

# Renew Plugin FA – User Guide

Release 2.2  
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## Introduction

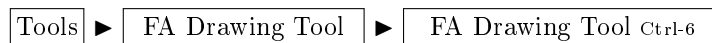
On the following pages, you will learn about the usage of RENEWS plugin *FA*. The plugin allows for drawing of finite automata. The first part describes the activation of the plugin and the second part covers its capabilities concerning drawing. Simulation of drawn automata is not part of this manual, as it is facilitated by the companion plugin *FA Formalism*. Thus, instructions on simulation is given there.

## Activation

Some RENEW packages include the FA plugin. In this case, the plugin is automatically loaded on startup of RENEW. However, this just means it is ready for activation. Only after activating the FA toolbar, the plugin is accessible.

This manual assumes you have started up a fresh instance of RENEW (see figure 1).

The following menu items show how to activate the toolbar (see figure 2):



You have successfully activated the FA toolbar, if it is shown as the third row in the main window of RENEW (see figure 3).

## Opening a drawing

To draw a finite automaton it is necessary to create or open a new drawing. This drawing has to be of type *Finite Automata Drawing* (FA drawing).

To create a new FA drawing, navigate along the following menu items (see figure 4):



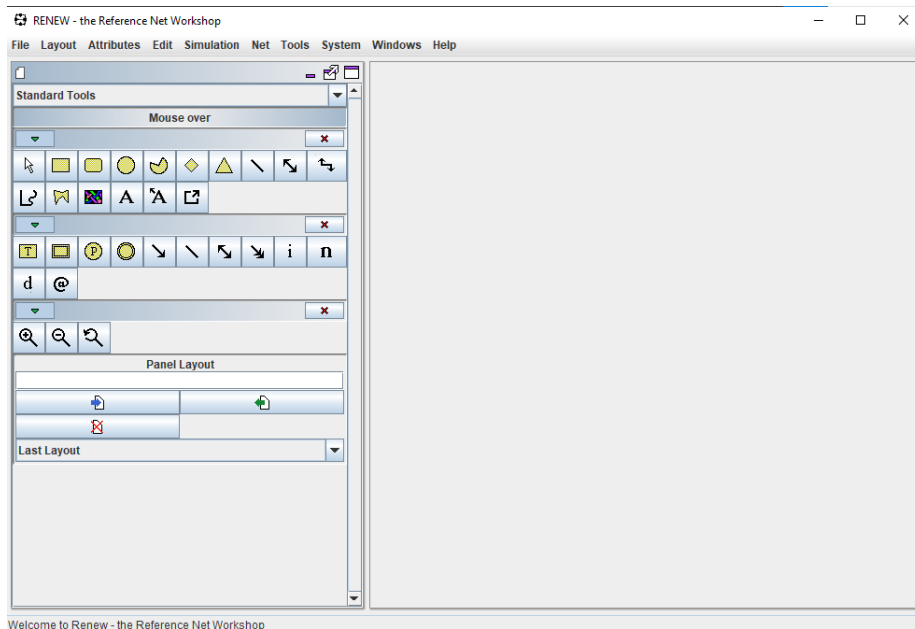


Abbildung 1: Starting point – a fresh instance of RENEW

Subsequently, a dialog box pops up which lets you choose the drawing type to use (see figure 5). To create an FA drawing choose *Finite Automata Drawing (\*.fa)*. A new window will open, showing the drawing area of that drawing.

## Drawing

The tools of the FA toolbar are used for drawing finite automaton. They are named as follows (according to figure 3 bottom and l to r) :

- Startstate
- State
- Final state
- Start-Final state
- Naming (n)
- Inscription (i)
- Word (w)
- Arc
- Loop

You use a tool by choosing it with a left click and then apply it one-time by another left click into the drawing area. That way you can draw states to desired locations, whereas arcs need to be drawn per drag'n'drop from source

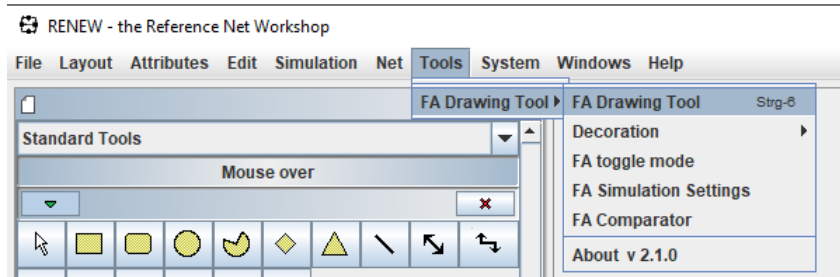


Abbildung 2: Activation of the FA toolbar

to destination state. Loops are drawn by a single click to the according state. Words can be added to star states via left click. They can be edited by right-clicking them. A start state may have at most one word. Figure 6 shows a simple FA drawing, drawn with the FA toolbar.

When choosing a state by left click, anchor points for this state are shown. Rectangular anchor points allow for scaling the state. Round anchor points allow for drawing a further state by drag'n'drop, which is connected to the base state with an arc.

Also when choosing an arc by left click, anchor points are shown. Rectangular anchor points allow for changing the source or destination state by moving the arc tips. Round anchor points allow for arc bending.

Naming and inscribing<sup>1</sup> can only be attached to elements. By right clicking a state it is named with an automatically increasing tag (from  $Z_0$  upwards). Via right clicking an arc a default inscription  $a$  (for NFAs) or  $a, \rightarrow X$  (for PDAs) is attached to it.

