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Introducing TESLA 2.2

For over a decade, Quintessa have been using TESLA to assist our clients with decision support. Using an approach founded on Evidence Support Logic, we enable our clients to structure their thinking, document and justify their reasoning, and gain confidence that they are making good, robust decisions, even in the face of complexity and uncertainty. TESLA has been extensively applied to support decision making, particularly in the context of complex assessments involving uncertainty, such as those relating to performance of geological systems. For example:

- Shell have used it to assess the suitability of potential sites for storage of CO₂ (Tucker et al, 2013); and
- TESLA has been used to assess the uncertainties associated with the estimation of geological uplift (Nakayasu, 2014).

TESLA has also been used as a tool to help communicate assessments used in regulatory approval submissions, for example to the UK Government's Department of Energy and Climate Change (DECC) concerning a sub-surface risk assessment for the White Rose CCS Project (Capture Power Limited et al., 2016).

Our experience with applying TESLA has led us to add new features to TESLA to improve how the flow of confidence can be modelled and visualised, culminating in this release of TESLA 2.2. As well as introducing new features, we have addressed quality and potential security issues, and improved the future maintainability of the software. Therefore, we recommend all users update to TESLA 2.2.

Contact Quintessa

If you are interested in learning more about how an approach involving Evidence Support Logic could be applied to your business, please contact Quintessa's decision support team at tesla@quintessa.org.

Important Information

TESLA 2.2 requires a .NET Framework runtime compatible with .NET Framework 4.6. A compatible runtime is pre-installed as standard on Windows 10.

TESLA's file format has changed between TESLA 2.1.1 and TESLA 2.2 to accommodate new features. TESLA files created by TESLA 2.1.1 and earlier can be opened in TESLA 2.2. However, TESLA files saved in TESLA 2.2 cannot be opened by earlier versions.

- If you wish to share decision trees developed in TESLA 2.2 with friends or colleagues, they will need to download and install TESLA 2.2 from our website to be able to view them.
- If you open a tree developed in TESLA 2.1.1 or earlier in TESLA 2.2 and save it, it will not be possible to open the saved file in the earlier version of the software. Therefore, *please back up any files created in older versions before opening them in TESLA 2.2.*

TESLA 2.2 installs for the current Windows' user only without requiring administrative permissions, whereas TESLA 2.1.1 and earlier installed as a system-wide application that required administrative permissions. Therefore, TESLA 2.2 will install alongside TESLA 2.1.1 and earlier, as a separate install. If TESLA 2.1.1 or earlier is no-longer required, it must be manually uninstalled via Add/Remove Programs in the usual way.

Evaluating TESLA

TESLA 2.2 can be downloaded from:

<https://www.quintessa.org/software/downloads-and-demos/tesla-2.2>

Until an activation code has been purchased from Quintessa, it will operate in restricted mode. The restrictions are as follows:

- New trees can only contain a maximum of 10 nodes.
- No new nodes can be added to trees opened from pre-existing files.
- The save functionality is disabled.

You may use TESLA in restricted mode to view and investigate trees created by others.

Notes for Users who have Unlocked Full Functionality

If you have previously purchased an activation code to unlock the full functionality of TESLA 2.1.1 or earlier, then:

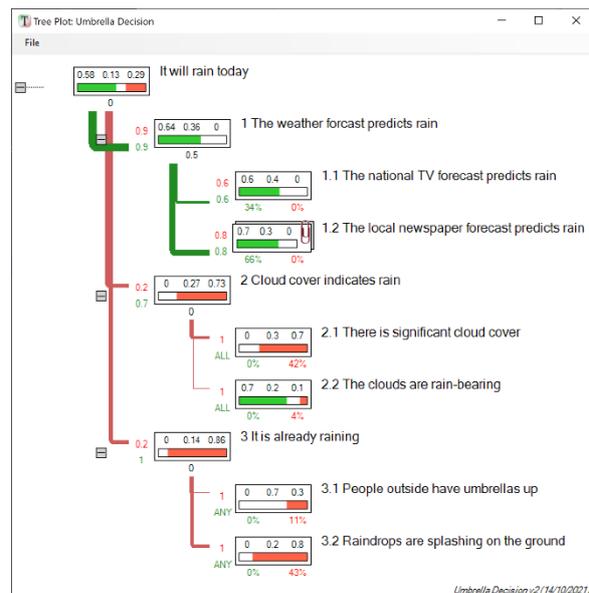
- If full functionality was activated within the past year, you will automatically gain access to the full functionality of TESLA 2.2 upon installation.
- If your existing install was activated over a year ago, TESLA 2.2 will operate in restricted mode. You will need to purchase a new activation code to unlock its full functionality. Please contact us at tesla@quintessa.org to enquire about upgrading your licence.

New Features

In TESLA, the primary hypothesis to be assessed is evaluated by breaking it down successively into a tree of ever simpler and more focussed hypotheses representing factors of potential influence. Evidence is applied and assessed at the leaf nodes of that tree structure and used to indicate the level of confidence that those factors are true or false. TESLA allows the flow of confidence from the leaves up to the primary hypothesis to be modelled and justified. The new features in TESLA 2.2 support the visualisation and modelling of the flow of confidence.

