AnCorra : Treebank for Kannada

Contents

1 Background

A major bottleneck in developing various natural language applications for Indian languages is the un- availability of appropriate language resources. For any NLP application, certain linguistic knowledge is required. This knowledge can be prepared in the form of dictionaries, grammars, word formation rules etc. An alternative approach is to annotate linguistic knowledge in electronic texts. The annotated texts can be used for machine learning, developing these resources by extracting the knowledge etc. Penn Treebank for English (Marcus et al., 1993), Prague Dependency Tree bank for Czech (Hajicova, 1998) etc. are some of the efforts in this direction.

The idea of developing such a resource for Indian languages was first decided to be taken up at the "Workshop on Lexical Resources for Natural Language Processing", 58 Jan 2001, held at IIIT Hyder- abad. The task was named as AnnCorra, shortened for "Annotated Corpora".

For achieving this, certain standards had to be drawn in terms of selecting a grammatical model and developing tagging schemes for the three levels of sentential analysis, POS tagging, chunking and syntactic parsing. Since Indian languages are morphologically richer, they allow the order of the words to be more flexible. This also implies that the information at the morphological level can be crucial for sentence analysis. Hence, coming up with standards for morph feature representations for various Indian languages also becomes critical. The standards for POS tagging, Chunking and Morph feature represen- tation were initially arrived at in the project 'ILILMT System'. In this project nine language pairs were taken for developing bidirectional MT systems. The project is being carried out in a consortium mode and is funded by DIT, Government of India. For defining the standards for the above, several workshops were conducted with participation from major NLP groups working on the nine languages undertaken in the project.

The natural next step after POS tagging, chunking and morph analysis is sentence level parsing.
Thus, it was decided to work out a scheme for annotating tree bank for Kannada. The theoretical model that has been adopted for the sentence analysis is Panini's grammatical model which provides a level of syntacticosemantic analysis.

This document, a guidelines on dependency annotation of Kannada has two major Parts. Part1 contains a description of the grammatical model and the details of the tagging scheme. Part2 contains examples of certain typical constructions of Kannada and their analysis in Paninian dependency model.

2 The Task

The task is to develop a dependency Treebank for Kannada. As part of the task, it is decided to annotate the corpora for the following linguistic information:

1. Relevant morph features for the token in the context(lexical level)

2. POS tag(lexical level)

3. Chunk (phrasal level(without distorting the internal dependencies))

4. Dependencies(sentential level syntactico-semantic)

5. Shared and missing arguments

6. Sentence type

7. Voice type

8. Conference in specific cases

The task can be better explained with the help of an illustration. Given below is a sentence from Kannada
(1) rAmanu mohananigeV bilYi puswaka koVttanu
ರಾಮನು ಮೋಹನನಿಗೆ ಬಿಳಿ ಪುಸ್ತಕ ಕೊಟ್ಟನು

Rama gave a white book to Mohana

The above example would be given the following dependency analysis:
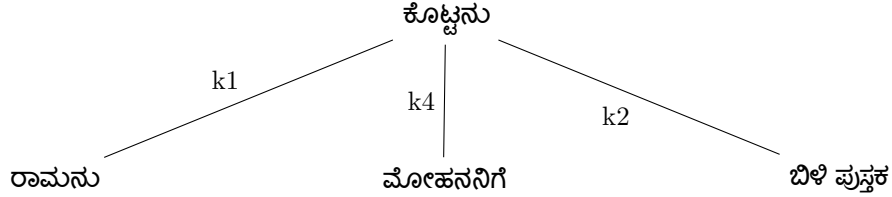
The dependency representation of the above example shown in Fig 1., represents that Rama the 'kartaa' (doer marked as k1) of the action denoted by the verb 'kottanu' 'gave', Mohan isthe'sampradana'(recipient marked as k4) and 'bili pusthaka' 'white book' is the 'karma' (locus of result of the action denoted by the verb -marked as k2) of the verb. The root node of a dependency tree is normally a 'verband, apart from the morphological information (not represented here) annotated for each note, the main verb (the root node) is also annotated for the sentence type and the voice type.

The main task, therefore, is to explicitly mark the relations (arc labels) between various elements(words) of a sentence. This obviously requires a grammatical model basing which the dependency relations can be annotated.

3 PART-1-A

This has a description of the grammatical model used in designing the tagging scheme and the details of the tagging scheme. Some details about the corpora and where it has been taken from are also provided.

