
Diagrams and figures in LaTeX¹

S. Parthasarathy
drpartha@gmail.com

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1 Building diagrams into L^AT_EX documents

L^AT_EX is primarily a tool for desk-top publishing. It does a remarkably good job of typesetting text. But there are situations in which the text has to carry diagrams and figures, for which we will need specific tools.

1. One approach would be to build such tools into L^AT_EX itself, so that figures and diagrams can be seamlessly built with the text itself (e.g. TikZ, pstricks).
2. Another approach would be to create the diagrams and edit them externally (outside L^AT_EX) before merging them with the text[4]. Such an approach makes the diagrams available for use in other contexts and in other situations too.

Diagram editors come in handy in this approach. Some diagram editors are useful only for specific/limited domains, whereas others are more generalised and can be used in many domains.

Dia [1] is a simple, generic and easy-to-use Diagram Editor for Linux. It loosely resembles the MS-Windows software Visio, and comes without the inevitable restrictions and constraints of MS-Windows.

In spite of its simplicity, Dia is extremely rich in features and facilities. Features of Dia include multiple-page printing, export to many formats (EPS, SVG, CGM and PNG), and the ability to use custom shapes [2] created by the user as simple XML descriptions. Dia is useful for drawing SADT diagrams, flow charts, ER diagrams, UML diagrams, network maps, automata, Petri nets, electrical circuits and control systems etc.

¹Texts shown in [winered](#) colour are click-sensitive hyperlinks.

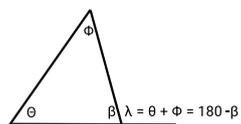
For those who are mathematics oriented, Dia allows use of Greek letters (in the diagrams/figures you draw with it). Choose the right input method (e.g. IBus) from the top menu, choose the appropriate language (e.g. Greek), and type the text you need. Of course, you should have configured your input method (IBus) beforehand, to include the language you want to use (Greek). This makes Dia the ideal choice for creating maths oriented diagrams in L^AT_EX documents.

In addition to the basic default shapes built into Dia, a whole lot of third-party shapes are also available. The user may also build/create his own custom shapes and add to this collection.

Limitations Dia is a versatile tool which offers the user ease of learning and flexibility. However, for images which are more involved mathematically (e.g log plots, polar plots, distributions, scatter diagrams etc.), it would be wiser to use specialised mathematical tools to generate the images and export them in some graphics format (e.g. png, gif, eps). You can then include the image as explained below.

2 A simple example

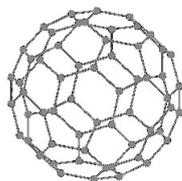
The simplest way to include diagrams in L^AT_EX would be to use the `\includegraphics` command. This command puts the diagram in a running text, as shown below.



and the text continues as usual. But, the interline spacing gets disturbed and could be ugly to see.

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Here is one more example. This image was created and exported as eps using



Geogebra [7]

The image is included using `\includegraphics` command and the text continues as usual. Notice that the inter-line spacing gets disturbed if you use `\includegraphics` like this. The result may look ugly (as seen in the above example). Two more commands `\wrapfigure` and

`\picinpar` are used to wrap text around figures placed inside paragraphs [6].

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2.1 wrapfigure

For mathematically involved diagrams (e.g log plots, polar plots, distributions, scatter diagrams etc.) , it is best to generate them externally, export the diagram in some graphical format (*.eps format is best) and include the diagram using `\includegraphics` or `wrapfigure` as shown in this example.

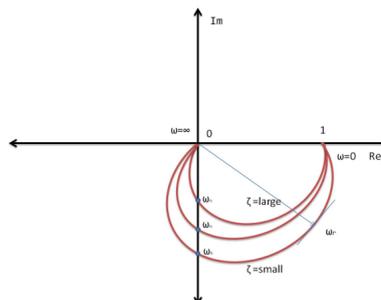


Figure 1: A polar plot

The `\wrapfigure` environment lets you place a figure at the right side or the left side of a paragraph [6] . It offers the possibility of defining the size of the box where the picture will be placed and adjusting its location (inside the box). It is a very convenient tool for creating maths-rich text books and documents.

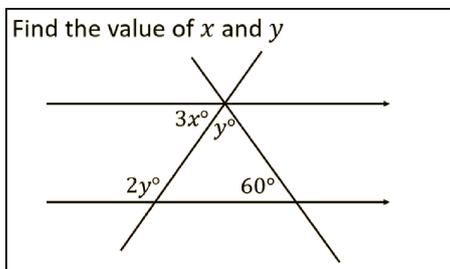


Figure 2: A maths puzzle

Take a look at this simple maths puzzle (you can solve it within your head, without any paper or pencil). Readers will find such texts to be easy to follow, since they can see the corresponding illustration also, as they read the text.

The `\picinpar` package is an alternate way to wrap text around figures [6], but it offers much lesser flexibility of usage. So we do not discuss it here.

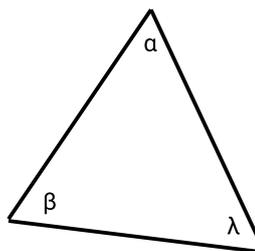
Here is one more example which uses `\wrapfigure` :

In a triangle, the sum of the interior angles adds up to two right angles

The figure is on the right of the paragraph.

