

How to Use Edith: The Euler Diagram Theorem prover

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Before You Begin

If you already know about Euler diagram reasoning, and just want to start using Edith, read on. Otherwise, check out the basic Euler diagram reasoning information first: <http://www.cmis.brighton.ac.uk/research/vmg/EulerDiagramReasoning.pdf>.

Before Edith will run, you need to make sure that the JRE is installed on your machine, available from www.tucows.com/preview/194327, version at least 5.0.

NOTE: Edith will **NOT WORK** properly with older versions of the JRE.

This guide will show how to get started using Edith, how to use Edith as an automatic theorem prover and how to write proofs manually using Edith.

If you have any further queries about using Edith please contact Gem Stapleton: g.e.stapleton@brighton.ac.uk

Getting Started Using Edith

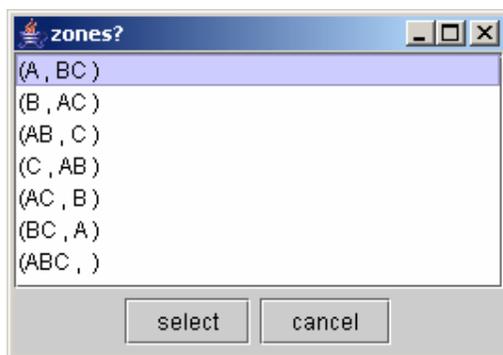
Before you can perform any reasoning, you need to enter some diagrams. To enter a diagram, select File -> new diagram. A window should appear as below:



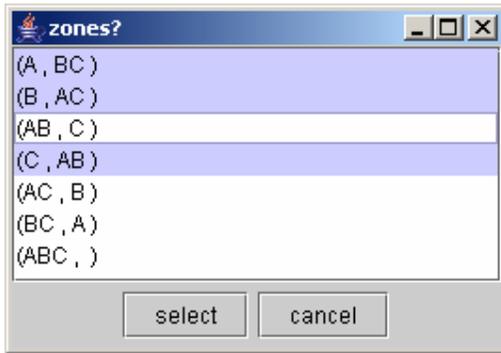
The contour names (sometimes called contour labels) can ONLY be single letters and are NOT separated by a comma or a space. For example, if you want a diagram with contour labels A, B and C, then enter ABC:



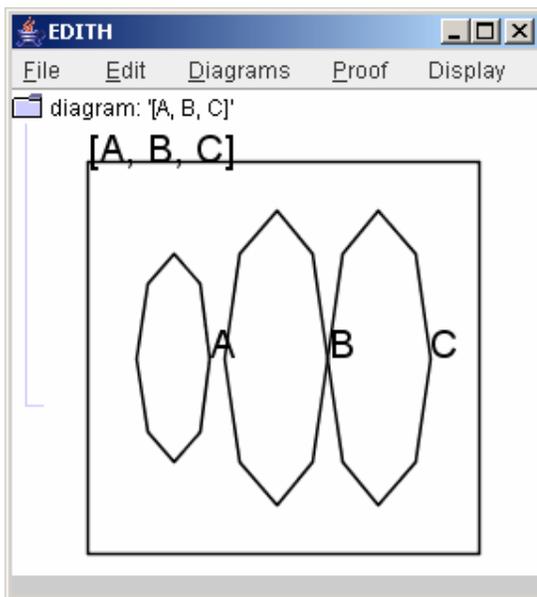
After pressing OK, Edith will present you with the zones that can be in your diagram, based on the contour labels you want.



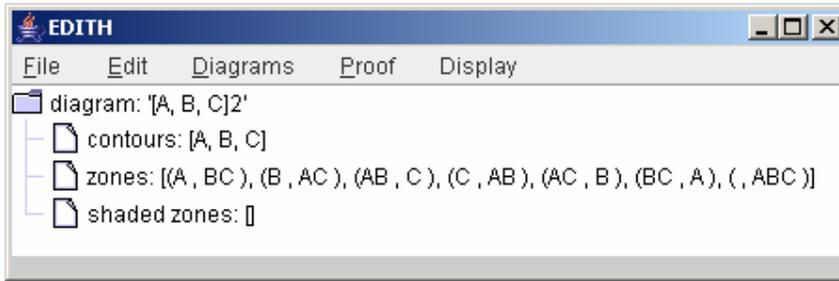
If you want A, B and C to be pairwise disjoint, for example, then select the zones as shown below (to select non-adjacent zones, hold down the ctrl key). Note that every Euler diagram has a zone which is outside all of its contours, so this zone is automatically included for you and, thus, not on the list of zones to select.