3.1 Grammatical Model

Paninian grammatical model has been chosen for the sentence analysis for the Kannada treebank creation. Hence, the tag labels also reflect Paninian framework. As mentioned above, the model offers a syntactico-semantic level of linguistic knowledge which has been adopted for the Kannada treebanking. Preference for this model is based on:

a The model, not only offers a mechanism for SYNTACTIC analysis, but also incorporates the SEMANTIC information (dependency analysis).

b Indian languages have a relatively free word order, hence a dependency grammar based approach would be better suited for sentence analysis

The Paninian grammatical model treats a sentence as a series of modifier modified elements starting from a primary modified (generally a finite verb) . The objective of the grammarian, according to this framework, is to extract meaning from a sentence as spoken by a lay person. It works with the assumption that language is used for communication. The meaning in a sentence is encoded, not only in the words (lexical items), but also in the relations between words. Thus every word in a sentence has a twofold role towards composing the larger meaning; (i) the concept it represents and (ii) theparticipatory role it plays in the sentence in relation to the other words. The latter (ii) is, most often, expressed through some explicit markers such as nominal inflections, verbal inflections etc. This implies that certain linguistic cues are explicitly available in a sentence using which one can extract the meaning from a sentence. Morphologically rich languages such as Kannada,Sanskrit (a classical Indian language), Telugu, Tamil etc (some of the modern Indian languages) mark the grammatical information in the words themselves (through affixes). However, for languages such as Hindi, one has to go beyond lexical items and use postpositions (for case marking) and auxiliaries (for tense, aspect, modalities) for this purpose. A step of local word grouping (LWG - Bharati et al, 1995) helps in computing the grammatical information easily. Thus, the Paninian Grammatical model (let us refer to it as Computational Paninian Grammatical (CPG) model) can easily be designed to meet the parsing requirements and also help in extracting meaning from a sentence. The grammatical relations which have been considered here are of two types:

1. kaaraka, and

2. Relations other than kaarakas.

Kaaraka, according to Patanjali, is the one which performs an action (karotiiti kaarakam). A number of direct participants are needed for an action to be completed successfully. Doer of an action, time when the action is carried out, recipient of an action which requires transfer of some sort, source of an action which denotes a point of departure etc are some examples of the direct participants (karakas)of an action. There could also be other players when an action is being carried out. These players may not have any direct role in the action though. Reason and purpose are two examples of such players.'kaarakas' are the roles of various direct participants in an action. An action in a sentence is normally denoted through a verb. Hence, a verb becomes the primary modified (root node of a dependency tree) in a sentence. Panini has spelled out six karakas (Bharati et al., 1995). The sentence may contain a number of relations between words which are not 'kaaraka' relations. The scheme adopted for annotating dependency relations in this treebank refers to these relations as 'other than karaka relations.Purpose,reason, genitive etc. would fall under the second type of relations within the Paninian framework.

The six **karakas** given by Panini are '**kartaa**' (doer of an actions), **karma** (locus of the result of the action), **karana** (instrument), **sampradana** (recipient/beneficiary), **apadana** (source) and**adhikarana** (location).

'**kartaa**' is defined as the 'most independent' of all the kaarakas (participants). 'kartaa' is the one who carries out the action. It is conceptually different from the agent theta role as it does not always have volitionality. It is the locus of the activity implied by the verb root. In other words, the activity resides in or springs forth from the '**kartaa**' (Bharati et al., 1995). For example:

1. *Ram made the basket*

Ram is 'kartaa' here as he is performing the action of making the basket. In Paninian grammar,every action is a bundle of sub-actions and all the participants (kaarakas) in an action have a sub-action located in them. Thus every kaaraka is the 'kartaa' (doer) of its own action. For example;

1. ರಾಮನು ಬುಟ್ಟಿಯನ್ನು ಮಾಡಿದನು
   rAmanu buttiyannu mAdixanu
   Ram dat basket did
   'Ram made basket'
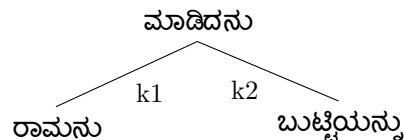
2a. *Ram opened the lock with a key*

In the above example, 'Ram' ('kartaa'), 'lock' (karma) and 'key' (instrument) are the three kaarakas of the action of 'opening'. The larger action of opening the lock involves following sub-actions (i) action of Ram, (ii) action of the lock and (iii) action of the key. Therefore, 'lock' and 'key' are the 'kartaa' of the sub-actions carried out by each of them. (2b) and (2c) exemplify this.

