

0.1 Pre-Processing: The VIZ Raw-to-Visual Data Conversion Wizard

While some visualizations are straightforward to be drawn in real time, a more complex one, which sometimes needed to display more information, may require ‘heavy’ computation which may be too taxing in real time.

Our search trajectory visualization requires a lot of distance computation, which can be as big as $O(|AP_{Size}|^2 * n + |NumberOfEntries| * |AP_{Size}| * n)$, plus the time required to layout the points in $O(|AP_{Size}| * maxIteration1 + |NumberOfEntries| * maxIteration2)$, once we know the distance information.

To alleviate the burden of complex computation from the end-user and to allow smooth visualization, we pre-process the raw data using VIZ Raw-to-Visual Data Conversion Wizard. By using this wizard, the end-user’s task is then very simple, we just need to log the local search runs using the simple format discussed in the previous section ???. The Conversion Wizard is the one that will do the dirty work. VIZ GUI itself is not designed to compute too many things, except to display the animated visualization information.

Conversion Wizard Technical Document

This wizard is created using combination of Microsoft Wizard’97 and Microsoft AERO Wizard — just a little bit — (Windows Vista) guidelines. It has several linear pages (some pages are skip-able in express mode) which the user must complete in sequence. There is a ‘back’ and ‘next’ button to navigate between these sequential pages. All adjustable UI controls (buttons, checkboxes, etc) have context sensitive help text. Each (simple) step are clearly labeled and given 1/2 lines of explanation. Validation is done in every pages so a user can only move on to next page if he/she has finished doing the task(s) in a page successfully. A user friendly error message will be displayed in non intrusive manner to guide the user. This wizard provides an express mode where the user can choose to speed up his/her conversion task by following the orange line (See Figure 1, the step number are labeled, ‘w’ — waiting mode where the computation takes place).

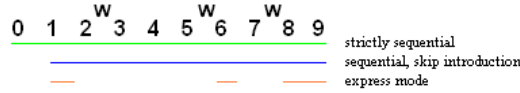


Figure 1: Conversion Wizard — Overall Workflow.

To be precise, the steps done by Conversion Wizard are listed below:

Step 0 — Welcome Screen

User’s task:

1. Read and understand how to use this Conversion Wizard, e.g. the pre-requisites and the resulting VIZ visual data file produced by this Wizard.
2. There is a check box to bypass this step in the future.

Step 1 — Build AP set from RunLog(s)

User’s task:

1. Choose whether to select RunLogs or load an APLog — btw this feature is not yet implemented, so jump to task 2.
2. Select a list of RunLogs $List_{RunLog}$ by browsing for *.RunLog files in the user harddisk.
3. Specify $APSize$, the default value is 100.

Requirement: $List_{RunLog}$ cannot be empty, at least 1 RunLog must be there and the header of each RunLog in $List_{RunLog}$ must be compatible (they are from the same fitness landscape.)

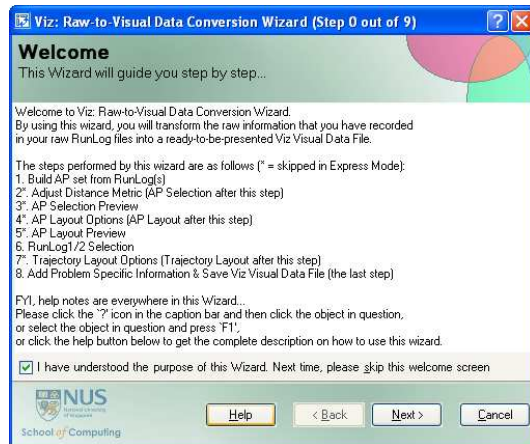


Figure 2: Conversion Wizard — Step 0.

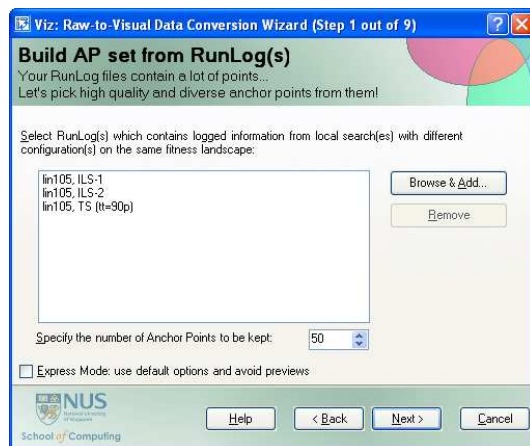


Figure 3: Conversion Wizard — Step 1.