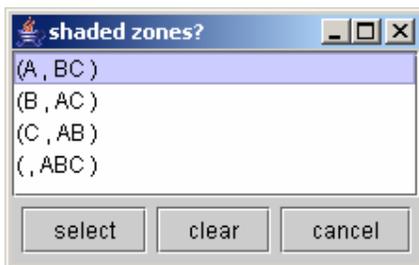
Edith will then, if possible, draw an Euler diagram after you have pressed the 'select' button. In the chosen example, Edith can draw the required Euler diagram.



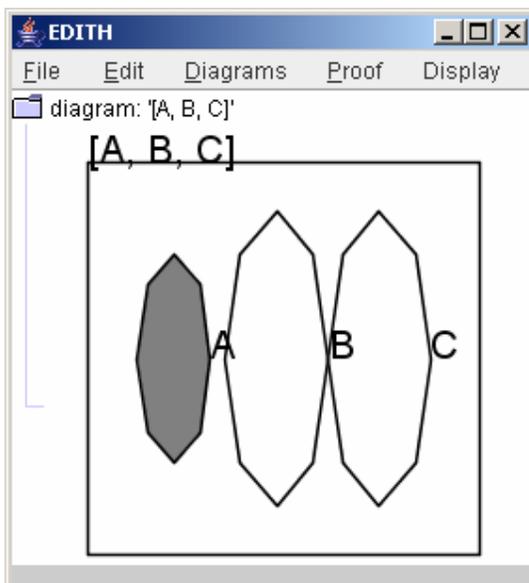
If it is not possible to draw the diagram then Edith will present you with the abstract syntax, which will look something like this:



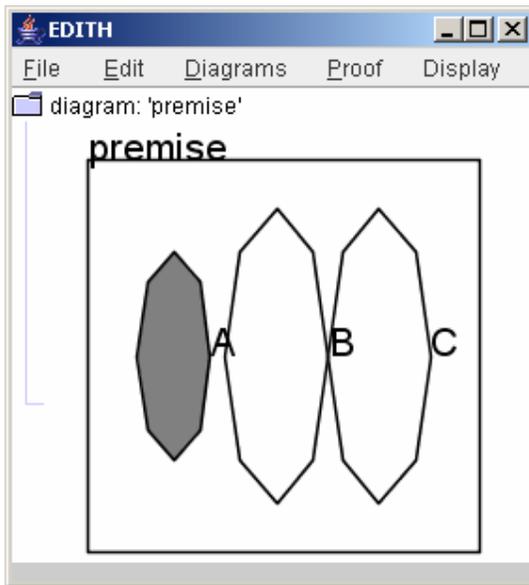
So far we have entered a basic Euler diagram. You might also want some shading in your diagram. To add shading, click on Edit -> edit shading. The list of zones in the diagram will be displayed. Click on those you want to be shaded whilst holding down the control key. In our example, we will shade the zone inside A.



After selecting the zones to be shaded, Edith will update your view of the diagram.



Other editing options include the facility to change the diagram's name and, in case you change your mind after entering the initial zone set, the zones can also be edited, for example. At the moment, our example diagram is called [A,B,C]. This name was chosen by Edith and we might want to chose a more sensible name, like 'premise'.



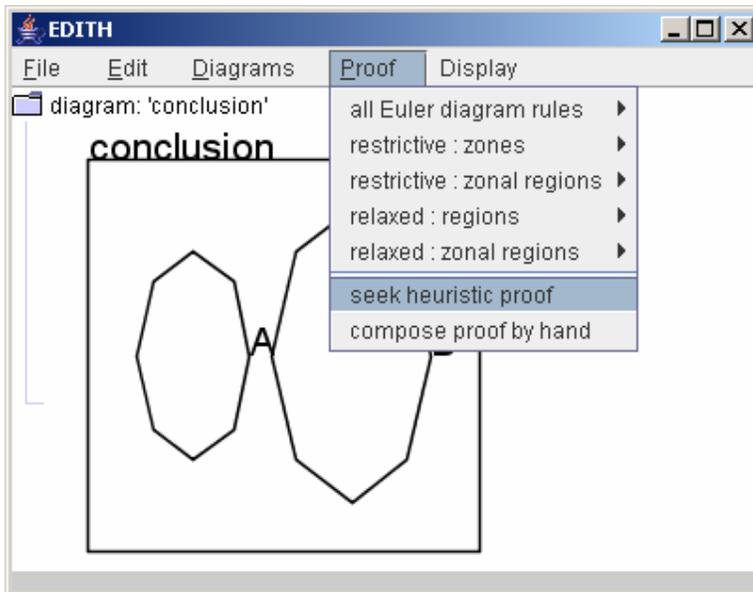
After you have entered several diagrams, you can switch between views. To do so, click on Diagrams -> <name of diagram> to display the diagram you are interested in.

