

User Manual

Elvira 0.11.

Graphical User Interface

Carmen Lacave – UCLM
Fco. Javier Díez – UNED

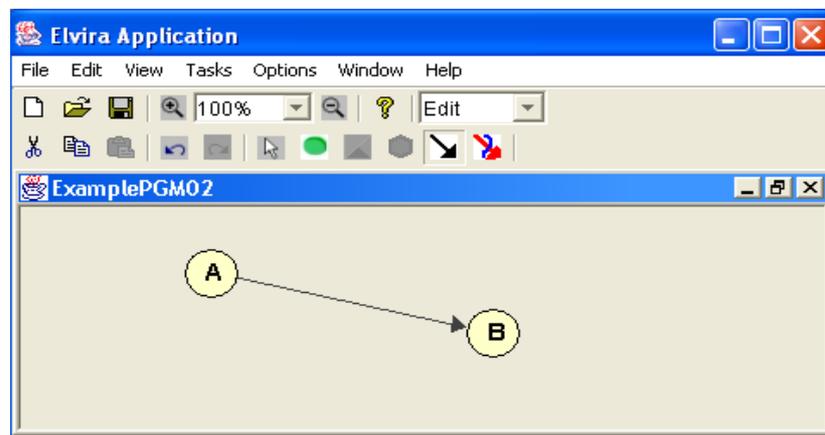
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Elvira can operate in three modes:

- **Edit**, to create and modify Bayesian networks and Influence Diagrams whose variables are only discrete.
- **Inference**, to do evidence propagation and abduction. Most of the explanation capabilities of Elvira are offered only in this mode.
- The **learning** mode allows to build Bayesian networks from databases.

Elvira is implemented to be run in several languages. And, as other graphical tools, the user can open different windows simultaneously in order to perform different tasks.

Edit Mode



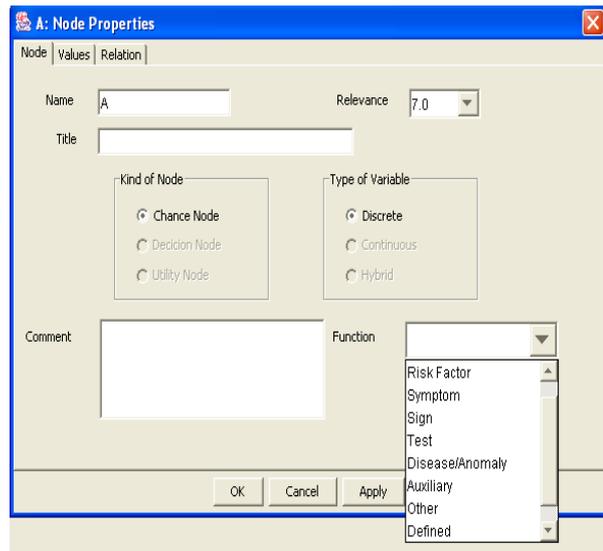
The main differences for edition between Elvira and some other tools are related to the possibility of:

- adjusting the **zoom** for displaying the network,
- **doing** and **redoing** the last changes,
- and setting some **properties of the displayed nodes**, such as their graphical identifier and the probability precision, in the **View Menu**.

Moreover, there are some edition facilities, as we can see in the next figure, which are defined only if the user wants to:

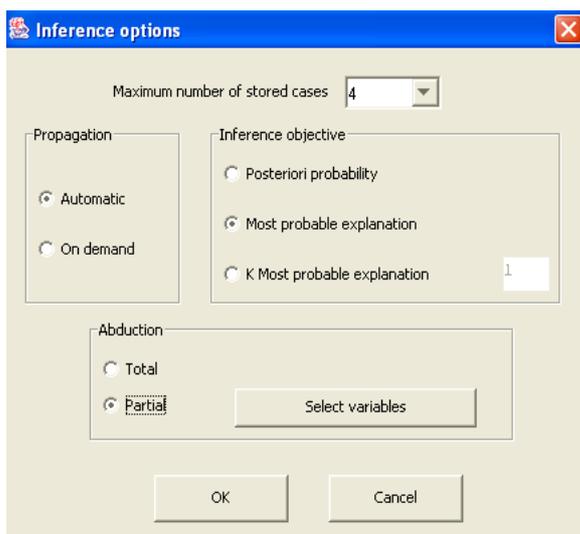
- the classification of nodes by the **role** they play in the Bayesian network. By default, an empty string is assigned. A set of **predefined functions** is provided, although others can be defined by the user.