2. ರಾಮನು ಬೀಗವನ್ನು ಕೀಲಿಕೈಯಿಂದ ತೆರೆದನು
   rAmanu bIgavannu kIlikEyiMxa weVreVxanu
   Ram opened the lock with key
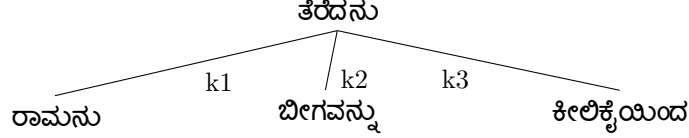
2.b *The lock opened*
The action here is of the lever coming apart. If a lock is rusted, then even if the key turns the lever,the lock would not open as the lock's action is not carried out. Thus, in (2b) the emphasis is on the 'lock's action'.
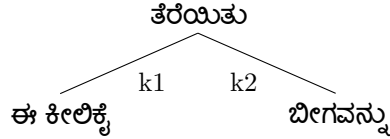
3. ಬೀಗವು ತೆರೆಯಿತು
   bIgavu weVreVyiwu
   lock opened
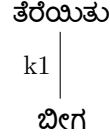
4. ಈ ಕೀಲಿಕೈ ಬೀಗವನ್ನು ತೆರೆಯಿತು.
   I kIlikE bIgavannu weVreVyiwu

3.2   The Scheme

The tagging scheme here includes tagsets at various levels of annotation, the representation format, the naming conventions etc.

3.2.1   A Little History

The first step in the direction of coming up with a tagging scheme for annotating dependencies at the sentential level for Indian languages was conceived and worked out in 2000 itself. At the time it was decided to break the dependency annotation into two parts. Local dependencies and the dependencies of postpositions and auxiliaries to their respective nouns or verbs etc would be done separately. Since it is easy to mark such dependencies automatically with fairly high degree of accuracy, it was decided to leave these out of the manual task of annotation. Thus, the dependency annotation would be manually marked only between

the heads of the chunks, i.e. at the inter-chunk level. A chunk is taken to be a basic unit for marking the syntactico-semantic relations with the assumption that the intra-chunk dependencies could be obtained automatically by using a rule based system. Also, the verb chunk is more or less a grouping of the verb base form and its tense, aspect and modality (TAM) auxiliaries. The practical aspect of this decision was that it would save the effort in manual annotation. Once inter-chunk annotation is over, a tool would automatically mark the relations within a chunk/local word group, thus, giving a full dependency tree. Thus, the initial dependency tagging scheme did not include intra-chunk relations.

The task of treebanking could not be immediately carried forward at the time as other tasks such as POS tagging and chunking etc for Indian languages needed prior attention. Substantial amount of work was then done in the direction of developing standards for POS tagging and chunking for Indian languages and a tagging scheme for the same (Bharati et al. 2006). It was decided to revisit the AnCora Tagset for inter-chunk dependency relations in Jan 2005. Each of the tag was discussed and a revised list was arrived at. The tagset contained around 26 tags.

Based on the tagset developed in 2005, a small set of sentences (about 2000) from Hindi were annotated. During this process it was noted that there were constructions which could not be satisfactorily captured in the existing tagset. Subsequently, the tagset was re-visited and the tagset given in these guidelines was evolved.

Intra-chunk dependency labels (see Appendix 10.4) were also subsequently.

3.2.2 Corpora

The corpora for the treebank has been acquired from IISc, Bengaluru. The Kannada corpus is mainly newspaper texts from Dailies. The domains chosen for the annotation are general news articles (100k), tourism and conversational texts (50k).

3.2.3 Treebank Representation Format (SSF)

The annotated data is stored in SSF format (Bharati et al., 2007). The SSF is a four column format in which the first column is for address, the second column is for the token, the third column is for the category of the node and the fourth column has other features. Any required linguistic or other information can be annotated in the fourth column using an attribute value pair. Thus, POS and chunk category of the tokens would be in the third column and the morph, dependency and any other information pertaining to a node would appear in the fourth column. For more details on SSF read (Appendix 10.2)

3.2.4 Naming Conventions

The naming conventions adopted in the treebank are as follows:

A Naming tokens
  Every lexical item and chunk will have a name. The attribute for naming is 'name'. Values for lexical nodes would be the concerned lexical item. In case there are more than one occurrences of the same word the value for the name attribute would be the lexical item followed by a numerical. For example, if the token is 'phala' (fruit), it would be represented as name='phala'. In case 'Pala' occurs twice in a sentence, the first time its naming feature would be name='phala' and the second time it will be named as name='phala2'. Some more examples are: Hari name='Hari' said name='said'

  Ram name='Ram'
  Ram name='Ram2'
  ! Name='!'

B Naming Chunks
  The chunks are named as their respective phrase tags(NP/VP/JJP). As in the case of lexical items, the subsequent occurrences of the chunks are also named by appending an iterated number(starting with 2)to the phrase tag. For example,

```
NP name=`NP'
VP name=`VP'
NP name=`NP2'
NP name=`NP3'
```

C Naming NULL nodes

In case a NULL node is inserted, the NULL node would be assigned a appropriate POS tag. The naming of a NULL node would also be similar to the naming of tokens. That is the node would be named name='NULL' and the subsequent NULL nodes within the same sentence would be assigned names NULL2, NULL3 etc. Similarly, at the chunk level, a chunk containing a NULL node would have the chunk category of the type NULL_NP, NULL_VGF, NULL_JJP etc depending on the POS category of the NULL node within a chunk. The naming on these chunks would be similar to the other chunks, i.e. a NULL_NP chunk would be named as 'NULL_NP' etc.