Automated Theorem Proving.

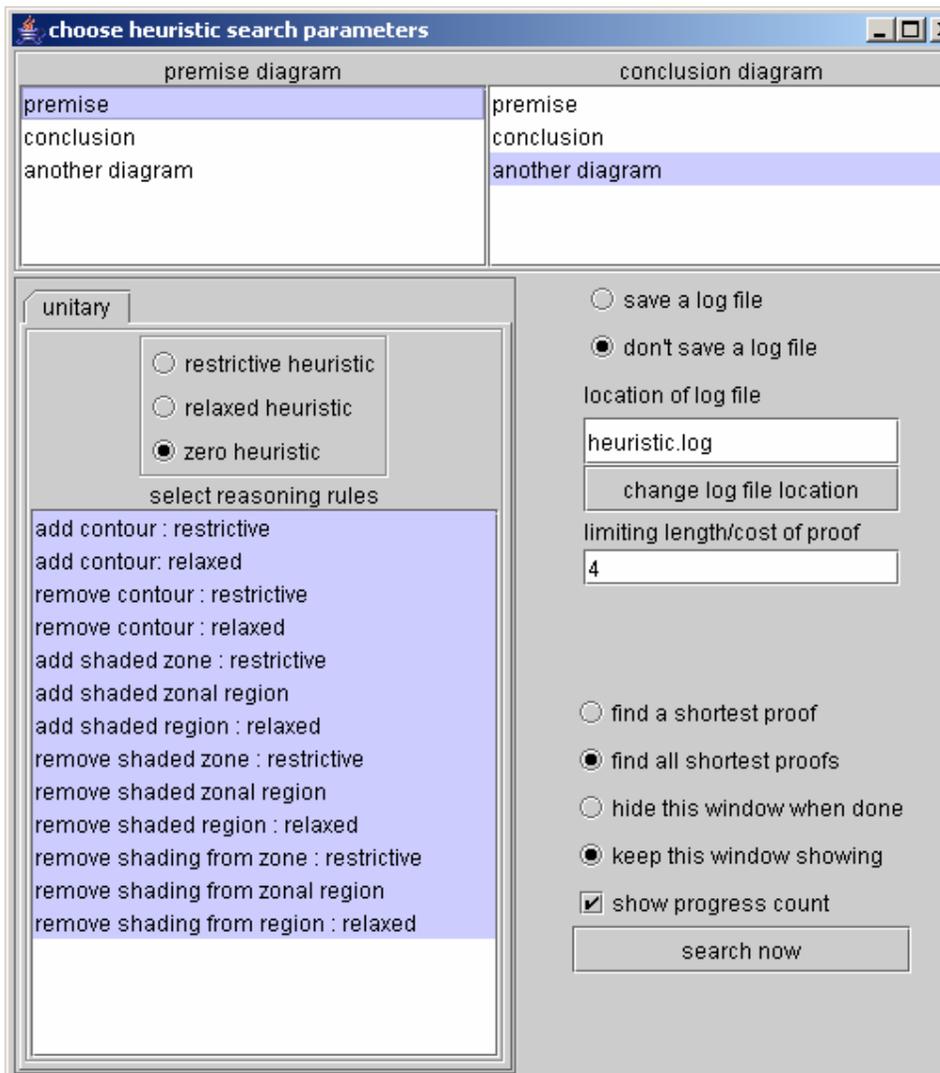
Edith is able to find a shortest proof, whenever a proof exists, given sufficient time, memory and limiting proof length (more on this later), when used according to the instructions below.

Before you start to write a proof, you need to have entered your premise diagram (that you assume to be true) and your conclusion diagram (that you wish to deduce).