- and an **importance factor**, subjectively assigned by the user. By default, it is set to 7.
- Apart from providing the user with a set of **predefined values** for ordinal variables, probabilities of relations can be modelled by means of **Canonical Models**.



Options Menu

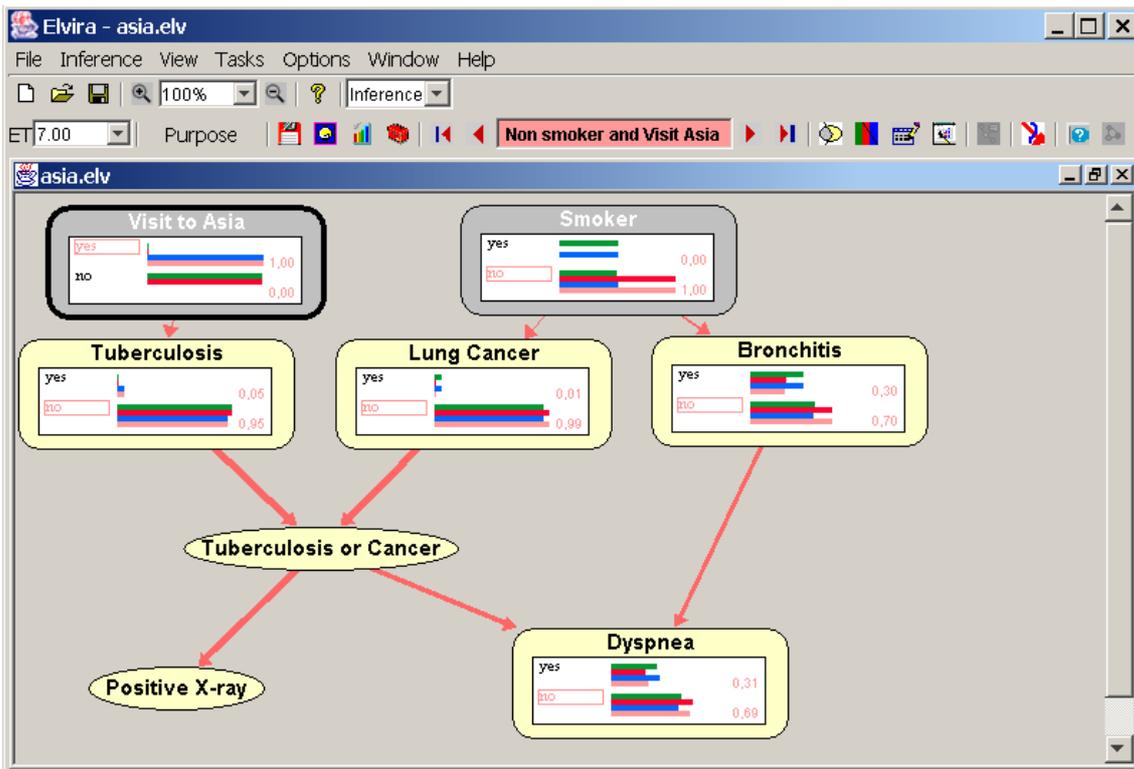
This menu, accessible in the three modes, contains some interesting submenus:



The **Inference Options Menu** allows the user to decide if the propagation is going to be made automatically or on demand, as well as the objective of inference, which can be probability propagation or abduction. In this case, the user decides whether he or she wants it to be total or partial and the number of explanations to obtain.

Moreover, the method for probability propagation or for abduction can also be selected in the **Propagation Method Menu**.

