Automatic Placement with Madonna

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The job of placing the instances can be performed by an automatic tool which was called after one of the most famous singers of the 1980'ies[1]. She places the instances such that the total wire length is (hopefully) minimized. As we all know, *madonna* is rather unpretentious; If you like, you can improve her results manually using the other commands in the instance menu. A circuit which was placed using *madonna* can be routed automatically, since *madonna* makes sure that all instances are present in the layout.

1 What is required before I can call ⬚Madonna ?

Madonna is very sensitive to errors in her input. To prevent offending her the following data must be present:

- A proper circuit description in the database. *Seadali* complains if a circuit description with the specified name doesn't exist. Do not forget to convert your *sls* network description into the database using *csls*.

- For each of the son-cells (instances) in the circuit description a layout must exist which has the same name. We made sure that this is always the case for all library cells.

If there is an error in the netlist description *madonna* opens a window to explain what you did wrong.

2 Running *madonna*

Just like *fish*, *madonna* can be called both from *seadali* and the command shell.

2.1 From *seadali*

Calling her by pressing the button ⬚Madonna in the instances menu is the most convenient for you. Pressing this button will overwrite the design which your are currently editing in *seadali*. Therefore you will be asked whether you are sure to continue in case the workspace is not empty.

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[1] And 90'ies.

As next step you must enter the name of the circuit which has to be placed. A small menu will appear, in which you just click $\boxed{\text{DO IT !}}$ to start *madonna*. In the menu some optional features of can be set for *madonna*:

$\boxed{\text{set box}}$ Set the box within which *madonna* has to place the instances. Click the right-top corner. In this way you can control the shape and the size of the placement. Specifying a big box will leave quite some unused transistors. Specifying a very small box will squeeze the instances on minimum area. If the box is too small, *madonna* will expand it in either the x- or the y-direction, depending on what you specified. It is better not no make the box much to small, because *madonna* will have a hard time recovering from that.

If the workspace was empty, *seadali* will make an empty image array before you can specify the box. In this way you have some reference for the size of the box.

$\boxed{\text{X-expand}}$ Force *madonna* to expand horizontally if the box was too small. This is default.

$\boxed{\text{Y-expand}}$ Expand vertically if the box was too small.

$\boxed{\text{Channels}}$ Create a placement with routing channels. If this feature is active, *madonna* computes the amount of space that *trout* needs to complete the routing process successfully. This computation actually involves a call to *madonna*'s internal global router. A report of the global routing process is written to the file `seadif/groutes`.

Note that the routing channels increase the layout area in both the X and the Y direction, regardless of the preferences indicated by means of the $\boxed{\text{X/Y-expand}}$ buttons or the $\boxed{\text{set box}}$ button.

$\boxed{\text{Options}}$ Set any other (unofficial) option which you want to propagate to *madonna*. Don't touch this button unless you know what you are doing.

$\boxed{\text{DO IT!}}$ Start *madonna*. This may take anywhere from 30 seconds up to 10 minutes, depending on the number of instances and the system load. You can kill *madonna* using the $\boxed{\text{KILL}}$-button.

You can try to place the circuit with various shapes and sizes.

Can I pre-place some instances? No, *madonna* is quite possessive. She wants to do everything herself. She will always place all instances in your circuit description. Pressing $\boxed{\text{Madonna}}$ a second time will overwrite the existing placement. You can only request her to place the instances in a certain box. Obviously, you can modify *madonna*'s placement manually using the buttons in the instance menu.

2.2   Calling *madonna* **from the command line using** *sea*

The non-interactive way to call her is by using the tool *sea* from the command line:

```
[op5u9/myproject]   sea -p name
```

in which *name* is the name of the circuit cell. As a result, the output placement will be written into the layout database. The program *sea* is a kind of bodyguard to *madonna*, it checks the correctness of your input. Only if everything is correct, it calls *madonna* to look at your circuit.

Sea also allows you to place and route a circuit in one step:

```
[op5u9/myproject]  sea hotelLogic
```

for instance, will place and route the cell `hotelLogic` and write the result into the layout database under the name `hotelLogic` (use the '-o name' option to write it under a different name). Just type

```
[op5u9/myproject]  sea -h
```

to see all the options.