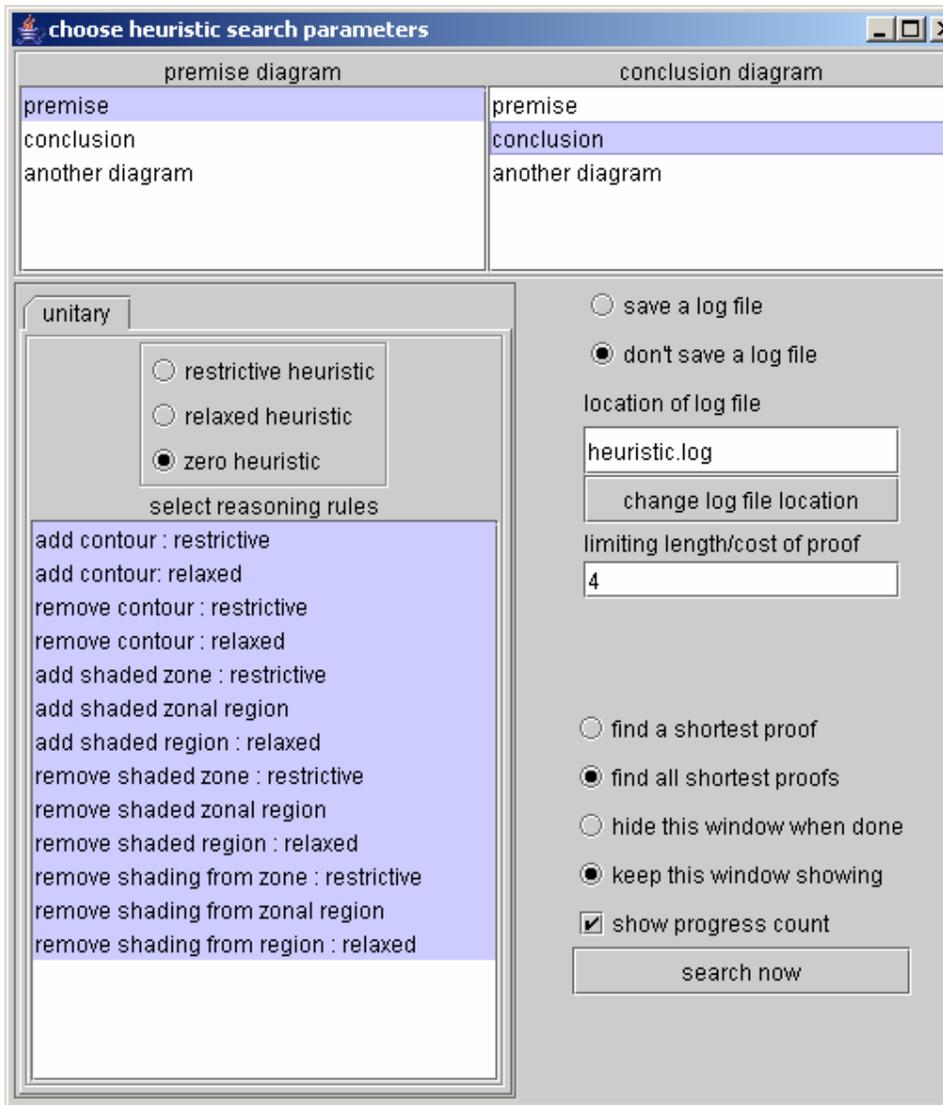
In order to invoke Edith's theorem proving abilities, the first step is to click Proof -> seek heuristic proof.



