

Discourse Component-Based Argument Extraction of Seoul Korean Directives

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1 Introduction

Question and command differ from interrogatives and imperatives (Sadock and Zwicky, 1985) in semantic and pragmatic view, considering that one can effortlessly observe the declaratives which explicitly require the addressee to return an answer (1a) or to take action (1b):

- (1) a. I want to know why he keeps that hidden.
b. I think you should go now.

In comprehending the intention of conversational sentences, the above kind of non-canonical utterances makes it difficult for the spoken language understanding systems to catch what the speaker requires. This comes out to be more challenging for the Korean language, which is head-final, *wh-in-situ*, and also scrambling. It is visible that some utterances are indecisive whether they are question, command, or statement, especially if given

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only textual information. To be specific, head-finality (2a) and *wh*-particles *in-situ* (2b) make it more tricky for the addressee to guess the dropped subjects, impeding the identification of directiveness. Moreover, scrambling makes it more difficult for natural language processors to cope with this issue (2c).

- (2) a. onul mwe hal ke-ya
 today something do.FUT thing-DEC
 ‘I will do something today.’
 b. onul mwe hal ke-ya?
 today what do.FUT thing-DEC
 ‘What will you do today?’
 c. mwe hal ke-ya onul?
 what do.FUT thing-INT today?
 ‘What will you do today?’

To combat such circumstances within terms of data-driven analysis, utilizing syntax-semantic property discourse component (DC) (Portner, 2004), Cho et al. (2018) built a coarse but comprehensive categorization (for Korean) that tracks the speaker’s intention yielded by the illocutionary act (Searle, 1976) and communicative function (Allwood, 2000). Here, directives (i.e., non-rhetorical questions and commands) are identified as the utterances that assign the addressee an obligation. However, a question is yet left; once we realize that an utterance conveys the intention of question or command, can we formulate what it requires to the addressee in a storable and recognizable format?

This led us to a discussion on discerning a structured argument of the directives. For (i) the questions that seek information or opinion, a question set (QS) is to be obtained and formalized. For (ii) the commands that request the addressee to act, similarly, a to-do-list (TDL) is induced. We call these (QS, TDL) arguments¹, or intent arguments throughout this article, in a way slightly modified from the literature, where routinely the terms such as intent, item, and domain come after (Haghani et al., 2018). We deal with these in a purely natural language (NL) format. Although non-NL formats, e.g., structured query language (SQL) (Zhong et al., 2017), have shown competitiveness in industrial areas, we claim that the NL format can be more appropriate for human management and understanding.

In this paper, we propose a practical methodology on extracting arguments from non-rhetorical questions and commands, exploiting an anno-

¹ In specific, QS is the set of sets of properties where the new questions are inserted into, and TDL is genuinely a function that projects a new property to a ready-made list of requirements of the addressee. However, for the simplification of the problem, we denote the question or requirement extracted from the directives as QS and TDL here.

tated corpus on Seoul Korean (Cho et al., 2018), which contains the directives of various sentence form. Note that filling a slot for canonical interrogatives and imperatives is done with a simple extraction. However, in colloquial expressions, not all the words (or particles) in a sentence are required for the extraction, especially for the sentences with covert speech act (SA) layer of question and command (1a,b). For such non-canonical directive utterances, words or particles that are not appropriate to be included in the argument, are removed considering what the speaker intends, e.g., (1a) to ‘*the reason he keeps that hidden*’ and (1b) to ‘*to go now*’. Likely, noisy input utterances can be converted into the format that lets dialogue managers handle them more efficiently. Moreover, abstraction is indispensable in some cases, mainly when *wh*-particles concern. For instance, considering questions “*When will the rain stop?*” and “*When are you going on vacation?*”, the former asks for the time or period, while the latter for the day, week or month.

In the rest of this proposal, we want to make a justification for this kind of formulation, beyond just comparing it with a non-NL format paraphrasing methodologies. Applicability and human-friendliness are deemed as a core issue. However, we have to ask: is our strategy general? Is it extensible? Most of all, does it match with the other theoretical constructions that have been undertaken in formal semantics?

