

## AUTOLISP FUNCTION FOR DIMENSIONING CHAMFERS IN AUTOCAD

**Abstract:** AutoCAD, one of the most popular drawing programs, has enriched over time the facilities offered in making drawings in terms of how to use different graphics, symbols, accuracy, speed, interface, etc. One aspect that gives it an advantage over other drawing programs is the ability to use the AutoLisp language in creating user's functions that can be used as commands in AutoCAD. In this article, the authors present a function made in AutoLisp, which, for the parts drawn in Autocad, facilitates the automatic dimensioning of the chamfers, in the usual format, considering the scale of the respective drawing or detail.

**Key words:** AutoCAD, AutoLisp, theoretical calculation, dimensioning, chamfer.

## 1. INTRODUCTION

The use of AutoCAD in making technical drawings has brought two great advantages: the short time to make the drawings and the high precision of making them.

The time to make the drawings was reduced by the ease of use of the program itself, by eliminating "auxiliary" actions that had to be done in drawing on the board, by making implicit calculations necessary to draw the graphics, etc.

Accuracy has increased through computer-specific drawing tools (selection, placement of objects, internal calculation of various sizes, etc.).

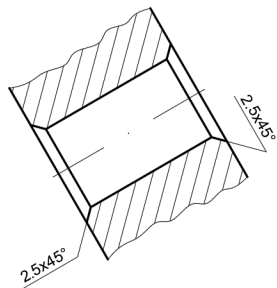
Human error has also been greatly reduced. This last can be caused either by carelessness, by various omissions, or by calculation errors, etc.

Over time, AutoCAD has kept active the ability to permanently customize the program by creating functions specific to a particular activity or operation created by users. Whether we are talking about AutoLisp [2], VisualLisp, or their cooperation with other applications.

The use of this facility has allowed us to simplify the way of dimensioning the chamfers at 45° by creating a specific function, which will be presented in this article.

## 2. DESCRIPTION OF THE FUNCTION

From the methods used in the dimensioning of the chamfers at 45°, the one that has been imposed for a long time in engineering practice was chosen (Figure 1).



**Figure 1** Chamfer angle is 45°.

The other dimensioning modes recommended in ISO 129-1 can be achieved by the existing dimensioning options in AutoCAD by launching two successive dimensioning commands (linear and angular) [3].

### 2.1 Dimensioning method used

We wanted to solve some aspects that we face in this way of dimensioning.

The situation in which the bevel at 45° has a different orientation from edges of the template of the drawing (Figure 1).

The situation in which the chamfer must be dimensioned on the same scale as the drawing (view or detail).

Suggesting possible positions for the placement of the dimension line.

Automatically draw the dimension line to a length correlated with the length of the dimension text.

Placement of the dimension in relation to the dimension line, depending on its orientation.

### 2.2 Explanation of the concept

When launching the command (function) for dimensioning of the chamfer, you will be asked to indicate the edge resulting from the bevel operation. It is then required to indicate the reference against which the bevel angle is calculated.

In the following sequence, we are suggested to indicate the area in which the quota is displayed. After specifying this area, representative positions for dimension line placement are suggested. Immediately after indicating its position, the dimension line is drawn and then the dimension value is displayed in the distance\_x\_angle format. The length of the dimension line is correlated with the length of the text of the dimension.

It was preferred to indicate as reference elements the edge resulting from the chamfering and then the segment starting from one end of it, to be able to collect more easily and safely the calculation elements necessary for the bevel angle (how flared the surface) and the length of the bevel on which it is made (how "shortened" the reference face is). Specifically, the coordinates of the ends of each reference line are collected, compared and

the intersection of the two segments is determined. The angle between the bevel edge and the indicated reference is then determined, this being the value displayed within the dimension. To calculate the distance at which the bevel is made, the scale factor characteristic of the current dimensioning style used to dimension the bevel shall be included in the calculation formula. This factor is determined by the current value of the DIMLFAC system variable. The distance from the "free" end of the chamfer line to the point of intersection of the two lines, measured along the reference, is then determined. This represents the value of the distance at which the chamfer was made.

