

Design of Machine Element by using Auto LISP Programming in Auto CAD

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Abstract- AutoLISP is a dialect of the LISP programming language built specially to use with AutoCAD and its derivatives. It is a subset of the LISP (List Processor) programming language, which is used in bids of artificial intelligence and expert systems. Many functions have been added to the LISP program in order to interface AutoLISP directly to AutoCAD, and you will see that same AutoCAD commands have been retained as AutoLISP functions. Key is the simple component in Mechanical design than others. Key is a machine element which is used to connect the transmission shaft to rotating machine elements like pulley, gear, sprocket or flywheel. Keys provide a positive means of transmitting torque between shaft and hub of the mating element. In this thesis a key model is designed with simple programming language. Initially stresses depending on the application is taken as the input for the generating various dimensions of the key.

Keywords- AutoLISP, Key LISP, AutoCAD.

I. INTRODUCTION

After the development of AutoCAD, conscripting of engineering drawing becomes easier. In case of Mechanical Engineering drawing, drafting of machine element with small describing at any scale is made possible. Also main benefit of AutoCAD is to increase competence and reduce in time. But to achieve this benefits user must have thorough information of AutoCAD. In this project the calculations is done by program from giving input values from user. The dimensions of components are generated by programming in AutoLISP.

The design of machine component is done through program i.e. after giving input values from user the calculations is done & according to calculating values the output dimensions are generated & this dimensions used for creating component in AutoCAD by giving values of co-ordinates of component. The language is simple for producing drawing & also for mathematical calculations & analytical calculations.

AutoCAD

Designing is the process of converting an idea into an object, product or a system. This process is iterative. CAD (Computer Aided Design) is a tool that can be used for design and drafting activities. Since it used the computing power of a processor, CAD drawings are faster, better and more accurate than their manually drafted counterparts.

1. AutoLISP

AutoLISP is a programming language that allows you to customize AutoCAD to meet your own unique requirements. It is a subset of the LISP (List Processor) programming language, which is used in applications of artificial intelligence and expert systems.

Many functions have been added to the LISP program in order to interface AutoLISP directly to AutoCAD, and you will see that some AutoCAD commands have been retained as AutoLISP functions.

2. Benefits of AutoLISP

- All the manual drafting operations can be done individually by AutoLISP.
- LISP has certain set of tasks which allows us to perform many operations automatically in a very less time.
- They can even handle loops, mathematical operations, error spotting and corrections.
- Once the program for a machine assembly or component is done many other forms can be generated based on the inputs from the parent assembly drawing itself.

2. METHODOLOGY

Initially the inputs for the assembly drawing generation are given. From which the generated program will produce the output in terms of dimensions. By using basic commands the entire assembly drawing is modeled which is given in the upcoming sections.

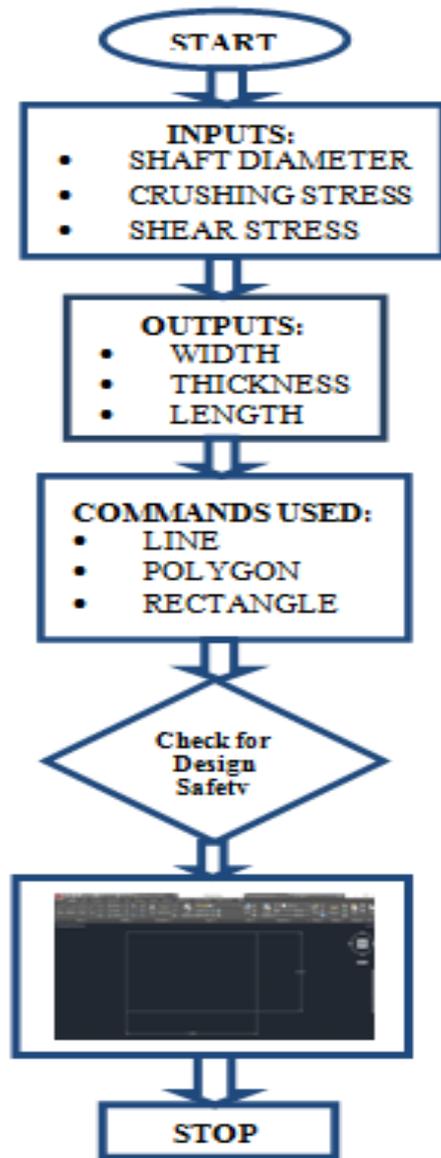


Fig no 1. Modeled.