Step 2 — Adjust Distance Metric

User's task:

1. Adjust the most fundamental distance metric and its multiplier which is going to be used throughout components of VIZ that require distance information. The most suitable distance metric for well-known problems is already pre-selected:
 - TSP - Bond/Permutation/Edge distance
 - QAP - Hamming/Exact distance
 - For other unknown COPs, VIZ will suggest the default distance function: Hamming/Exact distance
2. Adjust the distance multiplier, this is used to reduce the collision in the ST visualization.

After this page, the AP selection process commences (plus, the pairwise distance information for the selected AP points are computed).

Step 2.5 — AP Selection

The wizard will compute which AP points are diverse and good enough to be kept in AP set. We used the strategy described in Chapter 5.4.X??.

Step 3 — AP Selection Preview

User's task:

1. Verify whether the selected *APSize* points from all the points collected in *ListRunLog* are diverse but high quality.
2. Press 'back' and adjust RunLogs selection if it is not satisfactory.

Step 4 — AP Layout Options

User's task:

1. Specify options for the AP layout algorithm, most of them are defaults. Currently, the only adjustable item is the 'iterations for AP layout', to adjust how long/short the AP layout will be performed. A slightly better AP layout is expected for longer runs.

After this, the AP Layout process (using the strategy described in Chapter 5.4.Y??) commences.

Step 4.5 — AP Layout

The wizard will layout AP points using greedy Spring Model layout algorithm.

Step 5 — AP Layout Preview

User's task:

1. Verify whether the AP layout is satisfactory.
2. Press 'back' and adjust number of iterations for AP Layout if it is not satisfactory.

Step 6 — RunLog1/2 Selection and Trajectory Layout Options

User's task:

1. From the augmented list of RunLogs (now with information about the best found objective value of that run), the user has a chance to set RunLog1 and RunLog2 to be analyzed.

For the sake of simplicity, for this version, we don't allow the user to add/remove new RunLog into it, the RunLogs must be from those selected in Step 1 or via APLog (which records filename of RunLogs too). RunLog1 is compulsory, but the user can leave RunLog2 empty if he/she doesn't need visual comparison mode.

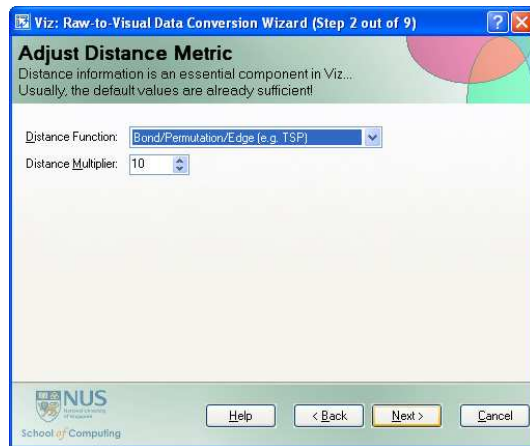


Figure 4: Conversion Wizard — Step 2 (skip-able in express mode).

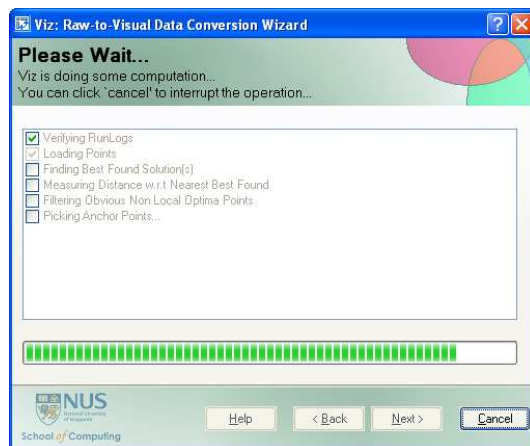


Figure 5: Conversion Wizard — Step 2.5.