The dimension text will consist of composing the two values distance and angle in the format specified above. This value is analysed, and the length of the text of the resulting dimension is determined by counting the characters that make it up. The size of the text used is given by the current value of the DIMTXT system variable. Depending on this value, the width of the font is determined and finally the length of the dimension line is calculated, maintaining a reserve of space, symmetrically distributed at both ends of the dimension line.

Although it is a  $45^\circ$  angle and does not matter the reference to which the angle or distance is calculated, this calculation concept was chosen to obtain the information in a format that allows their use and for the case of angles other than  $45^\circ$ . For the dimensioning of bevels with an angle other than  $45^\circ$ , one of the dimensioning modes indicated in the standard is used.

Once these items are calculated, the orientation of the reference to the current UCS is checked. Based on this information, the necessary values for the Polar Tracking mode are determined, to propose possible directions for each of the segments to be traced. The dimension is placed according to the dimensioning method according to which the dimensions are arranged parallel to the dimension line, in the middle, above 1 mm away, so that it can be read from the base or from the right of the drawing.

### 2.3 Example

The function is called DIMCH.

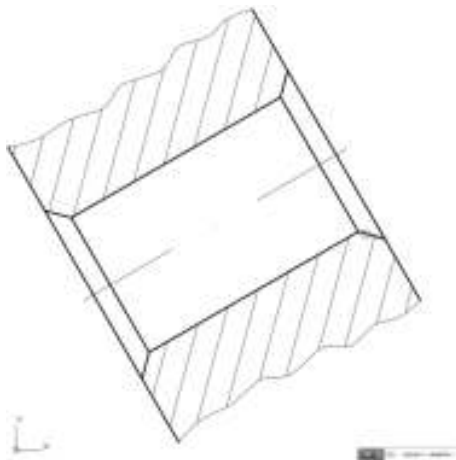


Figure 2 "Select chamfer:"

AutoCAD has the facility to enter the function name as a command in one of the menus in the menu bar (for example the "Dimension" menu) but can also be launched from the command line.

After launching it, in the dialog area appears the requirement to select the edge resulting from the chamfer: "Select chamfer".

The indication will be made with the help of the mouse using the graphic selection cursor. A LINE entity must be specified. If an entity of the type mentioned above is not indicated, it is required to enter the respective edge until the correct selection of a LINE type entity or until the exit from the command by pressing the Enter or Escape key (Figure 2).

We then move on to the next requirement, namely the indication of the calculation reference of the elements of the chamfer. As previously stated, indicate the edge of the face that is shortened, the one for which the value of the chamfer distance is relevant. And this time, to continue, it is imperative to introduce a LINE type entity (Figure 3).

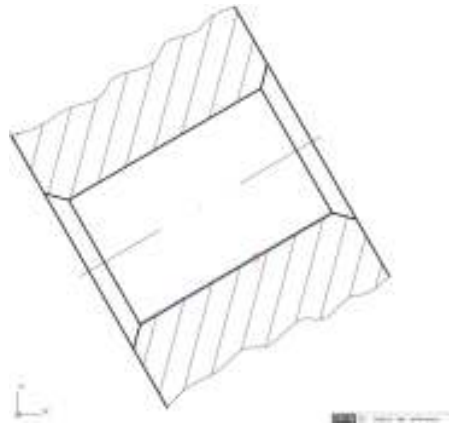


Figure 3 "Select reference:"

Next, it is expected to indicate the direction in which the dimension support lines will be drawn. For this, several drawing directions are suggested for each of the segments that make it up. These suggested directions are correlated with the orientation of the edge of the chamfer relative to the horizontal [4].

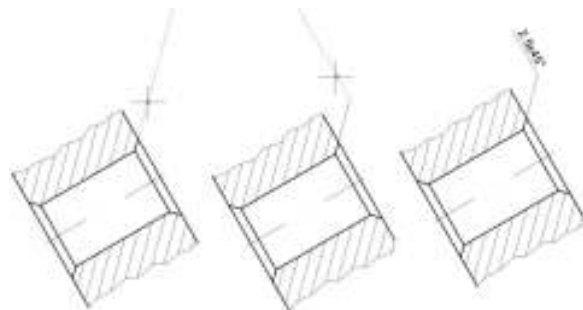


Figure 4 Indicating the suggested directions and dimensioning.

