Traversing LaTeX

The Harried Undergraduate's Guide

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The Oxford University Computer Science and Technology Society

February 22, 2025

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Fig. 1. A sample of the code used to typeset this slide

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- LaTeX documents look quite different before and after they've been processed!
- It might look a little scary at first, but once you get over the learning curve LaTeX becomes a very powerful tool.

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A (very brief) History of LaTeX[1]

- LaTeX's genealogy can be traced back to TeX, a typesetting tool created by Donald Knuth in 1978. TeX is a more basic set of commands and macros than LaTeX, and still forms the basis of LaTeX — a lot of what we'll learn today is technically TeX, not LaTeX!

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- LaTeX was developed by Leslie Lamport in the early 1980s, as a package of macros on top of TeX. The current standard, LaTeX 2_ε, was released in 1994.
  LaTeX has been designed with the intention of separating presentation from content; the intention is that you just need to type up your document semantically, and LaTeX will handle the difficult formatting bits. We'll see a lot of ways in which LaTeX makes things easier for us in this way in the talk.

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- If you're doing a third- or fourth-year project, you'll need to write a report. That report will probably need to be written in LaTeX.
- It's just fun to use LaTeX! It's very rewarding to make beautiful documents.

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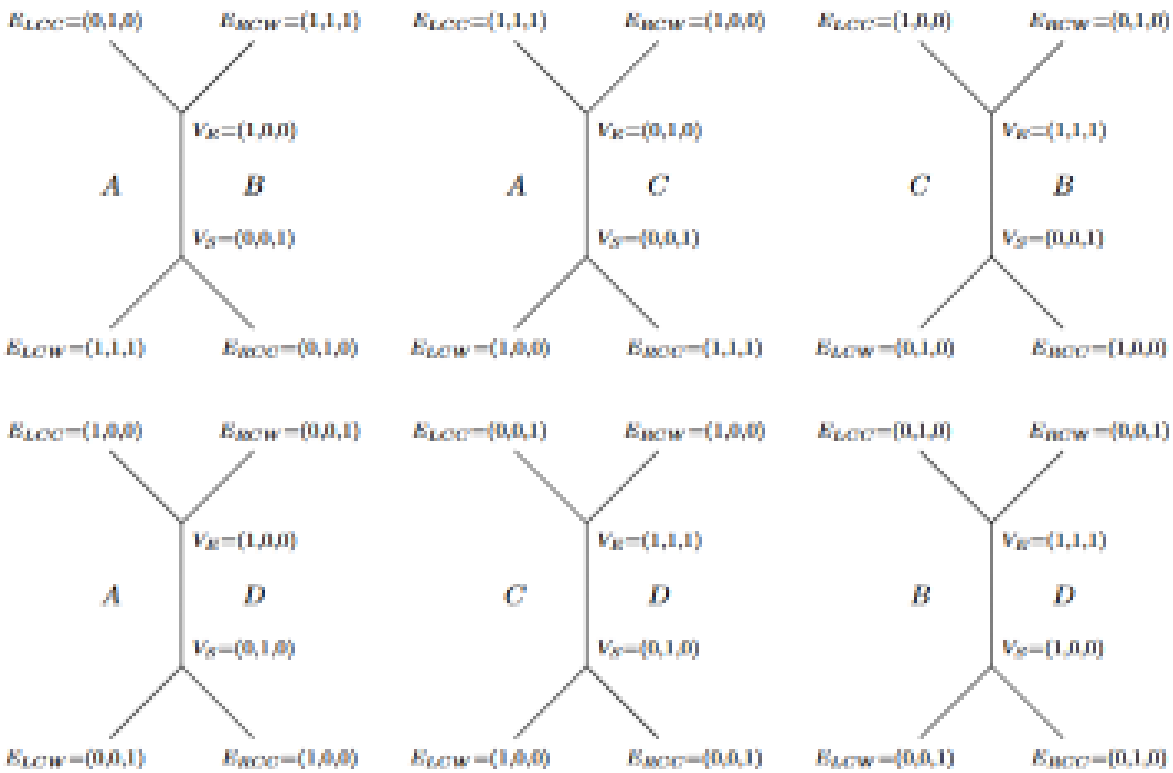
If using B-rep, then, the winged-edge structure starts off looking like:



The final convex hull has an identical structure, but with every instance of $(1, 1, 1)$ replaced with $(3, 3, 3)$, with new corresponding faces. Said replacements are the intermediate edges added during the algorithm's running.