D Naming Example Sentences

For ease of access, the examples for various labels and construc- tions have also been given ids in this document. The convention in Part-1b is that every example starts with 'Relation-DS-'. Thereafter, the id has the relation label for which the example stands for followed by a number. For example, examples for 'kartaa' kaaraka would have the following ids Relation-DS-k1-1, Relation-DS-k1-2 and so on. Similarly, for karma kaaraka examples the ids would be Relation-DS-k2-1,Relation-DS-k2-2 and so on. This allows a exibility of adding more examples for each type of relation at a later stage.

In Part-2, the examples are named as [Construction type-DS-example number]. Thus, examples for causative constructions would read as follows: Causative-DS-1,Causative-DS-2 and so on.

3.2.5 Relations and tag labels

A The POS and Chunk Tags

The tagging scheme for POS and Chunk annotation has been developed through conducting various workshops in which scholars representing several major languages of India participated. The scheme aimed at coming up with a tagset which would be comprehensive to the extent possible covering issues from all Indian languages and should be simple for the annotators.

((ADD MORE DETAILS)) Annotation guidelines based on the above scheme are also prepared(Appendix 10.3). The task of annotating POS and chunk in several Indian languages is already goingon under the ILMT project funded by Department of Information Technology (DIT), Ministry of Communication and Information Technology (MCIT), Government of India.

B Dependency labels

The scheme contains about 40 tags which are arrived at considering various types of sentence constructions in Hindi. These labels contain relations (a) kaaraka and non-kaaraka dependency relations (b)some underspecified tags of the type vmod, nmod etc and (c) some tags which indicate relations which are not exactly dependency relations but are required to represent the sentence structures. As mentioned earlier, the grammatical model captures certain syntactico semantic relations. The tag labels represent various kaaraka and other than kaaraka relations. All kaaraka relations have been labeled starting with a 'k' followed by a numerical. Paninian grammar talks about six kaaraka relations. In this section we describe the kaaraka relations and how they have to be annotated. Although the basic

number of karakas is six, there are a number of relations which are either finer types of karakas (such as k2p, k2g etc) or are in some way or the other related to a kaaraka (such as k1s, k2s, k1u, k2u etc). The labels for dependency relations other than karakas start with an 'r'.

There are certain relations which do not fall under 'dependency relation' directly but are required for showing the dependencies indirectly. For example, for representing a labels 'ccof' and 'pof' appear in the tagging scheme to represent 'co-ordination' and 'complex predicates' respectively. The dependency relation type tree in bf Figure 2 below shows the relations from coarser to finer on a modifier modified paradigm.
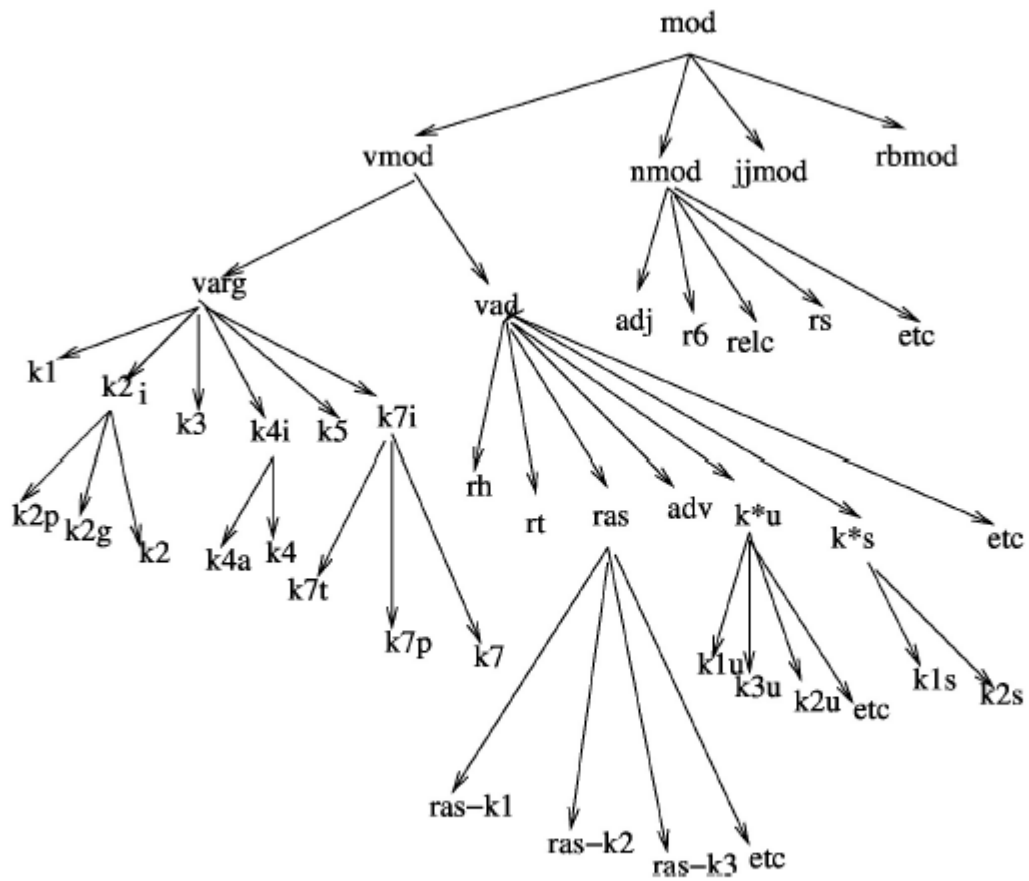
Figure 1: Dependency Relation Types

