1.4 Notes and Cautions

1. To use `Idraw` type `idraw` if you want the small view and `idraw -l` if you want the large view[1]. Note, however, that the large view more than fills the screen vertically so that the *panner* is below the screen's lower edge and hence unavailable. As an alternative to `idraw -l` one can use `idraw -geometry 782x800` . This gives a large window in which the *panner* box still shows and the *view* is exactly as wide as the part of the page which will actually print, i.e. 8 inches wide instead of 8.5 inches.

2. If you start a graphic or text line that you don't want, there are two actions you can take: A.) If you have gridding *on* and haven't passed the second control point or breakpoint in a *Multi Line*, you may move the cursor back to where you first clicked the left mouse button and click the middle or right button; or B.) You may complete the current segment of your graphic or type line by clicking either of these buttons; then type `^D` (Control-D).

3. Attempting to open a non-existing file with `Idraw` will shut down all of `Idraw`'s controls including *Quit*. You will then need to use the *Kill Window* command on the *TWM Window Manager* menu. Also using `Idraw`'s *Print* command closes the `Idraw` window.

4. After you select a graphic on your drawing, to select *Move* you can press the middle button on the mouse (or type "`m`") when the mouse pointer is **on a line** of the drawing. The rectangle for accomplishing the move will appear only when you begin dragging the mouse.

5. Grid marks provide a way of aligning objects at multiples of a regular user specified spacing along the page. By turning 'gridding' on (see the Options menu), the user constains the placement of each object created so that it's border falls on a grid point. You can also specify whether the grid points are visible or hidden in the *view*.

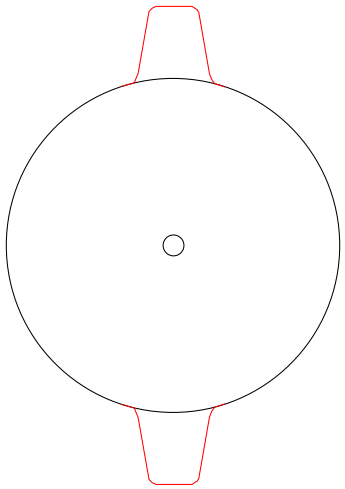
   The default spacing for grid-marks is 8 printers' points which equals about $\frac{1}{9}$th of an inch. One printers' point corresponds to about 1.2 screen pixels on the SUNs so the spacing between grid-marks will not be entirely even. This irregularity becomes more apparent at lower magnifications (e.g. at 0.25x) and, to some degree, at smaller spacings between grid-marks.

6. The following code positioned the inset figure on page 4:

```
\parbox[b]{5.5in}{ \hspace{.3in} The {\em panner} is . . .
. . . this rectangle becomes.)  \\*[-12pt] }
\ \hfill\psfig{figure=panner.ps}  \\
 Clicking and holding . . .
```

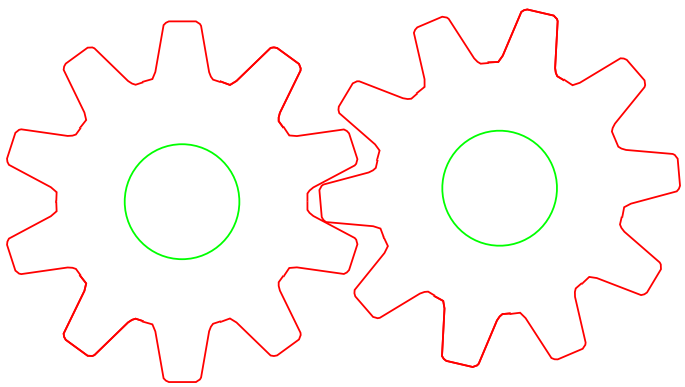
[1] You can open up an existing drawing when starting up `Idraw` by typing a filename on the command line. This might be useful if you are editing the same drawing day after day. For such a case you might want to define an alias such as:

alias idraw8 'idraw -geometry 782x800 drawing.8'