2 Theoretical Background

In Portner (2004), question set and to-do-list were defined in a way that they can be a conceptual representation of requirements, mainly via the form of set theory-based formal semantic notation. Also, the specific examples show that the representation can exploit the form of lambda calculus, possibly the most unambiguous format of conveying the semantic information. This philosophy is well reflected in the SQL representation of question and command, which has been proven to be most appropriate for semantic parsing (Berant and Liang, 2014, Zhong et al., 2017). It can also be useful in graph format analysis as in abstract meaning representation (AMR) (Wang et al., 2015). Words with the following prefixes should be spelled out, and not hyphenated:

However, it is not guaranteed that such kind of approaches, that is dissecting all components of the target utterance, is appropriate for human-friendly annotation of the corpus and reconstruction of the sentences. Human understanding of directives is, intuitively, more close to understanding (1a) as ‘*the reason he keeps that hidden*’ than {**subject**: a man, **wh**:- reason, **content**: keeping something hidden} and so on. That is, notwithstanding the empirical results that the latter is more appropriate for the computational analysis of directives, the former method lets all the machine-familiar aspects of the latter be more comprehensible for the human.

Moreover, in Korean and Japanese, where the morphology is agglutinative and the subject drop is frequent, an automatic understanding of spoken languages might highly benefit such extraction.

Here, we want to emphasize that the question set and to-do-list, which are represented as a sequence of functions and arguments in the lambda calculus, can also be expressed in a natural language format if met with the nominalized expressions. This holds for both question and command, at least in terms of JK linguistics, although the formulation is different. The supporting details of utilizing nominalized form is as follows:

1. Empirically, nominalized clauses or composite nouns can most properly express the components of question set or to-do-list. These correspond to *if-/whether-/to-* clauses in English, but are represented along with the nominalizing cases in Korean or Japanese².
2. Nominalized form can be either a phrase with a noun head or an *if-/whether-/to-* clause containing a predicate, which might more fit with semantic parsing.
3. A noun phrase or nominalized clause can be flexibly utilized in making up a paraphrase for questions or commands, in the sense that either type of utterances can be rewritten in the form of, e.g., “May I ask you QS/TDL³?”

To further investigate each, for the first part, we want to claim that our formulation can be quite language-invariant, though whether the exact correspondence exists for all languages is not guaranteed. This bases on a syntax-semantics study that the speech act of statement, question, and command is quite universal (Portner, 2004, Beyssade and Marandin, 2006). It is inevitable that such question and command, which differ from interrogatives and imperatives, incorporate a question set or to-do-list that includes the demands of the speaker. They are represented in the nominalized form, at least in the Korean and Japanese language, as will be described in the next section.

For the second issue, transforming the non-canonical directives into canonical expression, as the concept suggested in Dong et al. (2017), makes it much easier for the machine or human annotators to parse the utterance semantically. It usually accompanies (i) an omission of non-content-related terms such as polarity items and politeness particles, (ii) a reliable interpretation on non-typical questions and commands e.g., de-

² Throughout this article, we use the term ‘nominalize’ as a broader meaning compared to the literature; we indicate the non-nominative cases that are modified in the way that they can replace the nouns.

³ The term that corresponds to the question set or to-do-list.

clarative questions, and (iii) nouns or nominalizing expressions on some *wh*-particles, such as *reason*, *person*, and *period*.

Lastly, the noun heads and the nominalizers just mentioned above, make it easier for the dialog managers and human participants to comprehend the genuine demand of the directive and make a paraphrase. This approach, at a glance, resembles the strategy from the QA domain that generates a canonical form of a question to make paraphrases (Dong et al., 2017). However, the canonical form of a question cannot be directly employed in making up the paraphrases, while the nominalized terms do if the templates are reasonably prepared (Bhagat and Hovy, 2013). Also, providing only a canonical question or command form in the machine training or human generating process can induce bias and deter the robustness in the inference phase, which is to be eschewed in the cases that the analysis of various non-canonical expressions is required.

In the next section, we demonstrate how the nominalization above is realized in the Korean language. Based on the previous discussion, we show how non-canonical questions and commands can be polished into a structured format, with detailed examples.

3 Annotation Scheme

For questions that are not rhetorical (Rohde, 2006), the cases regarding *yes/no* answer (3a), preference (3b), and *wh*-particles are handled (3c-f, Huddleston (1994)).