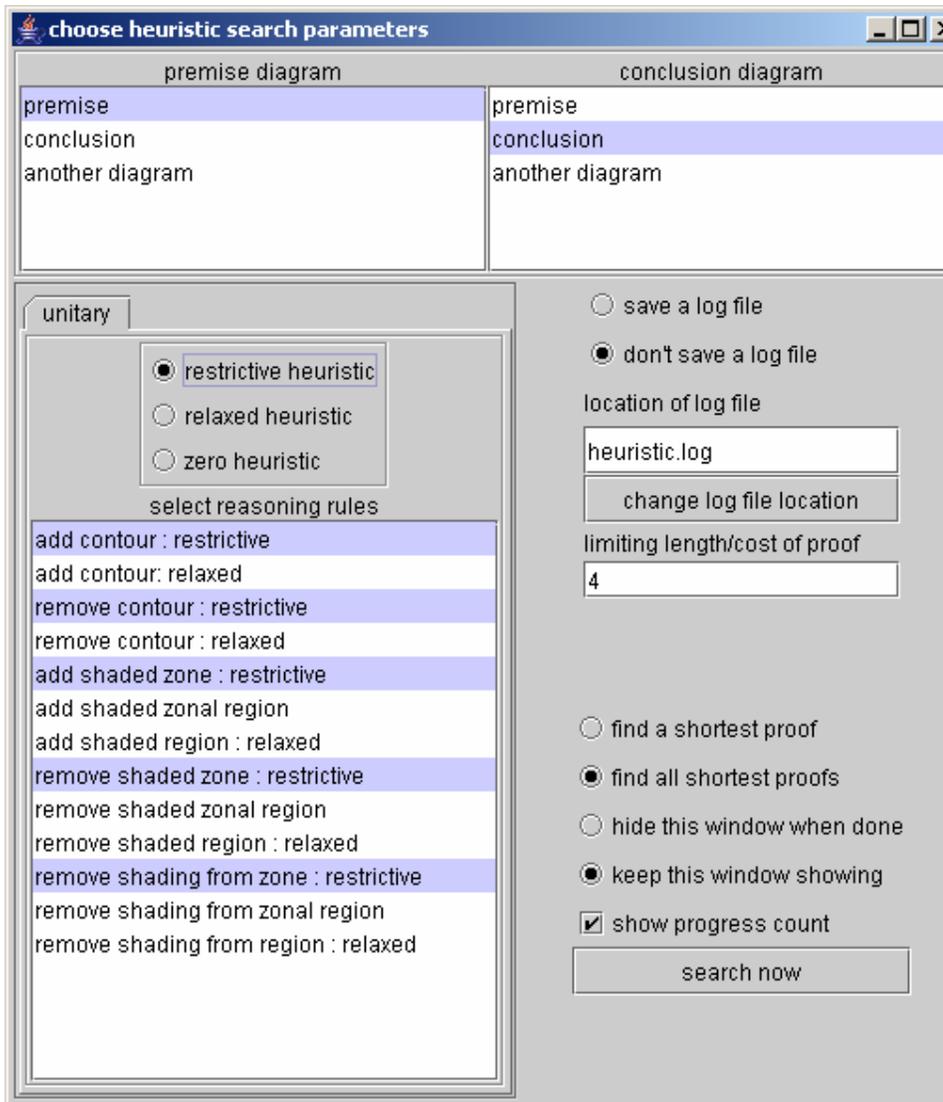
This brings up a dialogue box, shown below.



Select your premise and conclusion diagram from the lists of diagrams.



The next stage is to decide which reasoning rules we want Edith to use. For beginners, it is recommended that the so-called restrictive rules are used. Clicking on the 'restrictive heuristic' button automatically selects these rules, shown in the next screenshot. The heuristic guides Edith towards a proof more quickly than just doing a blind search. If you want to compare the difference using the restrictive heuristic and a blind search then you can perform a blind search also, by selecting the 'zero heuristic'.



This default selection of rules can be overridden – just hold down the ctrl key and click on the relevant rule to select/deselect.

There is also another heuristic option, called the relaxed heuristic. The table below shows recommended combinations of rules together with an appropriate heuristic choice. Other rule combinations/heuristics may be used but are not generally advised because this may result in either an overly long proof being found (i.e. not a shortest proof) or finding no proof at all.