In addition to these elements, all elements of the top toolbar (drawing tools) can be used. It should be noted that those do not have any semantics, thus are only for display purposes.

Further features are accessible via the menu points **Tools** ► **FA Drawing Tool**.

**Decoration** allows for changing the type of the currently selected state(s). By changing the type in this way it is not necessary to delete it, inscriptions and arcs, which would then have to be reattached. Furthermore, the representation of states is switchable between an alternative (see figure 6b) and a standard type via the menu item **FA Toggle Mode**. The purpose and functionality of the **FA Simulation Settings** is covered in the FAFORMALISM guide.

With the **FA Comparator**, it is possible to compare the languages of NFAs. On the left-hand side of the newly opened window, a template in form of an *fa*-drawing or regular expression can be entered. On the right-hand side,

<sup>1</sup>The difference between the text tools lies in the semantics. Inscriptions and words are considered while simulation, whereas namings are not.

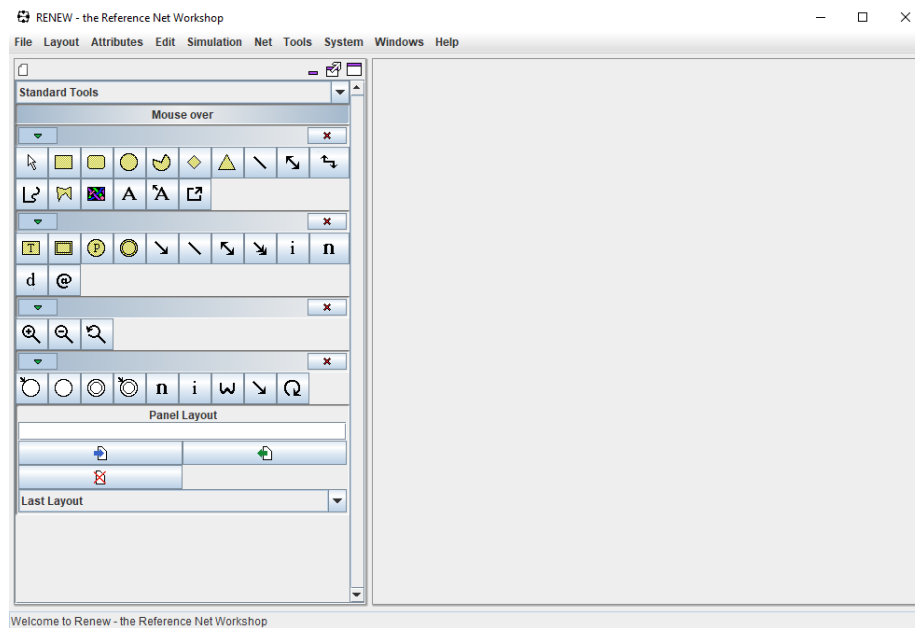


Abbildung 3: RENEWinstance with activated FA toolbar

multiple *fa*-drawings can be added. By using the *Compare* button, all drawings from the right-hand side are one-by-one compared to the template. The result of this comparison will be printed into the console. If the languages are not equal, the shortest separating word will also be given.

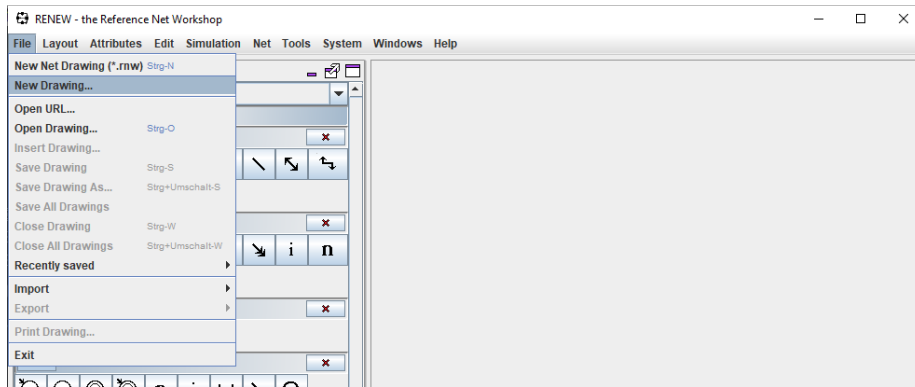


Abbildung 4: Creating a new FA drawing

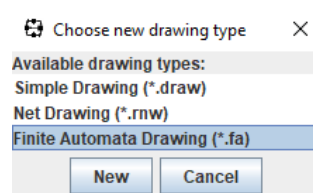


Abbildung 5: Dialog box for choosing the drawing type

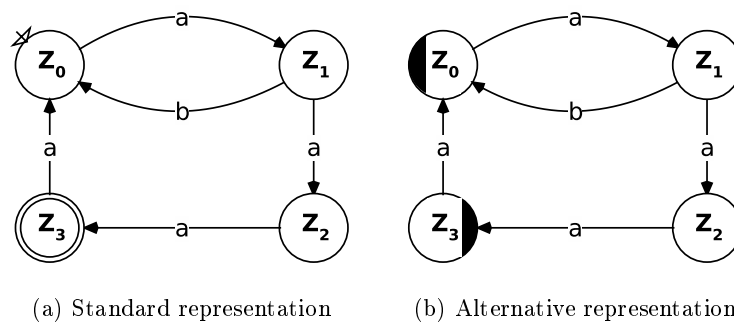


Abbildung 6: Finite automaton drawn with the FA toolbar shown in two representations