Confidence Flow Lines

Confidence flow lines is a feature that can be enabled to help visualise the flow of confidence for (green) and against (red) from the leaf hypotheses through to the root or primary hypothesis. The flow lines can help to identify which leaf hypotheses (and ultimately, evidence sources) are contributing (or not contributing) to the root hypothesis outcome and by how much. They can also be used to check the influence of logic on the propagation of confidence through the tree. When dealing with complex assessments, which can be time consuming to evaluate in detail, this feature can help save time by ensuring time and effort is optimised on acquiring evidence for and assessing hypotheses that most strongly impact the root hypothesis.



Symmetric Necessity Heuristic

Previous versions of TESLA included support for a *necessity* heuristic, which could be employed to affect the propagation of confidence from child nodes to a parent. This is referred to as the Asymmetric Necessity Heuristic in TESLA 2.2. The idea behind this heuristic was to limit the confidence values propagated to a parent hypothesis if a child hypothesis, referred to as the *necessary hypothesis*, failed a defined confidence test. Several limitations of this heuristic were identified.

- It only treats the case where either one of confidence for or confidence against a hypothesis fails to meet a criterion. It cannot test both confidence for and against simultaneously.
- The asymmetric heuristic only treats the case where the necessary hypothesis must be true for the parent to be true. It does not treat the case where the necessary hypothesis must be false for the parent to be false.
- The failure criterion (whether to test confidence for or confidence against) is defined globally as a tree option and cannot be set on hypothesis-by-hypothesis basis.

TESLA 2.2 defines a new Symmetric Necessity Heuristic, which is set as the default for new trees, and which overcomes these limitations. To change this option, visit the Tree > Tree Options... menu item.

Further details are given in the User Guide for TESLA 2.2, which is accessible via the Help menu in the software.

Known Issues

Here we document confirmed or reported low-level issues with TESLA 2.2, with workarounds, for your information.

- Since TESLA 2.1, the data within .tes and .tem files has been encrypted to help maintain confidentiality when transmitting them. However, the algorithm used to encrypt the data is no longer considered to be cryptographically secure. **Workaround:** If storing sensitive information within TESLA .tes. or .tem files, the recommendation is to use additional means of encrypting them for secure storage and transmission.
- In TESLA 2.2, when a user copies coloured text from a Word document and pastes it into a text box in the general tab of a hypothesis, it is subsequently impossible to change the colour of the text. **Workaround:** Change the colour before copy-pasting or type it in manually.
- Tooltips sometimes stop appearing when editing a node. **Workaround:** Close and reopen the hypothesis dialog. Refer to the User Guide.
- The Specify Alternative Dependencies tooltip does not always appear. **Workaround:** Refer to the User Guide for information on alternative dependencies.
- Opening a hypothesis dialog and clicking OK without making any changes results in the tree becoming marked as modified. **Workaround:** None
- If the default font-size (DPI) of the operating system has been adjusted (increased), as can happen on large workshop displays, this can cause the ANY/ALL fields in the tree view to wrap mid-word. **Workaround:** Changing the tree zoom level may help or adjusting Windows compatibility settings may help.
- TESLA file sizes can get large, particularly when saving and re-opening the file regularly. **Workaround:** If the change history is not required, copy and paste the tree into a new file, or use the change history manager to export a given version. When saving, opt to save reference files as a separate archive rather than embedding them in the TESLA file itself.
- The default size of the plot window can be slightly too small, resulting in the window having scrollbars. **Workaround:** Manually increase the size of the plot window.
- Windows Compatibility Assistant may question whether TESLA ran correctly on closing the application on the first run after being installed. **Workaround:** Choose the “The application ran correctly.” option. (However, if TESLA behaves incorrectly, please report it!)

Plans for Future Releases

The basic propagation algorithm currently supports combining confidence from hypotheses using OR-like logic only, in which confidence from child hypotheses combines constructively. In the next release, we plan to introduce support for combining logic from hypotheses using AND-like logic too.

Please contact Quintessa at tesla@quintessa.org if you have any requests for enhancements to TESLA that you would like us to consider for future releases.

References

Capture Power Limited and Sub-Contractors (2016), “White Rose K42: Storage Risk Assessment, Monitoring and Corrective Measures Reports - Category: Storage”.

<https://www.gov.uk/government/publications/carbon-capture-and-storage-knowledge-sharing-technical-subsurface-and-well-engineering>

Nakayasu A., Doke R., Niizato T., Urabe A., Ono E., (2014), “An Evaluation of the Uncertainty on the Investigation Results by Using Evidential Support Logic — An Example of an Estimation of Uplift Rate —” (in Japanese) *Geoinformatics*, 25 (4), 189—203,

https://doi.org/10.6010/geoinformatics.25.4_189

Tucker O., Holley M., Metcalfe R. and Hurst S., (2013), “Containment risk management for CO₂ storage in a depleted gas field, UK North Sea” *Energy Procedia*, 37, 4804—4817,

<https://doi.org/10.1016/j.egypro.2013.06.390>