[scale=0.7]

The classification shown in the above tree allows underspecification of certain relations in cases where a finer analysis is not very significant for this level of annotation and is also more difficult for decision making for the annotators. Therefore, the labels such as k1, k2 etc represent a finer level depicted deeper in the tree, whereas, labels such as 'vmod', 'nmod' show an underspecified representation of the relation.

More details for this are given under respective labels in Section 4.1 of this document.In deciding the kaaraka relations of elements in a sentence, the semantics of the verb plays a major role and at the same time syntax helps too. Normally 'kartaa' and karma agree with the verb. If 'kartaa' agrees with the verb then it takes a zero vibhakti (nominative case) otherwise it takes one of the following vibhaktis (postposition)- ne, ko, se, xvArA. Therefore, a mapping between vibhakti and TAM (tense, aspect and modality) can be quite useful for identifying the dependency relations such as'kartaa' and karma.

A default rule for annotating karakas in sentences with more than one verb is that all kaarakas attach to the nearest verb on the right. k1 has a special default rule for the shared argument relation.It attaches to the finite verb.

4   PART-1B

The issues related to actual annotation task such as how to mark various relations, how to handle shared arguments, what to do in case of missing arguments are described in this part of the document. All the relations and the labels to be used for them are also listed here. As mentioned above, the framework provides two kinds of dependency relations - kaaraka relations and other relations. Detailed description for each of the labels and the syntactic cues for marking them are also provided.

NOTE: Gloss has been provided for the examples given in the document. But often the gloss provides only the relevant lexical information and not all the information which might be there in a Hindi word.For example, most often the gender and number information is missing.

4.1   The Dependency Relations and How to mark them

We will now describe all the dependency relations and the tag label for each of them one by one. The objective of this section is to help the annotators with the actual annotation of various relations in a sentence. All the kaaraka relations which have labels starting with k are listed first followed by non-kaaraka relation labels which begin with 'r'.

4.1.1   kaaraka Relations

'kartaa' (k1)- (doer/agent/subject) 'kartaa' is the one who carries out the action. Various cases of a 'kartaa' in a sentence are listed below: The grammar talks of two types of 'kartaa', (a) primary and (b) secondary. Primary 'kartaa' has volitionality whereas the secondary 'kartaa' does not. Therefore, 'kartaa's of 2b and 2c above do not have volitionality. In A.B.C. And D. below various conditions under which a 'kartaa' occurs in kananda are explained through examples.

1.A. If the verb denotes an action, the k1 is the doer of the action. In examples (Relations-k1-1 to 7), rAma is the doer of the action so rAma is the 'kartaa'.
Example Id = Relation-DS-k1-1:

1. ರಾಮ ಕುಳಿತಿದ್ದಾನೆ.
   rAma kulYiwixxAneV
   Rama sit-perf is
   'Rama sitting'

<p align="center">ಕುಳಿತಿದ್ದಾನೆ</p>

<p align="center">| k1</p>

<p align="center">ರಾಮ</p>

Syntactic Cues: Most general or default syntactic cues for identifying karta in a Kannada sentence are:

(a) *Kartaa* is normally in nominative case which is realized as 0 in Kannada. (b) By default verb in active voice (list of TAMs attached) agrees with the kartaa in number, gender and person.

IMPORTANT NOTE on syntactic cues: It is important to note that kartaa is not the only karaka which may appear with a 0 vibhakti. Some other relations may also appear without an explicit case marker. The conditions under which various karakas etc occur with a particular 'vibhakti' may not always be syntactic. Therefore, one needs to look at various cues such as the context, the semantic properties of the word under consideration, semantic properties of the words to which the given word is related etc. In short, the cues provided here are only to help take a decision but are not to be followed mechanically.