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(defun c:cskey()
  (setq
    cs(getreal"\n Enter the permissible crushing stress in
N/mm2=")
    d(getreal"\n Enter the diameter of shaft in MM=")
    w(/ d 4)
    th(/ d 6)
    TR(* (/ 3.14 16) cs (* d d d))
    lc(/ (* TR 2 2)(* cs th d)))
  (setq osm "osmode")
  (setq pt1(getpoint "\nSpecify point you want to start")
    pt2(polar pt1 0 w)
    pt3(polar pt2(/ pi 2) th)
    pt4(polar pt3 pi w)
  )
  (command "pline" pt1 pt2 pt3 pt4 pt1 "c")
  (command "dimlinear" pt1 pt2)
  (princ)
)
  
```

)

III. ANALYTICAL CALCULATIONS

The key is designed with usual proportions as follows & then checked for shearing and crushing stress.

$$\text{i.e. } w = d/4, t = d/6 \text{ \& } l=L$$

By considering shear failure torque transmitted

$$T = l \times w \times \tau \times d/2 \quad \text{-----by shear failure}$$

By considering crushing failure torque transmitted

$$T = l \times t/2 \times \sigma_c \times d/2 \quad \text{-----by crushing failure}$$

IV. AUTOLISP PROGRAMMING

The AutoLISP is a based lisp programming procedure. The various steps involved in AutoLISP programming are as follows

Step1: Defining the drive where AUTOCAD is installed.

Step2: Defining a name for our program it should be noted that, no alphabets should be used which are to be used to define formula .

For example “d” which is used to define the diameter. In turn this alphabet “d” should not be used to define our program.

Step3: Defining the point on the working coordinate based on required diagram.

Step4: By using commands such as line , hatch, circle, rectangle, triangle ,etc

KEY

;TR=Torque transmitted by shaft
;F=Tangential force acting on circumference of shaft
;d=diameter of shaft
;l=lenth of key
;w=width of key
;th=thickness of key
;tau & cs = permissible shear & crushing stress of material

V. PROBLEM DESCRIPTION

A key is a piece of steel inserted between the shaft and hub or boss of the pulley to connect these together in order to prevent relative motion between them. It is always inserted parallel to the axis of the shaft. Keys are used as temporary fastenings and are subjected to considerable crushing and shearing stresses.

A keyway is a slot or recess in a shaft and hub of the pulley to accommodate a key.

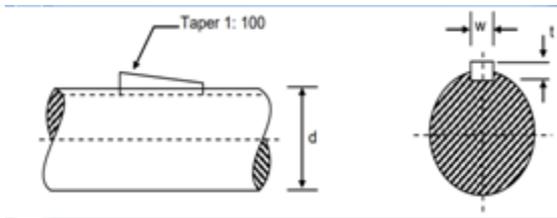


Figure 2. Rectangular Sunk Key.

VI. CONCLUSION

AutoCAD is one of the most versatile 2D and 3D CAD software available in the market. In addition to that, the AUTOLISP Programming provides an intuitive approach towards generating automatic diagrams with minimal user input. The Program can also be saved as a Macro or as an AutoCAD plug-in which can then be used in any type of systems and can be made commercial. Even a first-time novice user can be able to understand the level of programming in LISP as it uses a common representation of equations and command history which is easy to understand. Thus the flange coupling has been designed for transmitting the power and found the designed values within the allowable limits and the modeling of Flange coupling has been successfully done by using the AutoCAD LISP.

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