In this diagram : $\alpha + \beta + \lambda = 180^\circ$

This relationship is true for any triangle. This diagram illustrates a fundamental property of triangles, and is useful in a large number of applications of Euclidean



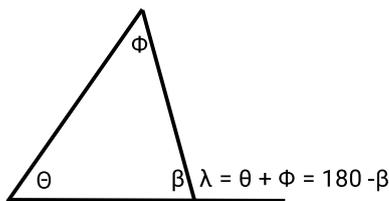
geometry. It is also the basis of many other theorems involving triangles. The proof of this theorem is simple, and is known even to school children.

Notice that the inter-line spacing of the surrounding text does not get adversely affected.

3 One more simple example

A theorem is a statement that has been proven on the basis of previously established statements, such as other theorems, and generally accepted statements, such as axioms [5]. Mathematicians make sure that all theorems and axioms are consistent with one another. This is an example of how mathematics is built, one fact after another fact.

Here is one more theorem from Euclid's plane geometry [3] :



The figure is on the left of the paragraph. In this diagram : $\lambda = \theta + \phi$

This theorem is based on the theorem illustrated above. This theorem itself can be used in other theorems.

Figure 3: External angle

Dia can be used to illustrate some elaborate geometric principles. Here is one more example, made using Dia. This single diagram (on the right) explains all major trigonometric ratios using a quadrant of a unit circle.

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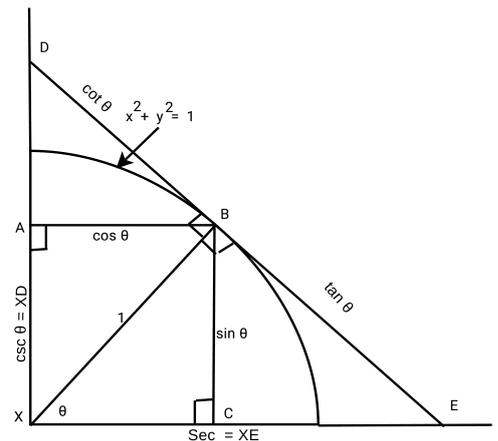
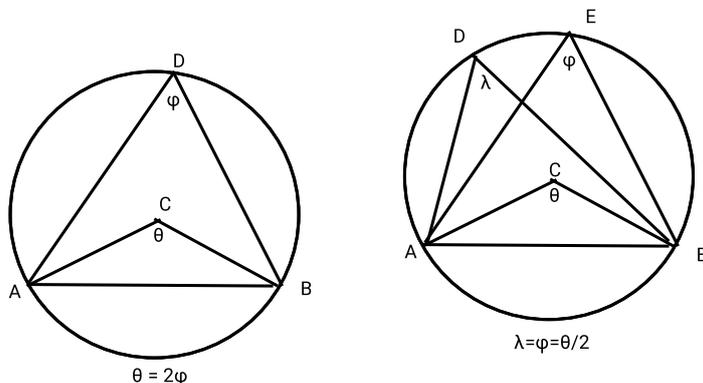


Figure 4: Trigonometric ratios

4 A final example

Sometimes, we may need to put figures in the centre of text. But, it would be clumsy to wrap text around such a figure, because the lines would get cut at inconvenient points, and text would become unreadable to anybody. A better option would be to centre the `\includegraphics` on a separate line by itself. We include below, two diagrams which illustrate two more theorems of Euclidean geometry, using this approach.

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Angles subtended by a chord of a circle

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This is just to show how diagrams enhance the clarity of textual matter, and how we can build diagrams and figures in \LaTeX texts.

5 Concluding Remarks

“A picture is worth a thousand words” . This is very true for mathematical texts written with \LaTeX . We have shown above, a few examples of how Dia can help in creating texts with mathematical (particularly geometry) figures, and thus enhance the clarity of such documents. However, Dia has a few limitations when used for creating diagrams related to mathematics e.g. function graphs, logarithmic plots, probability distributions etc. In such cases, it would be wiser to use other tools which can generate and export diagrams in appropriate graphical formats (e.g. eps, png, jpg). However, it is still easier to use a diagram editor like Dia for adding diagrams in \LaTeX documents rather than cumbersome tools like TikZ, pstricks etc.

This article was created by the author, using \LaTeX under a Linux environment . The \LaTeX source of this article can be obtained by sending a request to : drpartha@gmail.com. Please mention the Ref.No., and the Vers. code mentioned at the top of this article. As always, your constructive suggestions and remarks are always welcome.

References

- [1] Dia Diagram Editor,
<http://dia-installer.de/download/index.html>
- [2] Field-specific, special objects and shapes,
<http://dia-installer.de/doc/en/special-objects-chapter.html#N40841>
- [3] Aref M.N., Wernick W,
Problems and Solutions in Euclidean Geometry,
Dover Publications, New York.
- [4] S. Parthasarathy,
Using Dia in LaTeX
<http://drpartha.org.in/publications/dia-try1.pdf>
- [5] S. Parthasarathy,
Theorems and friends,
<http://drpartha.org.in/publications/theoremcorollaries.pdf>
- [6] S. Parthasarathy,
Wrap text around figures,
<http://drpartha.org.in/publications/wraptext.pdf>

[7] Geogebra,
<https://www.geogebra.org/>