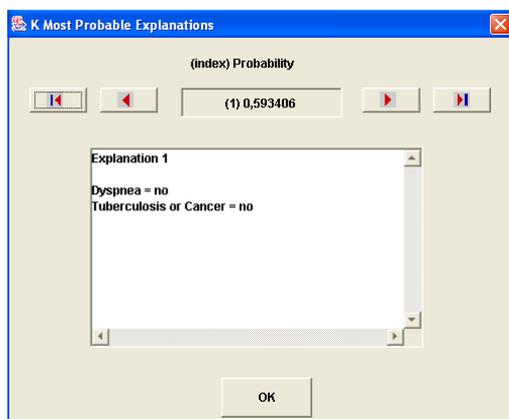
Inference Mode



When the user changes from edit mode to inference mode, nodes whose importance factor and/or whose purpose is among the set of the selected ones, are **expanded**. A node can also be expanded or contracted also by clicking on

icon . In the previous figure, nodes Tuberculosis, Lung Cancer and Bronchitis are expanded. An expanded node contains its name, its states and the probabilities of these, when the objective of inference is probability propagation.

If the objective of inference is abduction, only the state corresponding to the MPE displays a numerical value, which corresponds to the probability of the



MPE. In both cases, the most probable state is marked. If the user wants to get more than one explanation, a new window appears, like the picture on the left, which allows the user to navigate through a list of explanations.

Evidence

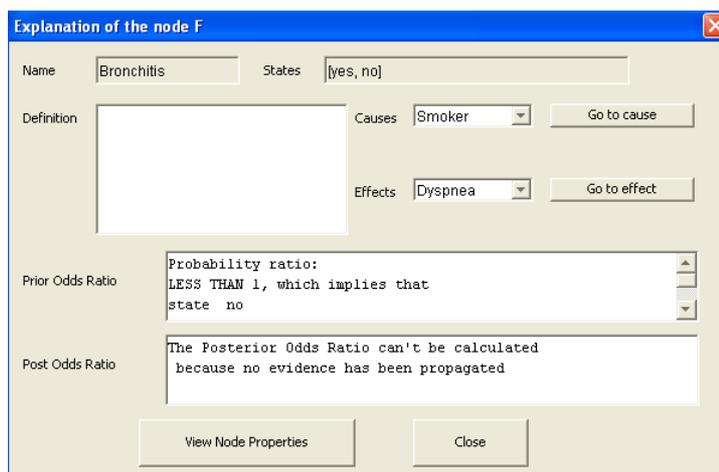
In inference mode, the user can also introduce some evidence by clicking on the state of the observed node, which is then coloured in grey; to delete a certain finding the user just has to click out of the state area. All the findings of a given evidence case can be deleted by clicking on the button . Evidence can be saved to memory  or to a file , and can be loaded from memory (as explained below) or from a file (*Load evidence* option from **File Menu**).

Explanation

In inference mode there are some explanation capabilities for the model and for the reasoning performed in the network. It can be offered verbally and graphically both at the micro and the macro level.

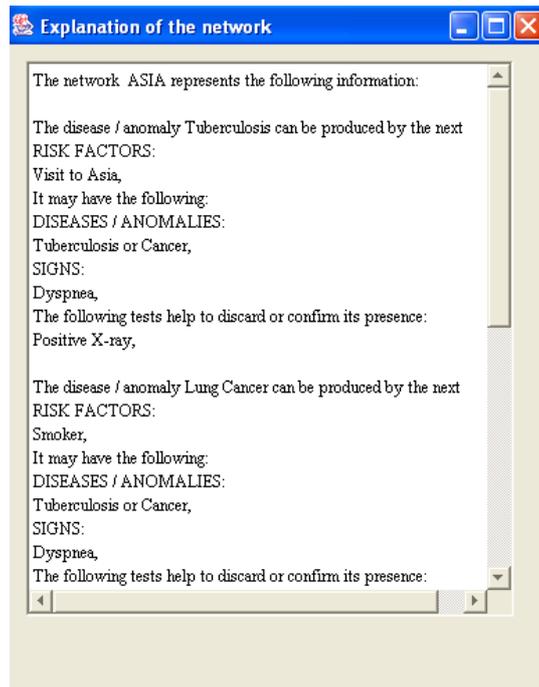
Verbal explanations

Elvira can generate verbal explanations of nodes and links. The verbal explanation can be obtained by means of the contextual menu associated with each node and each link. The figure on the right shows the verbal explanation window for node Bronchitis.



The verbal explanation of a selected link presents, among other things, the likelihood ratio for each state together a brief description of its meaning.