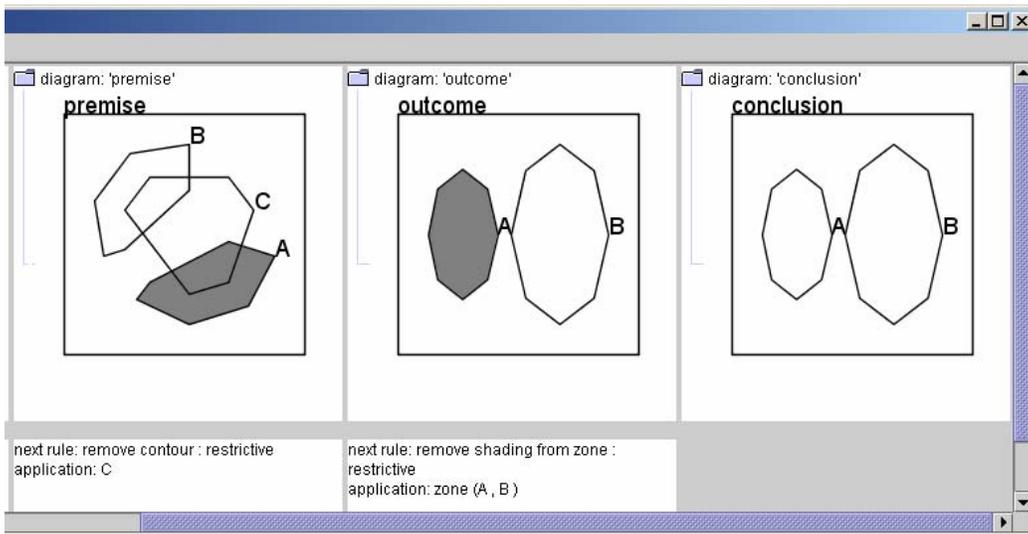
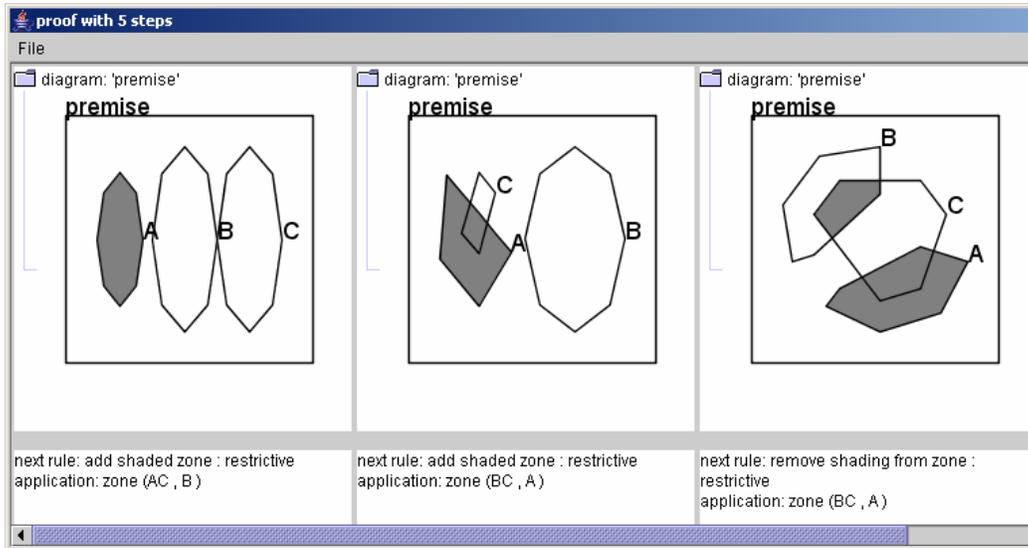
Rule Combination	Appropriate Heuristic
add contour : restrictive remove contour : restrictive add shaded zone : restrictive remove shaded zone : restrictive remove shading from zone : restrictive	Restrictive heuristic.
add contour : restrictive remove contour : restrictive add shaded zonal region remove shaded zonal region remove shading from zonal region	Restrictive heuristic
add contour : relaxed remove contour : relaxed add shaded zonal region remove shaded zonal region remove shading from zonal region	Relaxed heuristic
add contour : relaxed remove contour : relaxed add shaded region : relaxed remove shaded region : relaxed remove shading from region: relaxed.	Relaxed heuristic

Once we have chosen our premise and conclusion there are a few more decisions to make before we set Edith the task of finding a proof. You will probably have noticed some buttons on the righthand side of the previous screenshot that allow us to choose whether to save a log file. The contents of a log file are technical and so you probably do not want to save one. A bit further down you are asked for a limiting length/cost of a proof. By default, this is set to be 4. It tells Edith how long you are prepared to let proofs get before you want to give up. For simple tasks, the default of 4 is ample, but the more complicated the proof, the higher you might want this number to be. It all depends on how long you are prepared to wait before giving up searching for a proof.

We can also decide whether we want all shortest proof to be found or just one. It can be time consuming to find all proofs. You can ask Edith to automatically close the ‘choose heuristic search parameters’ window after finding a proof – useful if you do not want to search for another proof. Edith can also be asked to show a progress count. The progress count tells you how many diagrams Edith has created in its search for a proof, most of which are not actually part of your proof, so you can see how much work Edith is doing for you.

After making all your selections, click search now. Then Edith will seek a proof and display the proof to you if one is found within all your search criteria.