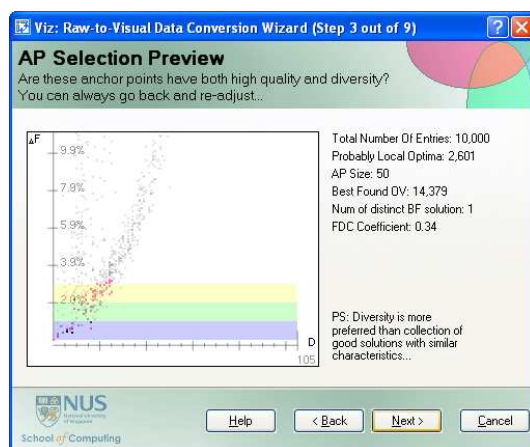


Figure 6: Conversion Wizard — Step 3 (skip-able in express mode).

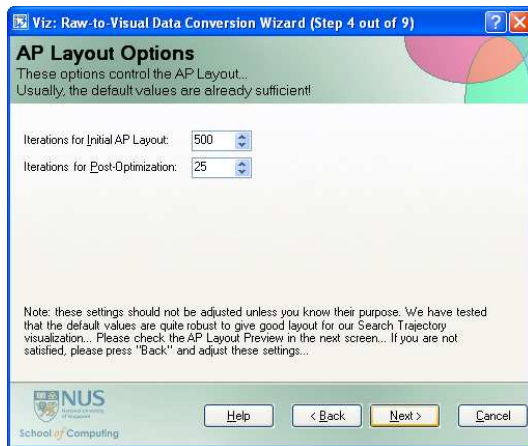


Figure 7: Conversion Wizard — Step 4 (skip-able in express mode).

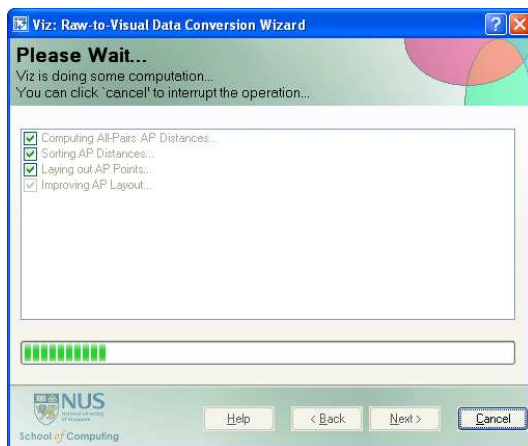


Figure 8: Conversion Wizard — Step 4.5.

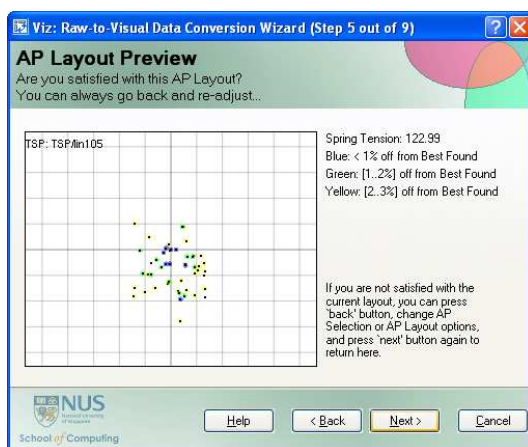


Figure 9: Conversion Wizard — Step 5 (skip-able in express mode).

Step 7 — Trajectory Layout Options

User's task:

1. Adjust the Trajectory Layout algorithm options. The options are similar but slightly different to step 3...

After this, the important (but tedious) Trajectory Layout conversion process (using the strategy described in Chapter 5.4.Z) commences.

Step 7.5 — Trajectory Layout

The wizard will layout points along the search trajectory of RunLog1 and RunLog2 w.r.t the anchor points laid out previously, still using the greedy Spring Model layout algorithm.

Step 8 — Supply Problem Specific Information

User's task:

1. Supply Problem Specific Information to the conversion wizard.

Note: Currently, we can only accept TSPLIB EUC_2D [2] and QAPLIB [1] file formats.

Step 9 — Save Viz Visual Data File

User's task:

1. Save the converted information into a VIZ visual data file (a dialog box for saving the file is presented). VIZ will then open the newly created VIZ visual data file in the main interface, the conversion process is done :).

Note: there is no preview for the search trajectory as it requires all the VIZ GUI for search playback. Try the newly created VIZ visual data file in VIZ. You can always re-create a new VIZ visual data file anytime.