Some more examples of kartaa where the above syntactic cues would apply are:

Example Id = Relation-DS-k1-2:

2. ರಾಮನು ಪಾಯಸವನ್ನು ತಿನ್ನುತ್ತಾನೆ
   rAmanu pAyasa winnuwwAneV
   Ram rice-pudding eat-hab-sg-m is
   'Ram eats rice-pudding'
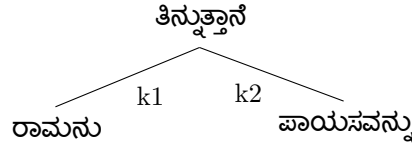
Example Id = Relation-DS-k1-3:

3. ಸೀತಾ ಪಾಯಸವನ್ನು ತಿನ್ನುತ್ತಾಳೆ
   sIwA pAyasavannu winnuwwAlYeV
   Sita rice-pudding eat-hab-sg-f is
   'Sita eats rice-pudding'
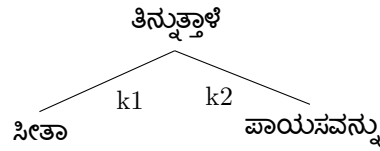
1.B. However, karta in Hindi can also occur with case markers other than nominative case (0 vibhakti). NOTE: The terms case marker, vibhakti or postposition are used interchangeably in this document.
Example Id = Relation-DS-k1-4:
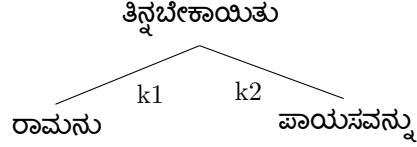
4. ರಾಮನು ಪಾಯಸವನ್ನು ತಿಂದನು.
   it rAmanu pAyasa wiMxanu
   Ram erg rice-pudding ate
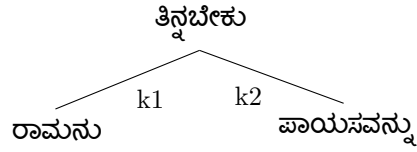   'Ram ate rice-pudding'

9
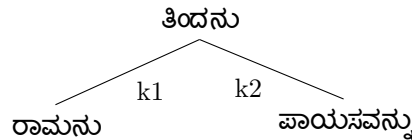
Example Id = Relation-DS-k1-5:

5. ರಾಮನು ಪಾಯಸವನ್ನು ತಿನ್ನಬೇಕಾಯಿತು.
   rAmanu pAyasa winnabekAyiwu
   Ram dative rice-pudding eat+inf had
   'Ram had to eat rice-pudding'

```
              ತಿನ್ನಬೇಕಾಯಿತು
                /      \
            k1        k2
          /              \
      ರಾಮನು           ಪಾಯಸವನ್ನು
```

Example Id = Relation-DS-k1-6:

6. ರಾಮನು ಪಾಯಸವನ್ನು ತಿನ್ನಬೇಕು
   rAmanu pAyasavannu winnabeku
   Ram dat rice-pudding eat+inf should
   'Ram has to eat rice-pudding'

```
              ತಿನ್ನಬೇಕು
                /      \
            k1        k2
          /              \
      ರಾಮನು           ಪಾಯಸವನ್ನು
```

Syntactic cues: for identifying a 'karta' in the above constructions are: If a verb has the corresponding TAM in the list below then the noun would always be a karta in Kannada.
TAM

  i wwAne or wwALyeV

 ii beku

iii beku_Ayithu

C. In passive constructions, normally a karta would be absent. However, if it occurs, will appear with 'iMxa', or 'xeseVyiMxa' as its vibhakthi or 'moolaka' as postposition.

7. ರಾಮನಿಂದ ಪಾಯಸ ತಿನ್ನಲ್ಪಟ್ಟಿತು *rAmaniMxa pAyasa winnalpattiwu*
   ram by rice-pudding ate passv
   Through Ram rice pudding was eaten

```
              ತಿನ್ನಲ್ಪಟ್ಟಿತು
                /      \
            k3        k1
          /              \
      ರಾಮನಿಂದ           ಪಾಯಸ
```
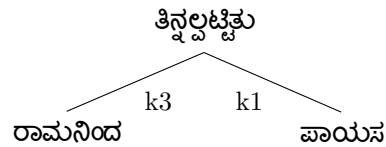
8. ಮರವು ಆವನಿಂದ ಹತ್ತಲ್ಪಟ್ಟಿತು
   maravu avaniMxa hawwalpattiwu
   tree by him was climbed
   Tree was climbed by him

ಹತ್ತಲ್ಪಟ್ಟಿತು
k1   k3
ಮರವು   ಆವನಿಂದ
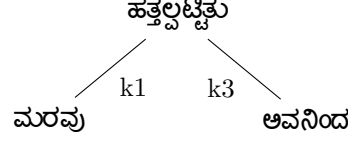
Example Id = Relation-DS-k1-8:

Syntactic cues: (a) A noun followed by the postposition 'moolaka' or 'mukhena' and (b) the verb having a passive TAM (tense, aspect and modality) would be a 'karta'. A list of passive TAMs in Kannada is provided in Appendix for reference.