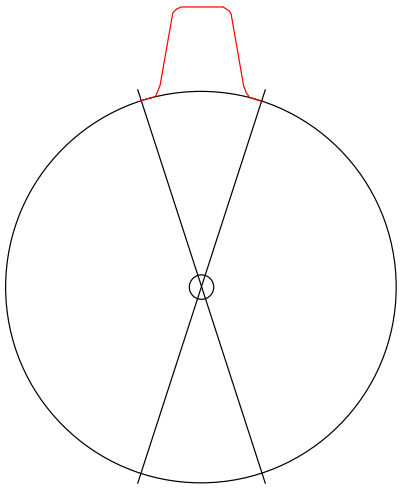


10. Use the *Group* command to combine the upper and lower teeth into a new graphic. Copy this graphic onto the clipboard.
11. Use *Precise Rotate* to rotate this pair of teeth 36 degrees. Then *Paste* the two teeth back into their original position at the top and bottom of the circle.
12. Repeat Step 11 using -36 degrees, 72 degrees, and -72 degrees in place of 36 degrees. (Alternately typing "`K`"' and "`v`" will make this go faster.)
13. Draw a moderate size circle to represent the drive-shaft hole in the gear. Then delete the large and small circles and use *Select All* and "`g`" to transform your gear into a single graphic.

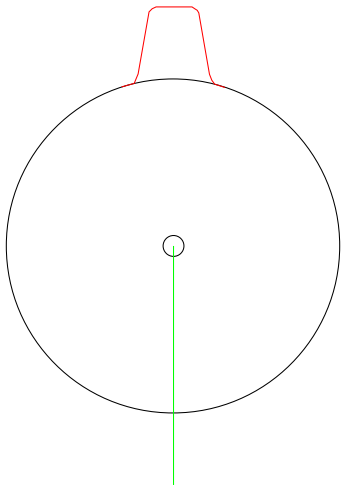
The completed gear, meshing with a copy of itself, is shown below.



Obviously the design of the teeth is far from perfect.



7. Turn on the *gridding* option and draw a vertical line down from the center of the circle to the seventh grid mark below the circle. You can now delete the two diagonals. The figure below shows the drawing after step 7.



8. Next use the *Group* command on the *Structure* menu to combine the tooth and the vertical line you have just drawn into one graphic. Do this by setting the *Select* tool and, while holding down the Shift key, clicking the left mouse button successively on the two graphics[1]. Then, after typing "g", touch the right mouse button.

9. Use the *Flip Vertical* command to invert the group of two elements just combined. Then *Ungroup* them, erase the vertical line and paste the copy of the tooth back into its position at the top of the circle. See the figure at the top of the next page.

[1]Multiple graphics can also be selected by draging a "rubber rectangle" around the graphics you want to include in your selection.

In a sense the *slider* in its box and the black border around the *page* in the viewing area complement each other. When, due only to magnification, the slider is visible, the black border will normally not be, and visa versa. At *Normal Size* the slider covers about 40 percent of the area of the box when the (default) smaller window is used.

1.3 Example: Drawing a 10 Tooth Gear

1. To get a graphic which is not filled in, you need to set *pattern* to "None".

2. To begin drawing the gear, first turn on the *Gridding* and *Grid Visible* commands and then draw a circle about 3.5 inches in diameter centered in the view. (Its radius should be about 16 grid points.) Then draw a small circle (two grid-point wide) at the center of the 3.5 inch circle for later use in centering. (Circles are ellipses plus the shift key.)

3. Extend a vertical diameter one grid point above and below the circle. (The shift key with *line* insures a vertical line here.) Then from the edit menu choose *precise rotate* and rotate this selected diameter by exactly -18 degrees. Draw another such extended vertical diameter and this time rotate it by exactly +18 degrees[1].

4. Drawing the first tooth: Turn off the *gridding* command, but leave the *Grid Visible* command turned on. Type "e" to magnify the drawing by a factor of two. Then use the small upward arrow in the *panner box* to bring the top of the circle to the center of the viewing area. Use *Multi Line* to draw a tooth which starts tangent to the circle at the right-hand diagonal, rises to the level of the seventh grid mark above the top of the circle, continues leftward as a horizontal line for a several grid marks, and then descends to become tangent once again to the circle at the left-hand diagonal[2].