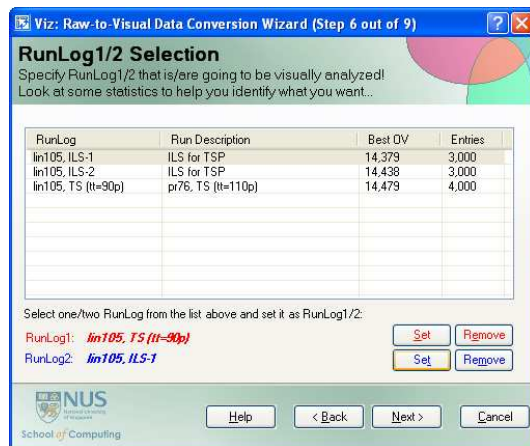


Figure 10: Conversion Wizard — Step 6.

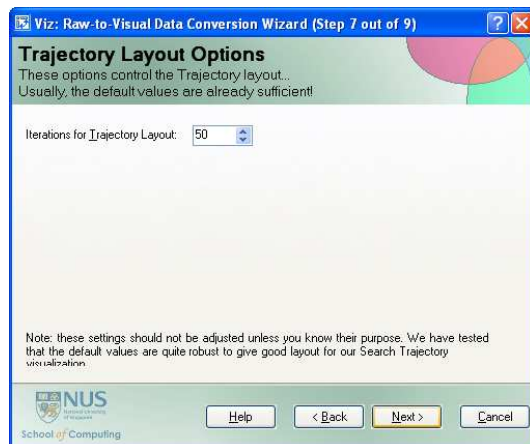


Figure 11: Conversion Wizard — Step 7 (skip-able in express mode).

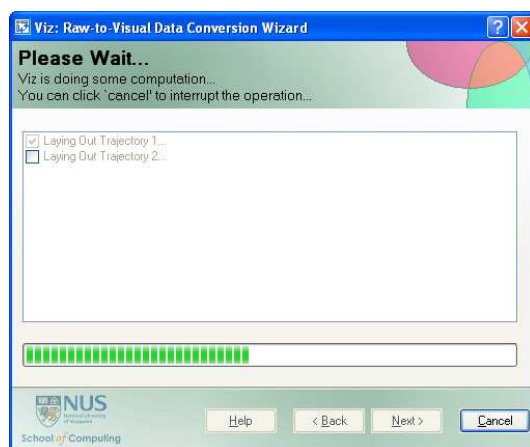


Figure 12: Conversion Wizard — Step 7.5.

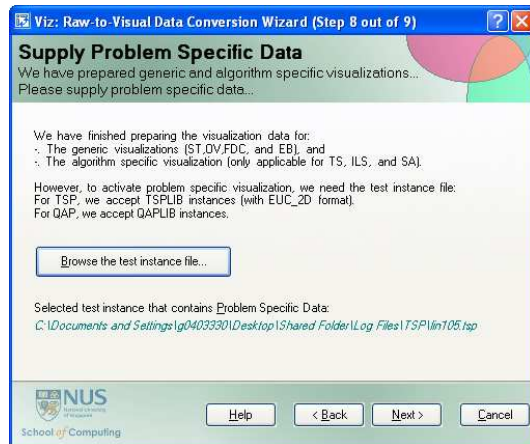


Figure 13: Conversion Wizard — Step 8.

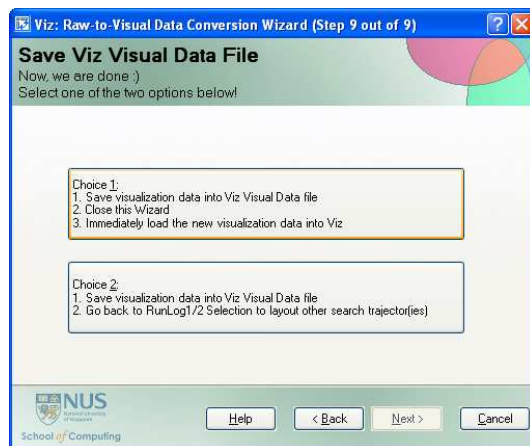


Figure 14: Conversion Wizard — Step 9.

Bibliography

- [1] R.E. Burkard, S.E. Karisch, and F. Rendl. QAPLIB - A Quadratic Assignment Problem Library. *European Journal of Operational Research*, 55:115–119, 1991.
- [2] G. Reinelt. TSPLIB - A Traveling Salesman Problem Library. *ORSA Journal on Computing*, 3:376–384, 1991.