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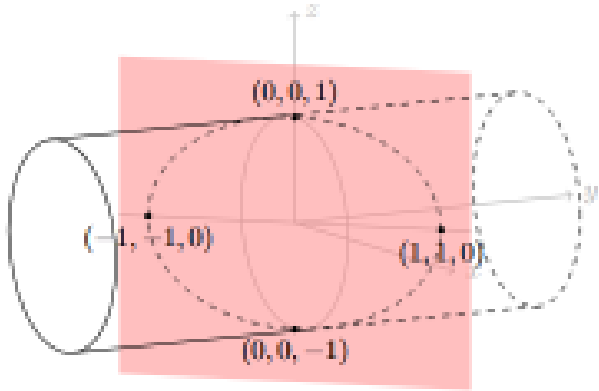
Q5. (a) We get a cylinder lying on its side, cut diagonally, as below::



Note that the ends of the cylinders are only included above to make the diagram look like a cylinder; the cylinder really should be infinitely long.

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1. We may encode the transition relation on the above LTS as such:

Transition	x_1	x_1'	x_2	x_2'
$(0,0)$	0	0	0	0
$(0,1)$	0	0	0	1
$(0,2)$	0	1	0	0
$(0,3)$	0	1	0	1
$(1,0)$	0	0	1	0
$(1,1)$	0	0	1	1
$(1,2)$	0	1	1	0
$(1,3)$	0	1	1	1
$(2,2)$	1	1	0	0
$(2,3)$	1	1	0	1
$(3,2)$	1	1	1	0
$(3,3)$	1	1	1	1

From this and by inspection, we can write out an equivalent Boolean formula which captures the relation as:

$$\neg x_1 \vee x_1'$$

Which seems quite simplified.

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(e) Again, we'll follow Sider in LfP 9.7:

(1) $\forall\alpha\Box\phi \rightarrow \Box\phi$
(2) $\Box(\forall\alpha\Box\phi \rightarrow \Box\phi)$
(3) $\Diamond\forall\alpha\Box\phi \rightarrow \Diamond\Box\phi$
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and so it follows that $\vdash_{\mathrm{SQML}} \Box\forall\alpha\phi \rightarrow \forall\alpha\Box\phi$.

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All these were put together in a week or so, for problem sheets. Once you get the hang of it, it's pretty easy to make pretty documents pretty fast.

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- If at any point you have any questions, do stop me and ask them!

Getting Set Up

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- For a proper editor that's free and open source, I'd recommend getting TeXworks (which is what I'm using to edit these slides in!). It's quick and easy to set up, and comes with a bunch of useful features (compiles many distributions of LaTeX, manages references, lets you split up your project into many files) and is easily extensible with your own features.

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- If you just want to play around and follow these slides for a bit, though, there are online editors as well — I've heard that Overleaf is good for this.

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- Let's fix the latter issue first. How do we lay things out more nicely?

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Discrete Maths 1

Hera Brown
February 21, 2025

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Discrete Maths 1

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- If you ever see a symbol out in the wild, and can't recognise it, do visit https://detexify.kirelabs.org. It lets you draw in the symbol by hand, and gives you a list of what macros might typeset that symbol — it's very comprehensive!

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and then wherever we wanted to typeset $[g]^{\alpha}_{f^u_{\beta}}$, we'd just type `$\g$` instead. Neat!

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- This generalises; if you replace the "1" in the above with "2" or "3", for instance, you can then define a macro with two or three parameters!

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  Which is just how the code examples in these slides were made.

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If you ever need help with something LaTeX-related, fire me a message! I'd be happy to help out.

Thanks for listening!

Any questions?