DISCUSSION

When the cutting operation is done, various problems are identified. These problems are

Tangential force on saw surface.

Tilting of Y table

Curve profile type.

During the cutting process, the feed table is continuously moving in X and Y directions. When the wood sheet is feed against the direction of cutter teeth, less effort is applied for cutting. But, when the feed is given against the surface of cutter then failure of saw cutter is observed. The saw was broken into two pieces. To avoid this, speed adjustment is done. The cutter speed is much higher than the table movement speed. The feed speed against the surface of cutter is very less. Because of this, chances of failing cutting tool is reduces.

The complete assembly is mounted on lead screw and guide ways. When pulse signals are given to the X-lead screw, the assembly mounted on it reciprocates in that direction. During this movement tilting of mounted assembly was observed. This tilting effect is controlled by providing supporting metal strips. The metal strips are welded from base upto the height of mounted assembly. The friction between these two surfaces is reduced by providing ball nuts.

The cutting profile is drawn on user interface. If it is having more sloping curve then it is not possible to cut this profile by normally used blade. For this a blade of 2 mm surface width is selected.

After implementing these solutions, a prototype of complete machine is developed.

## VII. CONCLUSION

The following conclusions are made.

- Once the wood sheet is clamped to the machine, the operator has to give signals through computer system. Hence this machine helps to reduce the effort taken by operator for giving manual feeding of sheet
- It is more safer machine than conventional one because the whole cutting operation is controlled by computer system
- It provides same accuracy of cutting profile for the repetitive work which is quite difficult in conventional cutting machine. Conventional machines requires more attention for getting same cutting profile on various wood sheets
- Less skilled operator can also able to operate this machine

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