- (3) a. sewul pi o-ni
seoul rain come-INT
'Is it raining in Seoul?'
- b. mayn aph-eyse thal-kka mayn twi-eyse thal-kka
very front-LOC ride-INT very back-LOC ride-INT
'Would I ride at the front or back?'
- c. pangkhasyulangsu-lan mwues-i-pnikka
bancassurance-TOP what-COP-INT.POL
'What is bancassurance?'
- d. yaksok-han cangso-nun eti-i-lkka
promise-do.PST place-TOP where-COP-INT
'Is it raining in Seoul?'
- e. way nay cwusik-man tteleci-ci
why my stock-only fall-INT
'Why is only my stock falling?'
- f. ne caytheykhu ettehkey hako iss-e
you fin-tech how do-PRT be-INT
'What is bancassurance?'

For (i) *yes/no* questions (*y/nQ*), the extraction is done by repeating the core content and augmenting ‘-ㄴ/ㄹ지 (-*n/l-ci*)’ or ‘여부 (*yepwu*, if -)’ after the keyword(s) (4a). For (ii) alternative questions (*altQ*) that require the addressee a choice between two or more suggestions, all the items are sequentially arranged with ‘(-랑 -중) -ㄴ/ㄹ- (-*lang -cwung -n/l-*, - is/to - between - and -)’ (4b). For (iii) *wh*-questions (*wh-Q*), we avoid repeating the *wh*-particles and instead make use of the *wh*-related nouns such as ‘의미 (*uyimi*, meaning)’, ‘장소 (*cangso*, place)’, ‘이유 (*iyu*, reason)’, ‘방법 (*pangpep*, method)’ as much as possible, since the *wh*-particles are redundant if *wh*-related nouns are determined (4c-f).

- (4) a. *sewul pi o-nunci*
 seoul rain come-NMN
if it rains in Seoul
- b. *mayn aph-eyse thal-ci mayn twi-eyse thal-ci*
 very front-LOC ride-NMN very back-LOC ride-NMN
whether to ride at the front or back
- c. *pangkhasyulangsu-uy uymi*
 bancassurance-GEN meaning
the meaning of bancassurance
- d. *yaksok cangso*
 promise place
the place in appointment
- e. *hwaca cwusik-uy halak iyu*
 speaker stock-GEN fall reason
the reason the speaker's stock falls
- f. *chengca-uy caytheykhu pangpep*
 addressee-GEN fin-tech method
the method of the addressee's fin-tech

For commands that are not rhetorical (Kaufmann, 2016), the cases regarding positive (5a/c, requirement) and negative (5b, prohibition) ones are taken into account.

- (5) a. *thipi com khyecwul swu iss-ni*
 television little turn.on.FUT PRT be-INT
 ‘Could you turn on the television?’
- b. *celtaylo o-ci ma-yo*
 never come-PRT not-IMP.HON
 ‘Never come here.’
- c. *yoksimsim-pwuli-ci mal-ko cikum phal-a*
 greed-spend-PRT not-PRT now sell-IMP
 ‘Don't be greedy, just sell it now.’

The results incorporate two factors, namely, content and negativeness. Content includes a specific TDL, which is usually a single noun phrase or a predicate that accompanies a nominalization: ‘-하기 (-*haki*, to do -)’ (6a). Negativeness indicates if the command is (i) requirement (REQ, 5a) or (ii) prohibition (PH, 5b), the latter with ‘-하지 않기 (-*haci anhki*, not to do -)’ (6b). Also, when PH and REQ are subsequently placed (the order is interchangeable), a (iii) strong-voiced requirement (SR) is induced, as in (5c).

- (6) a. *thipi khye-ki*
 tv turn.on-NMN
 to turn on the television
 b. *oci anhki*
 come-PRT not-NMN
 not to come here
 c. *cikum phal-ki*
 now sell-NMN
 to sell it now

In the above processes (3-6), unnecessary particles are removed, and proper lexicons are suggested, to an extent not impairing the speaker’s demand. It might be controversial to choose the components that are omissible, but such uncertainty is considered as a nature of the information retrieval tasks overall.