After the indication of the second direction of orientation, the dimension line is also drawn, at the



```

)
(setq distchamfer (/ moduldist radical)
)
(setq sd (getvar "DIMLFAC"))
(setq it (getvar "DIMTXT"))
(setq distchr (* distchamfer sd)
)
(setq unch (rtos unghig)
  distch (rtos distchr)
  sg (chr 176)
)
(setq ch (strcat distch "x" unch sg))
(setq nrcar (strlen ch))
(setq latlit (* 0.7 it))
(setq lunglin (+ 2 (* nrcar latlit)))
(Command "REGEN")
(setvar "POLARANG" unghch)
(setvar "AUTOSNAP" 8)
(Command "LINE" P2 pause "")
(setq angl (angle P1 P0))
(setvar "POLARANG" angl)
(Command "LINE" "" pause "")
  (setq l3 (entlast)
    P31 (cdr (assoc '10 (entget l3)))
    XP31 (car P31)
    YP31 (cadr P31)
    P32 (cdr (assoc '11 (entget l3)))
    XP32 (car P32)
    YP32 (cadr P32)
    oru (angle P31 P32)
  )
(entdel l3)
(setvar "AUTOSNAP" 0)
(setq P32 (polar P31 oru lunglin))
(Command "LINE" P31 P32 "")
  (if (and (> oru (/ Pi 2)) (<= oru (/ (* 3 Pi) 2)))
    (setq orucs P32)
    (setq orucs P31)
  )
  (if (equal orucs P32)
    (setq orx P31)
    (setq orx P32)
  )
  (if (and (> oru (/ Pi 2)) (<= oru (/ (* 3 Pi) 2)))
    (Command "UCS" "3P" orucs orx (polar orucs (-
oru (/ Pi 2) 10) ""))
    (Command "UCS" "3P" orucs orx (polar orucs (+
oru (/ Pi 2) 10) ""))
  )
(setq xs (atof (chr 49))
  STP (list xs xs)
)
(Command "TEXT" STP it "" ch)
(setvar "AUTOSNAP" 1)
(Command "UCS" "W")
)

```

## 5 CONCLUSIONS

Given that the dimensioning of chamfers function (DIMCH) has solved the issues mentioned at the beginning of the article, it can be said that it has achieved its purpose for which it was created: saving time (by reducing orders or data entered), ease of use (easy launch, suggestive queries), increase accuracy (PC calculations), reduce human error (is used the same scaling factor used for the dimensioning style used).

Due to the concept used for selecting and collecting data, the function can be easily developed, adding as options to the DIMCH command and other engineering dimensioning modes or those recommended in ISO 129-1: 2018.

This function can also be used for teaching purposes during classes.

## 6 REFERENCES

- [1] Chiriță, S. (1989). *Probleme de matematici superioare*, Editura Didactică si Pedagogică, ISBN 973-30-0406-9, București.
- [2] Stăncescu, C. (1996). *AutoLISP Manual de programare*, Editura Fast 2000, București.
- [3] Simion, I. (2009). *AutoCAD 2010 pentru ingineri*, Editura Teora, ISBN 978-973-20-1218-5, București.
- [4] Vasilescu, I-A., Petrescu, L. C. M., Stroe, I. (2000). *Grafiă inginerească și tehnoredactare computerizată*, Editura Printech, ISBN 973-652-134-6, București.

## Authors:

**Teaching Assistant Iulius STROE**, Ph.D. student, University POLITEHNICA of Bucharest, Department of Engineering Graphics and Industrial Design, E-mail: iulius.stroe@gmail.com

**Lecturer Ph.D. Eng. Elena IONIȚĂ**, University POLITEHNICA of Bucharest, Department of Engineering Graphics and Industrial Design, E-mail: elena.ionita@upb.ro