D. Karta with a genitive marker: Karta in Kannada can also occur with a genitive marker. Following are some examples of the same.

9. ರಾಮನ ನಂಬಿಕೆ ಎಂದರೆ ನಾಳೆ ಮಳೆ ಆಗುತ್ತದೆ
   rAmana naMbikeVyeVMxareV nAlYe malYe AguwwaxeV
   Ram of belief that tomorrow rain-will-happen
   'Ram believes that it will rain tomorrow'

ಆಗುತ್ತದೆ
k7t   k1
ನಾಳೆ   ಮಳೆ
rs
ಎಂದರೆ
r6v   k1
ರಾಮನ   ನಂಬಿಕೆ
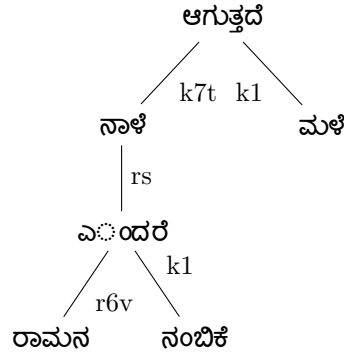
The karta with a genitive vibhakthi(na) occurs only with a few verbs such as 'helikeV', 'AlochaneV', 'naMbikeV' etc. The verb in these cases would have the TAM 'neV' or 'keV' (gerundive).

E. Some more examples of 'karta' in Kannada sentences :
Example Id = Relation-DS-k1-9:

10. ರಾಮನು ಒಳ್ಳೆಯವನು *rAmanu oVlYlYeVyavanu*
    Rama good is
    'Rama is good'

NULL
k1   k1s
ರಾಮನು   ಒಳ್ಳೆಯವನು
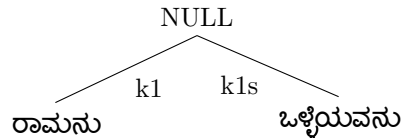
Example Id = Relation-DS-k1-10:

11. **ರಾಮನಿಗೆ ಚಂದ್ರ ಕಾಣಿಸಿತು**
    rAmanigeV caMxra kANisiwu
    Rama-dat could see moon
    Rama could see Moon

$$\text{ಕಾಣಿಸಿತು}$$

k4a / \ k2

ರಾಮನಿಗೆ   ಚಂದ್ರ
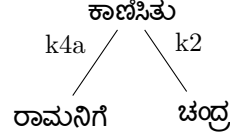
In the stative verbs, the state of a person or a thing is mentioned. The person or thing whose state is mentioned will be the karta. In example (Relation-DS-k1-8), state of rAma is mentioned so rAma becomes the karta.

Similarly, the subject of an unaccusative verb would also be marked as karta. In example (Relation-DS-k1-10), chandra 'moon' is the karta as 'kAnisu' (to be seen) is an unaccusative verb in Kannada. Following the denition of a karta as the doer of the activity denoted by the verb, the doer of the activity of'kANu' (to see) is different from the activity of 'kANisu' (to be seen). Therefore, the element 'rAma'in Relation-DS-k1-9, from where this activity springs forth would be karta.

F. Clausal karta: A clause can also be karta. For example,
Example Id = Relation-DS-k1-11:

12. **ರಾಮನ ಈ ನಂಬಿಕೆ ಸರಿ ಇದೆ**
    rAmana I naMbikeV sari ixeV
    Ram of this belief true
    'This belief of Ram is true.'