Notwithstanding such limitation, we claim that our scheme does not depend much on the annotator’s linguistic intuition as much as in other classification or generation tasks (e.g., document summarization and translation), if once the speech act is decided. For instance, for (5a), which is a *yes/no* question-type request in Korean (as well in English), it is essential to perceive the utterance as a request rather than a question if one wants to reach the final demand, *to turn off the TV*. Moreover, it is challenging to determine such property automatically in some colloquial contexts, mainly when rhetorical expressions are involved, as in “*You know how many times I told you to turn the TV off*”. Like this, deciding the type of a sentence by semantic criteria is itself a non-deterministic task. Our scheme incorporates an advantage in that such vagueness is reduced by adopting a reliable pre-annotated dataset. The labels indicate whether a Seoul Korean utterance is a question, command, or non-directive (Cho et al., 2018). In this way, we obtained the full annotated dataset with the type of a sentence and the intent argument paired as metadata.

4 Discussion

Still, there are three main points to be clarified, namely the assumption of the dropped subject, *wh*-intervention, and conditional clauses.

4.1. Covert participants

The first issue on the vague subjects mainly matters in Korean and Japanese, where the agent and beneficiary are usually omitted, especially for the directive utterances. For example, in (3f) while the subject is explicitly stated as *you* in English, the corresponding term is not required for the original Korean version. If one says *How do you manage your fin-tech?* in Korean, given the existence of the addressee, s/he may understand the agent of doing fin-tech as a hearer her/himself. This kind of omission happens quite frequently in JK. Thus, in this process, we claim that there are mainly five ways we can reflect such information in the annotation process.

- **Adding the speaker** (e.g., 3e to 4e): Speaker (*chengca*, the speaker) information is augmented with nominative or dative cases.

- **Adding the addressee** (e.g., 3f to 4f): Addressee (*hwaca*, the addressee) information is augmented with nominative or dative cases.

- **Adding both the speaker and the addressee:** Speaker and addressee information is simultaneously augmented, in some cases where the predicate concerns both participants, e.g., “*nayil eti kakilo hayssci* (Where did we say to go tomorrow?”).

- **Adding neither (Not required)** (e.g., 3a to 4a, 3c to 4c, 5a-c to 6a-c): Some utterances do not necessitate the notation of speaker or addressee since the utterances deal with the information that is related to neither, such as in a pure information-seeking question that asks encyclopedic contents.

- **Adding neither (Unknown)** (e.g., 3b to 4b): The last case considers when the agent or beneficiary cannot be guessed. Such cases are frequent among the colloquial expressions, and followingly induces vagueness within the conversation as well, unless the context and nuance are sufficiently given. Thus, in these cases, we notate neither information, as in (4b).

Again, notifying the participants mentioned above is a core process of extraction, but itself is a procedure that requires much extent of linguistic intuition. Thus, currently, the distributed corpus contains only the utterance-argument pairs with no speaker/addressee annotation⁴. Further validation is being undertaken, and the additional corpus will be released afterward.

⁴ <https://github.com/warnikchow/sae4k>

4.2. Syntactic ambiguity

The next two issues regard the sentence components that can affect the content of the argument. One is about *wh*- particles which play an intriguing role in various *wh*- questions. Beyond the ambiguity on the directivity of an utterance (which depends on the sentence-final information), what is also influenced by the prosody is the polarity of the question, that whether it is *yes/no* or *wh*-, as suggested in Cho et al. (2019a). As Korean being *wh-in-situ* (Jang, 1999), such property cannot be decided without phonetic information.

Thus, here we propose that these kinds of utterances should be interpreted as a *wh*- question by default, since the question set of *wh*- questions usually deliver that of *yes/no* counterpart as well. For instance, for a Korean sentence with a high rise intonation, *mwe mek-ko siph-e* (“What do you want to eat?” or “Do you want to eat something?”), the interpretation differs from *yes/no* question to *wh*- depending on the prosody around the *wh*- particle *mwe* (what) (Cho et al., 2019a). However, if the addressee interprets it as a *wh*- question rather than the other, s/he may attain a more flexible answer set, formulated as {*The food the addressee wants to eat*} (yes) + {*Nothing*} (no). This is not theoretically supported, and also it does not fit with the maxims of conversation Grice (1975), Levinson (2000) that returning *no* for *wh*- questions is awkward, but we frequently observe that the addressee give merely *no* answer to the speaker if no appropriate item comes up. Thus, it might have to be tolerated to identify such questions as *wh*-, if not given with additional acoustic information to further analyze, as widely happens for a text-based intent identification in (ASR-)NLU (pipeline) systems.

