`rezonateR`: An R package for analysing coherence in conversation

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1 Introduction

`rezonateR` is an R (R core team 2022) package working with complex data annotations, geared towards discourse and interactional linguists examining topics like dialogic resonance, turn-taking, and reference tracking. It aims to bridge the gap between data from modern multilayer corpus annotations, which usually take on complex graph formats, and features arranged in a tabular format which can be submitted to visualisation, statistical analysis, and machine learning environments for answering particular research questions. `rezonateR` takes annotations from the visual annotation environment Rezonator (DuBois 2019, DuBois et al. 2020) and transforms the graph into a relational database-like format, and offers a wide range of functions for generating features used in discourse research.

2 Features

The first step of working with Rezonator annotations in `rezonateR` is to import Rezonator's native `.rez` format using the `importRez()` function. This creates an object that contains, among other information, a series of data frames, each of which corresponds to a node type in Rezonator's underlying graph structure. Semi-automatic annotations can be added to these data frames by first guessing the values in R, then using `rez_write_csv()`, `rez_read_csv()` and `updateFromDF()` to export it as a `.csv`, edit it in a spreadsheet, and incorporates the edits in R.

After import, rezonateR contains numerous functions for deriving features from the imported annotations. Two sets of generic functions are available for data wrangling, including combining information from different node types in the annotations: the EasyEdit series for base R users, and the TidyRez series for `tidyverse` (Wickham et al. 2019) users.

Beyond these basic features, `rezonateR` contains features for analysing more specific discourse questions. Figure 1 shows three main structures in Rezonator: stacks (annotations of text segmentations), tracks (coreference chains), and dialogic resonance (DuBois 2014).

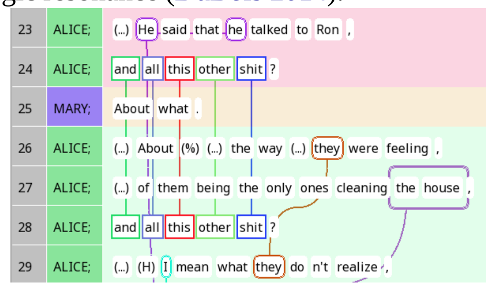

Figure 1: Sample Rezonator text (SBC007) with stacks (background colours indicating turns), resonances (straight-line connections between words), and tracks (curved lines between mentions).

Stacks represent discourse units (e.g. turns). `rezonateR` can compute values like positions of tokens within stacks, optionally excluding non-word tokens like pauses and punctuation; this is useful when e.g. investigating a form's function through its position within large structures (e.g. Kim 2022). For dialogic resonance, `rezonateR` can find resonances between parts of a sequence (e.g. between first and second assessments), and calculate resonance-related statistics used in studies like Tantucci & Wang (2021). For tracks, it contains a rich set of functions for deriving predictors for coreference-related issues like referential choice, e.g. extracting the distance to or property of the last mention or counting recent mentions (possibly conditionally, e.g. subjects only) within a window. The case study below demonstrates how `rezonateR` deals with the first two annotation types.

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3 Sample analysis

To demonstrate the use of various functions in `rezonateR`, this sample analysis examines responsiveness in the seventh conversation from the Santa Barbara Corpus of Spoken American English (SBC007; DuBois et al. 2000). Question-answer sequences are perhaps the clearest examples of responsiveness, since a question socially obligates a response. I began by identifying all the question-answer sequences using stacks, and tagged the stacks for the action they implement (e.g. information-seeking question, confirmation request, other-initiation of repair). Three types of questions were identified as the most common in the text: Information-seeking questions, ritualised expressions of disbelief (Wilkinson & Kitzinger 2006), and soliciting the recognition of a reference (Heritage 2007).

To analyse the formal correlates of responsiveness, I examined two linguistic devices: discourse markers (DMs) and resonance. I annotated all resonance in the text in Rezonator. `rezonateR`'s functions for combining various parts of the annotations (`rez_left_join()`, `findResonances-Between()`, `stackToToken()`) were used to produce the following graphs: the number of resonance chains associated with each Q-A sequence type (Figure 2), and word tokens found in Q-A sequences of each category (Figure 3).

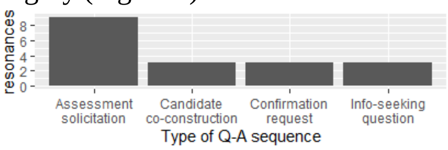

Figure 2: Resonance count for four Q-A types; remaining types have no resonance. Only 18 resonances were in Q-A sequences, out of 234 total.

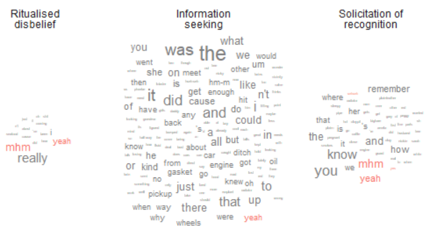

Figure 3: Word clouds by Q-A type (DMs in red).

Since little resonance is associated with Q-A pairs in this dataset, I then focused on analysing the DMs, including outside Q-A sequences. The two most common discourse markers in Q-A sequences were *yeah* and *mhm*. Since *yeah* seems to be used more for information-seeking questions and *mhm* for the other two with more regulatory functions, this may hint at a more general pattern regarding the distribution of *yeah* vs *mhm*, further supported by fact that yeah seems to appear more frequently in longer turns (Figure 5). To further investigate this, each instance of the DMs was tagged according to the epistemic gradient between asker and answerer (HIERARCHY, after Gadanidis et al. 2023); whether it was elicited by the other party (e.g. with interrogative syntax or rising intonation), responding to previous speech with no explicit invitation for a response, or simply pointing back to one's own speech (RESPONSIVENESS); whether the speaker was expressing affiliation with or understanding of the speech she was responding to, or some other stance (STANCETYPE); the DM's position in a sequence (second pair part (SPP), sequence-closing third, other; SEQPOSITION). The text was also annotated for turns using stacks. The DM's position in the intonation unit (IU) and the IU's position in the turn were automatically derived in `rezonateR` using data wrangling functions and `getOrderFromSeq()`. Hierarchical clustering with complete linkage revealed two layers of interpretable clusters. The first (k = 2) divides DMs with substantive semantic contribution from those with primarily regulatory functions. The second (k = 5) divides regulatory cases into backchannels and follow-ups to one's own prior talk, and substantive cases into SPPs to information-seeking questions, non-information-seeking questions, and thirds. Figure 4 shows the distribution of *yeah* and mhm within these categories, supporting the above-mentioned association of *yeah* with greater substantiveness.

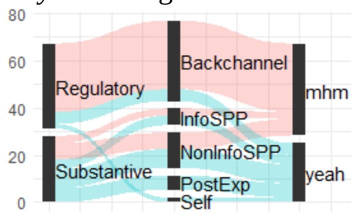

Figure 4: Sankey diagram of the two clusterings and the distribution of *yeah* and *mhm* within each.

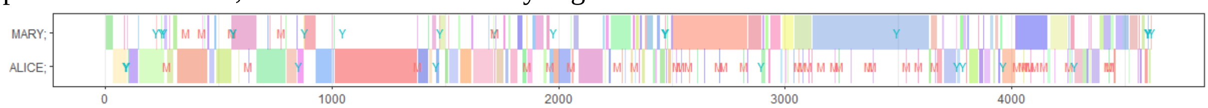

Figure 5: Gantt chart, produced with `rezonateR`'s `getGantt()`, of *yeah* (Y) and *mhm* (M)'s locations.

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