5. Symmetrizing the first tooth: Place a copy of the tooth just drawn onto the clipboard with *copy*. Use *Flip Horiz* on the original and then put the copy back in place using *Paste*. Enlarge the drawing at least one more time and use *Multi Line* again to draw a new graphic which lies between the lines of the two versions already displayed. This third version should now be quite symmetrical. You may, therefore, delete the first two versions of the tooth[3].

6. Use the commands *Normal Size* and *Center Page* on the *Option* menu to re-size and reposition the drawing. Copy the tooth onto the clipboard. The figure at the top of the next page shows the drawing at this stage of development.

---

[1] You may find that generating two additional guide lines seven grid points past the circle at +/- 9 degrees will also help in drawing the first tooth.

[2] The length of the regions of near tangency to the circle should together approximately equal the length of the tooth's flat top.

[3] Further enlarging may make this easier.

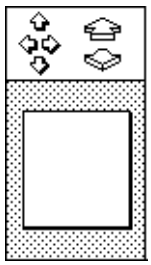
1.1 Enlarge, Scale, Stretch, Magnify and Zoom

To understand the relationships between these five ways of changing size, one needs some terms defined. First there is the *page*, the 8.5 by 11 inch page whose contents will be displayed when you print your drawing. The edges of the *page* are delimited by a think black border which appears only in the view, not in a printed copy. Next, there is the *view*, the area on your screen in which you can draw. Initially (using the default window), when the magnification is unity, the *page* is about 65 to 70 percent wider and taller than the *view*.

Enlarge, Reduce and the other size changing commands on the *Options* menu change the size of the *page* with respect to the *view*. *Enlarge* magnifies the drawing, i.e. shrinks the viewing area relative to the *page*. In addition, the grid spacing will expand in the *view* as magnification is increased. *Reduce* does the opposite. The Zoom arrows in the *panner* and the drawing tool *Magnify* also produce this kind of size change. To use *Magnify*, drag the mouse pointer to produce a rectangular outline of the *region* you wish to enlarge. Releasing the left mouse button causes the *drawing* to be enlarged to where this selected region nearly[1] fills the view.

The drawing tools *Scale* and *Stretch*, on the other hand, change the size of a *selected* graphic (or group of graphics) in the drawing area. *Scale* allows you to use the mouse pointer to scale a graphic about its center; *Stretch* stretches graphics vertically or horizontally while tying down the opposite edge. Neither of these tools change the spacing between grid marks on the screen. They will, however, let you change the sizes of graphics relative to each other, and, if you wish, expand a graphic beyond the border of the *page*.

1.2 The Slider



The *panner* is shown in the accompaning figure. The *mover* and *zoomer* arrows are in its upper section. The box below these arrows contains the *slider*. A *slider* becomes visible in this box when the viewed area becomes smaller than, or off-set from, the *page*. This *slider* is a rectangle which represents the visible area. The area outside it represents the total *page*. (The more you magnify some part of the drawing, the smaller this rectangle becomes.) Clicking and holding down any mouse button on the rectangle allows you to drag it to a different position within the total *page* area. Holding down the shift key while dragging the rectangle restrains its motion horizontally or vertically. Clicking outside the rectangle moves it in the corresponding one of eight directions; for example, clicking to the right of the rectangle moves it to the right. The left and center mouse buttons provide different movement increments. The right mouse button centers the rectangle around the cursor.

[1] Note that all of the above size changing commands and tools work only to the nearest factor of two.

The large table below shows the contents of the *pulldown menus* which contain commands. The names of the complete set of pulldown menus are shown above it.