4.3. Pragmatic ambiguity

The last one regards the conditional clauses of imperatives and possibly some interrogatives. In real-world usage, many directive utterances accompany conditions, which restrict the range of the question set or to-do-list (Schwager, 2006). For example, if one says “*Call me when the bell rings.*”, then the to-do-list ‘*to call the speaker*’ is valid only *when the bell rings*. Thus, to preserve the core content of the utterance, the argument should be formed as ‘*to call the speaker if the bell rings*’⁵.

However, tricky cases are where this kind of simple addition and subtraction do not hold. One exception can be “*Please copy these documents if you have time*”, which has an overt condition term ‘*if you have time*’ that is assumed to be added for politeness. Although it may change the nuance, it has a null effect in substantializing the argument, finally letting

⁵ *if*- clause is alternatively used to explain the conditioned terms better.

the output be ‘*to copy these documents*’. This kind of distinction does not involve syntax nor formal semantics, but rather socio-linguistics and pragmatics, that the attention on conditional terms may differ by person and culture. It is the background that a total of three annotators’ consensus was required in determining the final arguments.

5 Multilingual Extensibility

So far, along with the English translations, we have observed how the intent arguments can be formalized in a natural language format for the Korean language. Though they can be represented in English, the language that best matches the annotation of Korean is probably Japanese. Though with less scrambling, Japanese is head-final and *wh-in-situ* (Watanabe, 2001), that it is frequently compared or co-investigated with Korean. In this regard, we show that the preceding discussion can be continuously applied to the similar processing in Japanese.

For *yes/no*-questions (7a), a correspondence to ‘-*ci*’ or ‘*yepwu*’ (3a) in Korean can possibly be ‘-(*no*)*ka*’ in Japanese, which induces (7b) and thus allows paraphrasing such as (7c).

- (7) a. sooru-ni ame-ga fut-te i-masuka
 seoul-LOC rain-NOM fall-PRT be-INT.POL
 ‘Is it raining in Seoul?’
 b. sooru-ni ame-ga fut-te-iru-noka
 seoul-LOC rain-NOM fall-PRT-PRS-NMN
 if it is raining in Seoul
 c. sooru-ni ame-ga fut-te-iru-noka oshie-te
 seoul-LOC rain-NOM fall-PRT-PRS-NMN inform-IMP
 ‘Let me know if it is raining in Seoul’

For the alternative questions (8a), the most probable form is the sequence of ‘-(*no*)*ka*’ clauses as well. However, for some *wh*-related alternative questions, one can apply the form of *wh*- questions, as in ‘-*to -no naka ni - (sr)u mono* (something to - between - and -)’. For instance, (4b) can be translated as:

- (8) a. mae-ni noru-ka ushiro-ni noru-ka
 front-LOC ride-NMN back-LOC ride-NMN
 ‘Would I ride at the front or back?’
 b. mae-to ushiro-no naka-ni noru tokoro
 front-and back-GEN between ride place
 the place to ride between the front and the back

The case of *wh*- questions is rather straightforward. The *wh*-related nouns may place at the head of the clause, namely the clause-final here, and the

modifying terms may come at the initial part, as in ‘-*sru mono*’. The final term can be replaced depending on the *wh*-particle, such as ‘-*sru imi* (meaning)’ (9a,b), ‘-*sru riyuu* (reason)’ (9c,d), ‘-*sru kotsu* (method)’ (9e,f), and so on.

