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Mapping from DSARMD and Switchboard Dialogue Act Labels into Superclass Labels

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1 Motivation

We wish to create some translation between the dialogue act labels widely used in the Switchboard corpus annotation project (so-called SWITCHBOARD-DAMSL) and the dialogue act labels used in the DSARMD project. We do this via a series of superclass labels. These labels were created to serve as an intermediate between the SWITCHBOARD-DAMSL labels and the labels used in the AMITIES project. There are 16 superclass labels in total. The DSARMD project also uses a variant of the DAMSL annotation scheme, resulting in a set of 15 labels. Fortunately, there is a one to one correlation between many of the DSARMD labels and the superclass labels. However, there are 3 superclass labels that have no corresponding DSARMD label at this time (SC_MAYBE, SC_REPEAT and SC_COMPLETION). Additionally, two of the superclasses map to multiple DSARMD labels. SC_QUESTION corresponds to the DSARMD labels *Information-Request* and *Confirmation-Request*. SC_ANSWER corresponds to both DSARMD categories *Response-Answer* and *Response-Non-Answer*. Adopting this clustering of labels enables us to use existing, large-scale, manually annotated corpora (such as Switchboard, or ICSI-MRDA) to automatically annotate some or all of the DSARMD data. Currently, the CuDAC method is used to train over and then subsequently applied to existing DSARMD data.

2 Future Work

There are several possible avenues for investigation. These include:

- Use CuDAC trained over Switchboard data (or ICSI, or both) and apply it to DSARMD data

  We can either apply the classifier wholesale, or specifically for individual DAs. For example, the labels SC_ACCEPT and SC_REJECT are identified as critical for assertions. In previous research, we take cues from the Switchboard data and apply them directly as a classifier to ICSI-MRDA data. We achieve a precision of 0.69, and a recall of 0.5 on the corresponding *reject* label. However, we do not perform as well on *accept* labels, with a precision of 0.48 and a recall of 0.16. The problem with *accept* labels is that these labels are not accurately discriminated in Switchboard data; there is a large degree of annotation overlap with

other categories (such as *acknowledge*), making it impossible to automatically train sufficiently discriminative models.

- Extend CuDAC to use models of Dialogue Act sequence models

  CuDAC is a context free model; it takes no account of the surrounding dialogue acts. Where there is lexical confusion (such as between *accept* and *acknowledge*), we might hope that the surrounding dialogue context can help us to resolve the ambiguity. Again in prior research using the Switchboard corpus, we have found that using a bi-gram model of DA progression added around an absolute 4% accuracy (using a naive bayes model). We also found interesting results (using small amounts of data) using the JRip algorithm, where we learnt rules that indentified utterances that CuDAC labelled as <ACKNOWLEDGE>, and reclassified them as <AGREE-ACCEPT> if the most recent DA is also an <AGREE-ACCEPT>.

- Utterance segmentation

  The utterances of both the Switchboard and ICSI-MRDA corpora are pre-segmented by human labellers. This splits existing user turns into their constituent utterances (where the definition of an utterance is such that it has a one-to-one correlation with a single DA). Consider the following combination of user turns, for example:

  ```
  (1) A: ‘‘Hello. My name is Nick. How’s the weather?’’
  (2) B: ‘‘My name is Bill. It’s fine thanks, what about
      where you are?’’
  ```

  Here, User A completes a single dialogue turn (1), which contains three utterances under our definition: “Hello” (SC_HELLO), “My name is Nick” (SC_STATEMENT), and “How’s the weather?” (SC_QUESTION). In turn (2), User B *also* uses three utterances in a single turn, although the transcription here (presumably in response to the audio) uses a comma to separate the second (“it’s fine thanks”) and third (“what about where you are?”) utterances. In both these examples, it can be said that utterance structure appears sentential, but there are many examples where this is not the case. For accurate language modelling it may be necessary to identify one, two or all three of the DAs inside

each utterance. For example, is it important to know that turn (2) contains two answers to questions in turn (1). Imagine that those two questions appeared in two separate utterances from two separate users. Then in order to track the flow of dialogue, we would need to segment. Secondly, turn (2) also contains a question back to the speaker of turn (1). However, it may be sufficient for us to identify multiple labels for a turn. For example, we could identify some n labels for each turn (where n varies by length of utterance perhaps) in a ranked way. Alternatively, we could exploit features of CuDAC to attempt automatic segmentation. Recent results indicate that the majority of cues used by CuDAC for classification (that is, those cues that are actually referenced as a basis for labelling) contain our position specific cue feature. We introduced <*start*> and <*finish*> tags to each utterance, to capture position specific information for particular cues. Given the discriminative power of these cues, we could exploit them to hypothesise utterance breaks. For example, insert <*start*> phrases between every existing word, and determine if this corresponds to one of our known cues.

3 Mapping DSARMD into Superclasses

$$(1)\ Acknowledge\}\ SC\_BACK-CHANNEL \begin{cases} acknowledge \\ response-acknowledgement \\ hedge \\ back-channel-in-question-form \end{cases}$$

$$(2)\ NULL\}\ SC\_COMPLETION\ \{\ collaborative-completion$$

$$(3)\ Signal-Non-Understanding\}\ SC\_NON-UNDERSTANDING\ \{\ signal-non-understanding$$

$$(4)\ Correct-Misspelling\}\ SC\_CORRECTION\ \{\ correction$$

$$(5)\ NULL\}\ SC\_REPEAT \begin{cases} repeat-phrase \\ summarise-reformulate \end{cases}$$

Figure 1: Understanding mapping table (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)

(6) $Agree - Accept$ } SC_ACCEPT { $accept$

(7) $Disagree - Reject$ } SC_REJECT { $reject$

(8) $NULL$} SC_MAYBE {$maybe/accept - part$

Figure 2: Agreement mapping table (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)

(9) $Conventional - Opening\}$ SC_HELLO $\{$ $conventional - opening$

(10) $Conventional - Closing\}$ $SC\_GOODBYE$ $\{$ $conventional - closing$

(11) $Offer - Commit\}$ SC_OFFER $\{$ $offers - options - commits$

(12) $Action - Directive\}$ $SC\_ACTION - DIRECTIVE$ $\{$ $action - directive$

Figure 3: Conventional, offer, options, commits and action directive mapping table (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)

$$(13)\quad \left.\begin{array}{l} Information-Request \\ Confirmation-Request \end{array}\right\} \; SC\_QUESTION \left\{\begin{array}{l} yes-no-question \\ wh-questions \\ open-questions \\ or-clause \\ declarative-yes-no-question \\ declarative-wh-question \\ rhetorical-question \\ tag-question \end{array}\right.$$

Figure 4: Questions mapping table (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)

$$(14)\quad \begin{matrix} Response-Answer \\ Response-Non-Answer \end{matrix}\ \}\ SC\_ANSWER \begin{cases} yes-answers \\ no-answers \\ affirmative-non-yes-answers \\ negative-non-no-answers \\ dispreferred-answers \\ other-answers \\ hold-before-answer \end{cases}$$

$$(15)\ Assertion-Opinion\}\ SC\_STATEMENT \begin{cases} statement-non-opinion \\ statement-opinion \end{cases}$$

Figure 5: Answers and Statements mapping table (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)

$$(16)\ Other - Conventional - Phrase\} SC\_OTHER \begin{cases} abandoned/uninterpretable \\ appreciation \\ non - verbal \\ other \\ quotation \\ downplayer \\ thanking \\ apology \end{cases}$$

Figure 6: Other phrase mapping labels (DSARMD } SUPERCLASS { SWITCHBOARD-DAMSL)