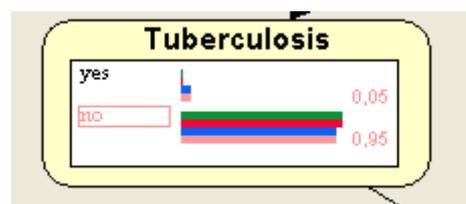
Finally, the verbal explanation of a network can be obtained by opening the contextual menu in an empty zone of the Inference Panel. The verbal explanation for the ASIA network is displayed in the next figure. Please note that this explanation is based on the roles of the nodes.



Graphical explanations

Elvira supports the next capabilities:

- **Qualitative representation of influences.** When clicking over icon , the sign of the influence of the parent node on the child node is represented by the colour of the link: positive influences are represented by red arrows, negative influences by blue arrows, indefinite influences by purple arrows, and null influences by black arrows. The thickness of the arrow is proportional to the magnitude of the influence. They are repainted when clicking over icon  or from the *Influences* option in the **View Menu**.
- Nodes can be **expanded selectively** by combining their expansion threshold and/or purpose Purpose
- Another important difference in order to improve the user knowledge is the simultaneous graphical display of **several evidence cases** in the expanded nodes, as is shown in the next figure .



Each evidence case is identified by a colour and by a name. When the user introduces new evidence, the current case is modified. If the user wants to create a new case, it must save the current one to memory



. Then, the new evidence case contains the same evidence than the previous one.

Therefore, every time the user changes to inference mode, a list of cases is created. It always contains in the first position the Prior Case, which corresponds to a case with no evidence and contains the prior probability of every node in the network. This case can not be modified. Each expanded node contains the graphical representation of the probabilities of every created case but only the numerical probabilities corresponding to the current case are displayed. The user can browse through the list of cases by means of this navigation bar:



The user can also empty the list with the button , although the Prior Case never is removed.

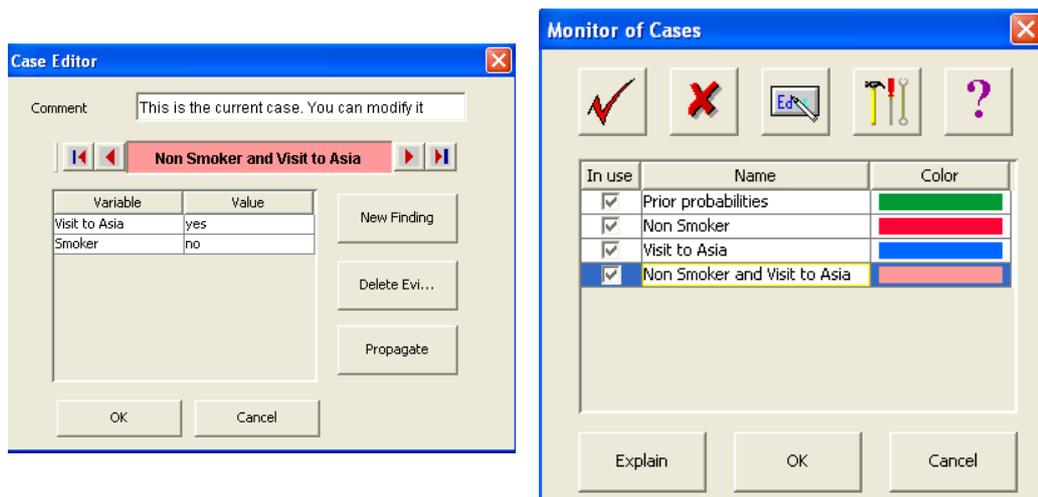
- In order to help managing the list of cases, Elvira provides an **Editor of**



Cases



and a **Monitor of Cases**.



- The Editor of Cases allows the user to edit, modify, delete, and propagate the evidence associated to the current case. The user can also navigate through the list of cases by using the Editor of Cases.