- (9) a. bankashuaransu-wa nan-desuka
 bancassurance-TOP what-INT.POL
 ‘What is bancassurance?’
- b. Bankashuaransu-no imi
 bancassurance-GEN meaning
 the meaning of bancassurance
- c. naze boku-no kabushiki-dake ochi-ru
 why I-GEN stock-only fall-INT
 ‘Why is only my stock falling?’
- d. hanashite-no kabushiki-dake ochi-ru riyuu
 speaker-GEN stock-only fall reason
 the reason the speaker's stock falls
- e. zaiteku-wa doono yooni shite-i-masuka
 fin-tech-TOP how like do-be-INT.POL
 ‘How do you manage your fin-tech?’
- f. kikite-no zaiteku-no kotsu
 addressee-GEN fin-tech-GEN method
 the method of the addressee's fin-tech

Transformation of commands is not clear-cut, since there is no exact term in Japanese that matches ‘-*haki* (to do -)’ in Korean. It can be literally translated as ‘-*sru koto* (the thing to do -)’, is not intuitively plausible. However, it is acceptable that the commands in Japanese (10a) can be fairly represented into the request (10b) or utilized in the prohibition (10c). Thus, we concluded that the corresponding phrase should be an infinitive one as (10d) for command/requests and negative (10e) for prohibitions, though they may not correspond to the Korean nominalizers for all the cases.

- (10) a. terebi-o tsuke-te kure
 television-ACC turn.on-PRT give-IMP
 ‘Turn on the television.’
- b. terebi-o tsukeru-no-wa ikaga-desuka
 television-ACC turn.on-NMN-TOP why.not-INT.POL
 ‘Why don't you turn on the television?’
 (= *How about turning on the television?*)

- c. terebi-o tsuke-nai-no-wa doo-desuka
 television-ACC turn.on-NEG-NMN-TOP how-
 INT.POL
 ‘How about not turning on the television?’
 (= *Please do not turn on the television.*)
- d. terebi-o tsuke-ru
 television-ACC turn.on-INF
to turn on the television
- e. terebi-o tsuke-nai
 television-ACC turn.on-INF.NEG
not to turn on the television

The only concern regarding the extensibility is that the pragmatic politeness is differently realized in both languages. It is widely known that in contemporary spoken Japanese, the requirement or prohibition is seldom directly expressed, and preferably in a roundabout or ambaige (iimawashi) (Dunn, 2013), while the opposite is frequent in the other. That is, the annotators would often face a situation where a simple statement or a question can turn out to be a requirement or prohibition. For example, in demanding the addressee to pass over a salt, Korean expression might be “*Pass me over the salt.*” or “*Could you pass me the salt?*”, while in Japanese the correspondence can be “*I can see a salt beside you so if it doesn’t matter...*” and so on. This kind of cultural difference will be the main reason that one cannot directly apply the proposed methodology merely upon a translated corpus. Thus, in the annotation phase, the native speakers of a substantial linguistic experience are highly required, especially if the corpus incorporates the above kind of indirect expressions.

6 Conclusion

This study aims at a structured argument extraction of Seoul Korean directive utterances, which is not influenced by sentence form. This kind of formalization can be utilized in the summarization, key phrase extraction, paraphrasing, and answer generation of non-canonical questions and commands, and the resulting corpus is expected to be widely used in the intent identification and slot-filling systems (Liu and Lane, 2016). The corpus composition (# of the utterance) is as: *y/nQ* (5,718), *altQ* (227), *wh-Q* (11,924), *PH* (477), *REQ* (12,369), and *SR* (122). It is observed that *y/nQ*, *wh-Q*, and *REQ* dominate in volume, probably due to the property of conversation-style but less scripted utterances in (Cho et al., 2018). The deficit of some utterance types has recently been supplemented with an efficient data augmentation methodology that utilizes human resources (e.g.,

in the way of making up questions or commands from the phrases and clauses) (Cho et al., 2019b).

Besides, lately, we implemented the automatic transformation of the directives, via investigation on the characteristics of the components that are preserved in the extraction (Cho et al., 2019b). The key phrases are obtained from various non-canonical input sentences, since the seq2seq models (Sutskever et al., 2014) today, such as Transformer (Vaswani et al., 2017), utilize the mechanism that lets the machine learn the relationship between the sentence tokens on its own and pay attention to the components that really contribute to yielding the output. Beyond this automation, the annotated corpus is also expected to be utilized in highlighting the different role of QS and TDL from a linguistic perspective, especially by accompanying analysis on propositions, adverbs, and particles, including sentence enders. We hope our results to be useful in materializing the properties of directives in not only JK, but also in other Turkic and Indo-European languages via language-specific annotation process and analysis.

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