File	Edit	Structure	Font	Brush	Pattern	FgColor	BgColor	Align	Option

Idraw's Pulldown Menus which Contain Commands

File		Edit		Structure		. . .	Align		Option	
New	^N	Undo	U	Group	g		Left Sides	1	Reduce	i
Revert	^R	Redo	R	Ungroup	u		Right Sides	2	Enlarge	e
Open . . .	^O	Cut	x	Bring To Front	f		Bottoms	3	Normal Size	n
Save	^S	Copy	c	Send To Back	b		Tops	4	Reduce To Fit	=
Save As . . .	^A	Paste	v	Number of Graphics	#		Vert Centers	5	Center Page	/
Print . . .	^P	Duplicate	d				Horiz Cents.	6	Redraw Pg.	^L
Quit	^Q	Delete	^D				Centers	7	Gridding Off / On	,
		Select All	a				Left To Right	8	Grid Visib./Invis.	?
		Flip Horiz	–				Right To Left	9	Grid Spacing . . .	S
		Flip Vert	|			Bottom To Top	0	Orientation	+
		90 Clockwise	]				Top To Bottom	-		
		90 Counter - Clockwise	[				Align to Grid	•		
		Precise								
		Move . . .	M							
		Scale . . .	J							
		Rotate . . .	K							

The pulldown menus in this figure were created using **`Idraw`**

Idraw's Drawing Tools		
Drawing Tool	Action of Shift Key: "V or H" = Vertical or Horizontal	Action of Mouse Button(s)
Select s	Retains previous selections while including (or excluding[1]) another.	Also invoked by right mouse button.
Move m		Also invoked by middle mouse button.
Scale j		
Stretch ;		
Rotate k		
Reshape q		Any other use of mouse terminates the tool.
Magnify z		
Text t		"
Line l	Constrains the *line* to lie on either the V or H axis.	
Multi Line w	Constrains *each segment* to lie on either the V or H axis.	Terminated by middle or right mouse button.
Open Spline h	Constrains *each control point* to lie on either the V or H axis with preceding point.	"
Ellipse o	Constrains the ellipse to be a circle.	
Rectangle r	Constrains the rectangle to be a square.	
Polygon p	Constrains *a side* to lie on either the V or H axis.	Terminated by middle or right mouse button.
Closed Spline y	Constrains *each control point* to lie on either the V or H axis with preceding point.	

[1]To exclude a graphic from those selected, click on it a second time with the left or right mouse button while still holding down the shift key.

Using Idraw[1]

1.0 Discussion

You can use `Idraw` to create and edit drawings containing graphics like text, lines, splines, rectangles, polygons and ellipses. It provides some of the of the same capabilities as MacDraw™[2].

`Idraw` can open an existing drawing when starting up or display a blank unnamed drawing. It displays a single portrait or landscape view of an 8.5 by 11 inch page with a set of tools on the left side of the view and a set of *pulldown menus* along the top of the view. You can pan and zoom the view of the drawing with a sliding knob or adjuster in `Idraw`'s lower left corner. Idraw can save a modified drawing and open another drawing. It can undo and then redo a user-settable number of the last changes made to the drawing. `Idraw` stores drawings in Postscript files which you can print at any time or include in a LaTeX document by using *psfig*. (See the chapter on LaTeX.)

Rather complete *man* pages exist for `Idraw`. These tell you about some of the options (such as `-s` for small-view, and `-l` for large-view) and how to customize the fonts, brushes, patterns, and colors, etc. displayed in the *pulldown menus*. They also contain detailed descriptions of the commands and other features on these menus as well as explanations of the *drawing tools*.

The *drawing tools* which lie vertically along `Idraw`'s left side are listed in the table on the next page. You can set the current drawing tool by clicking on it (or by typing its associated character.) The current drawing tool highlights itself with inverted colors. Clicking the left mouse button in the drawing area invokes the current tool; dragging the mouse pointer begins drawing the graphic from the point where the mouse button was first clicked. The *shift key* mentioned in the table, if used, should be held down while while you click the mouse to begin drawing.

A *panner* is displayed in `Idraw`'s lower left corner, beneath the list of drawing tools. This is a box containing four movers, two zoomers, and a *slider* to allow you to adjust the view in any way you want. Use of the *slider* is described in Section 1.2.

[1] This chapter written by John RB Whittlesey, November 1990.

[2] MacDraw is a trade mark of CLARIS Corporation, Apple Foundation, Inc.