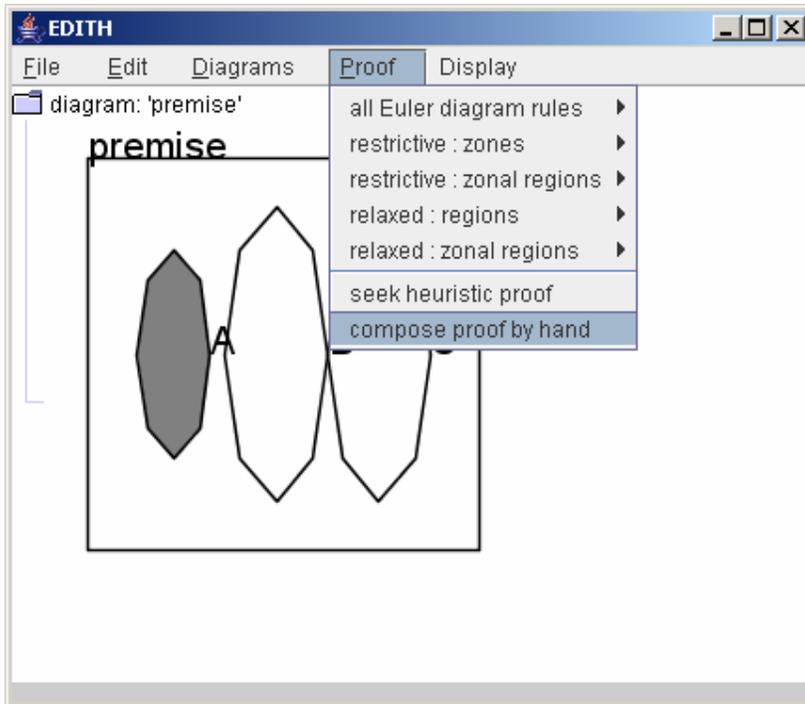
After seeking a single proof from the premise to the conclusion in our example, this is the output generated by Edith. Note that in this case, a limiting length of four was not high enough and had to be increased. Underneath each diagram (other than the conclusion) is an explanation of the rule Edith has applied to that diagram, and the way in which the rule has been applied.



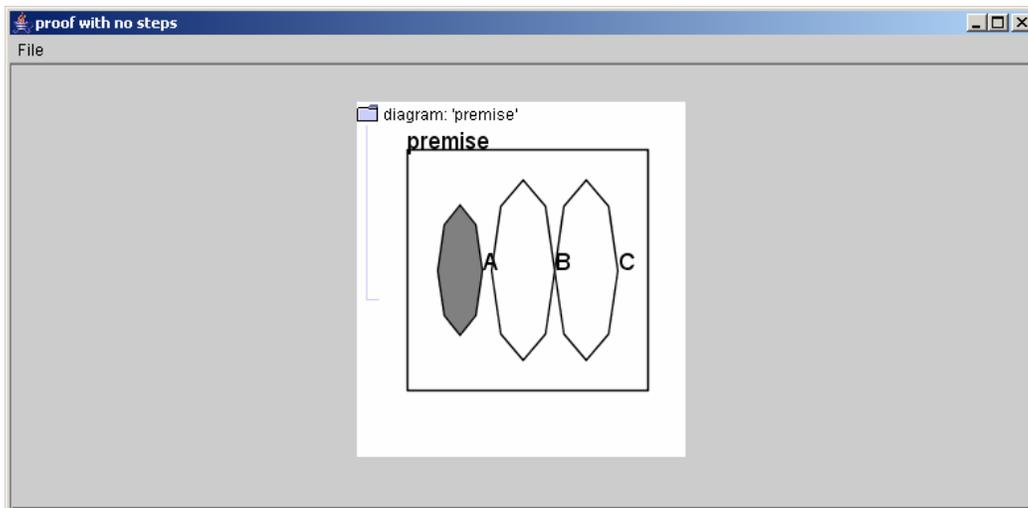
Note that the proof above has length 5, but six diagrams are displayed. The length of a proof is the number of times Edith has applied a reasoning rule to get from the premise diagram to the conclusion diagram.