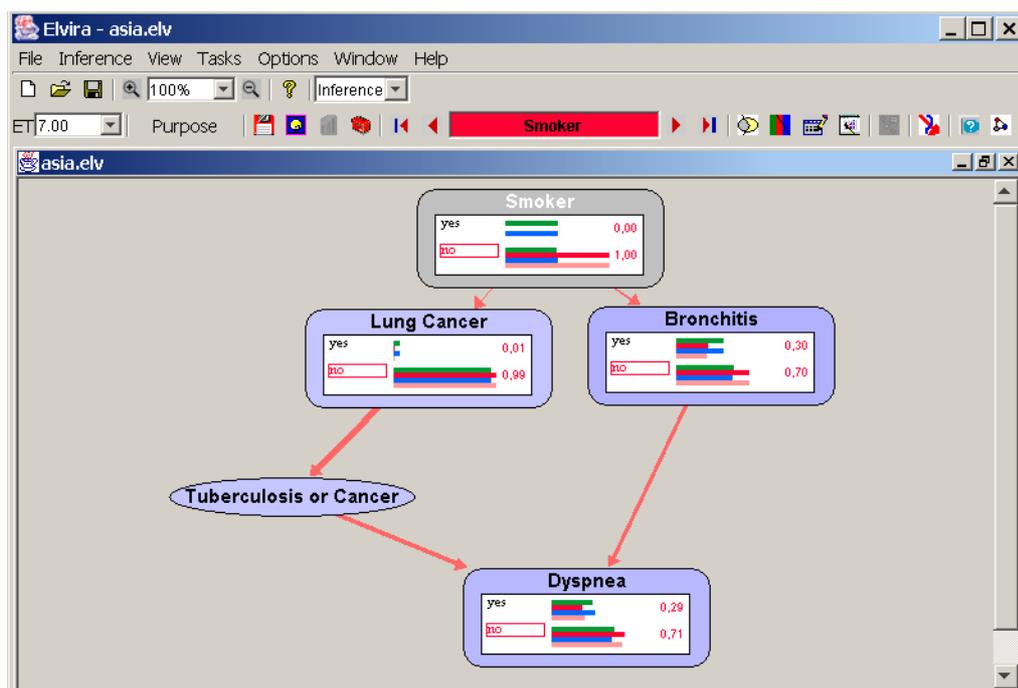
- In the Monitor of Cases, the user can select the cases to be displayed in the expanded nodes, modify the name and the colour of the case, add or delete cases from the list, request the explanation of a selected case, etc.

Explanation of a selected case

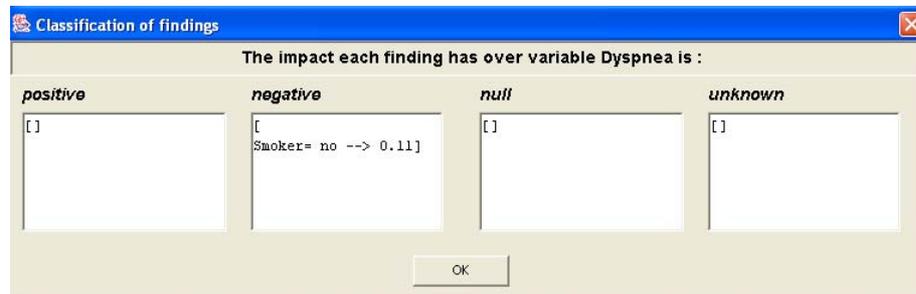
From the tool bar  or from the Monitor of Cases, the user can request the explanation of a certain evidence case. In this case, a new window appears containing:

- a table that displays the results of the **sensitivity analysis with respect to evidence**,
- a *How* button for showing:
 - the **chains of reasoning** from the evidence to a certain variable,
 - the **qualitative variation in probabilities** by colouring nodes in these paths depending on the kind and the amount of change with respect to a selected case. As an example, in the figure below, we can see the chains from Smoker to Dyspnea, the selected variable. The whole network can be displayed again by

clicking on button 



- a *Why* button for getting the **classification of findings** depending on the kind of influence they have on a given variable and the maximum amount of change that the selected variable can suffer in its cumulative distribution.



The selected case for the graphical representation of variation in probabilities and the minimum amount of change for doing the comparison can be defined by the user by means of the **Explanation Options Menu**, accessible from the Options menu. By default, the reference case is the Prior Case and the absolute variation is set to 10^{-3} . Apart from this, the user can also decide whether the explanation is going to be offered automatically or not. By default, it is non automatic. If he/she selects the automatic option, then every node in the network is coloured every time new evidence is propagated.