Composing Proofs by Hand

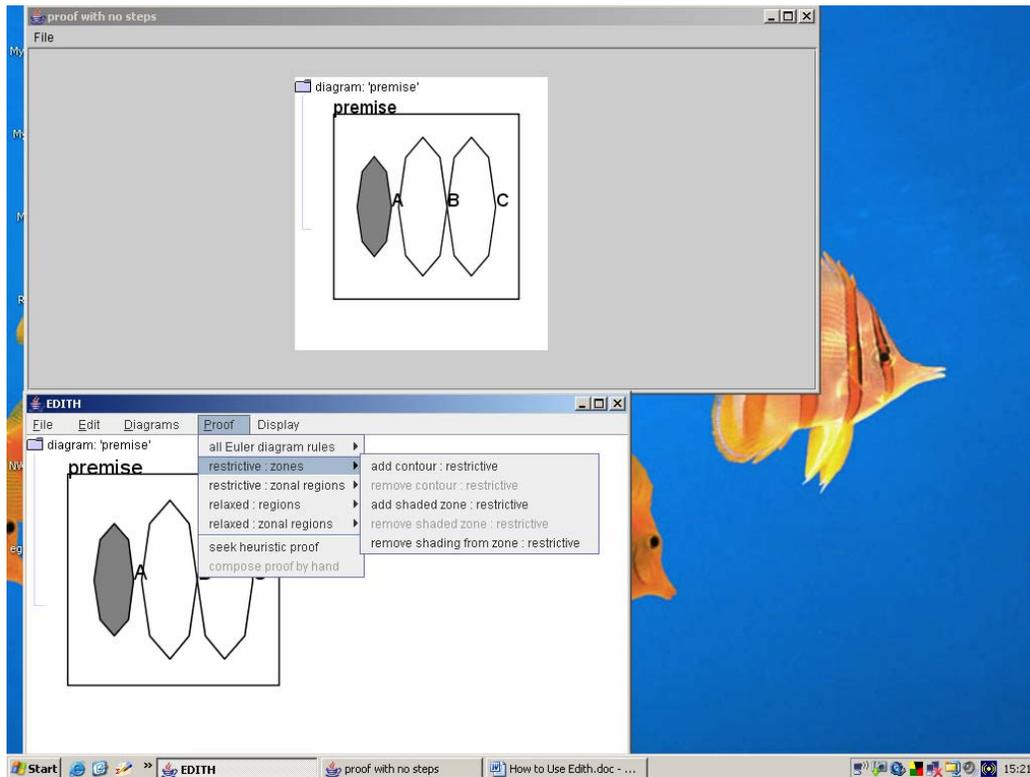
You can compose proofs by hand and apply rules to diagrams. First, make sure your premise diagram is in Edith's display. Then click on Proof -> compose proof by hand.



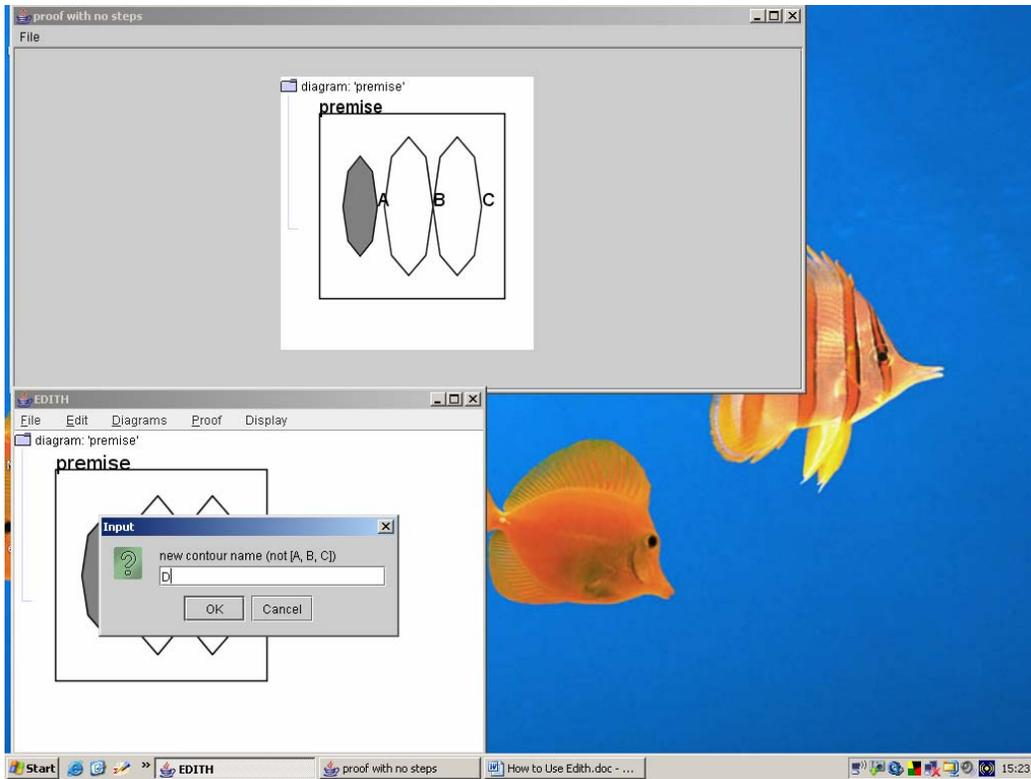
This brings up a new window, as shown below.



Next, click on Proof, and then hover the mouse over the set of rules you are interested in.



You'll see that only certain rules are enabled. Those not enabled cannot be applied to the current diagram in the proof window. If we want to add a contour with name D, then we select the add contour : restrictive rule and then type D in the dialogue box.



After clicking ok, Edith updates the proof window and Edith's window. You can then continue to apply other rules.

Acknowledgement

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