$$\text{ಇದೆ}$$

k1 k1s

ಈ ನಂಬಿಕೆ   ಸರಿ

r6

ರಾಮನ
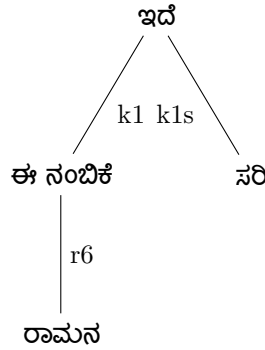
In the above example the non finite clause, 'rAmana E naMbikeV' is the karta of the verb 'ixeV'. The k1 tag in such cases would be annotated on the verb of the clausal karta. Therefore , (annotated example is represented in SSF).
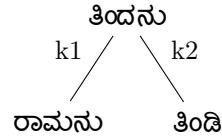
```
(( NP <drel=r6v:VGNN>
rAmana N\_NN
))
(( NP <drel=k1:VGF name=VGNN>
E naMbikeV VGNN
))
```

```
(( JJP <drel=k1s:VGF>
sari JJ
))
(( VGF <name=VGF>
ixeV V\_VM
))
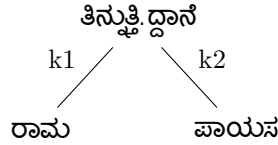```

Robust cues for identifying karta:
1. A noun chunk with 'u' case marker is always k1. For example:

13. ರಾಮನು ತಿಂಡಿ ತಿಂದನು
    *rAmanu wiMdi wiMxanu*
    Ram erg food ate
    'Ram ate food'



2. For a sentence in active voice, the verb generally agrees with the karta. For example,

14. ರಾಮ ಪಾಯಸ ತಿನ್ನುತ್ತಿದ್ದಾನೆ.
    *rAma pAyasa winnuwwixxAneV*
    Ram rice-pudding eat cont is
    'Ram is eating rice-pudding'



3. There is always at most one k1 for a verb. For example,

15. ರಾಮ ಶಾಲೆಗೆ ಹೋಗಿ ಮನೆಗೆ ಬಂದನು.
    *rAma SAleVgeV hogi maneVgeV baMxanu*
    Ram school gone home came went
    'Having gone to school, Ram came home.'
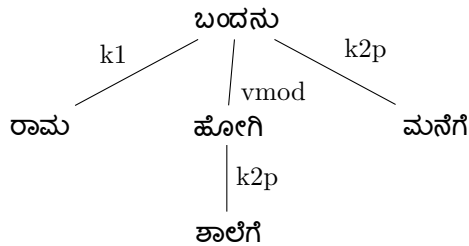
4. All first and second person personal pronouns in nominative case are k1. For example,

16. ನಾನು ತಿಂಡಿ ತಿನ್ನುತ್ತಾ ಇದ್ದೇನೆ.
*nAnu wiMdi winnuwwA ixxeneV*
I snacks eat is am
'I am eating snacks.'

ತಿನ್ನುತ್ತಾ ಇದ್ದೇನೆ

k1 / \ k2

ನಾನು        ತಿಂಡಿ
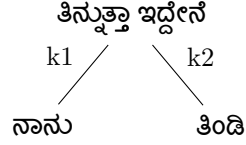
DRel-2. pk1, jk1, mk1 (causer, causee, mediator-causer)
Causatives in Kannada are realized through a morphological process. An intransitive or a transitive verb changes to a causative verb when suffixed by either an 'A' or a '-vA' suffix. In our scheme, both 'causer' and 'causee' are marked. In addition to the causer and causee, there can also be a mediator who is both causee and causer.
A. pk1 (prayojaka karta 'causer')
Example Id = Relation-DS-pk1-1:

17. ತಾಯಿಯು ಮಗುವಿಗೆ ತಿಂಡಿ ತಿನಿಸಿದಳು.
*wAyiyu maguvigeV wiMdi winnisixalYu*
mother erg child acc snacks caused to eat
'The mother fed the child.'

ತಿನಿಸಿದಳು

pk1                    k2
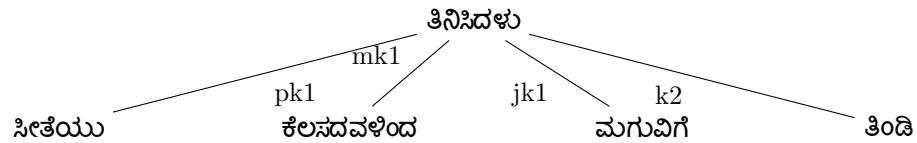
        jk1

ತಾಯಿಯು        ಮಗುವಿಗೆ        ತಿಂಡಿ
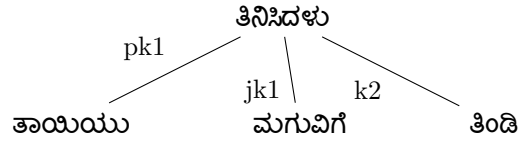
Example Id = Relation-DS-pk1-2:

18. ಸೀತೆಯು ಕೆಲಸದವಳಿಂದ ಮಗುವಿಗೆ ತಿಂಡಿ ತಿನಿಸಿದಳು

*sIweVyu keVlasaxavalYiMxa maguvigeV wiMdi winnisixalYu*
mother erg child acc food caused to eat

'Sita made the maid feed the child'

ತಿನಿಸಿದಳು

    mk1
        pk1            jk1        k2

ಸೀತೆಯು        ಕೆಲಸದವಳಿಂದ        ಮಗುವಿಗೆ        ತಿಂಡಿ

Example Id = Relation-DS-pk1-3:
Syntactic cues: Syntactically, 'pk1' will behave like 'karta'. Therefore, all the syntactic cues which are used for 'karta' would apply in the case of a 'prayojak karta' (pk1-causer) as well. The difference
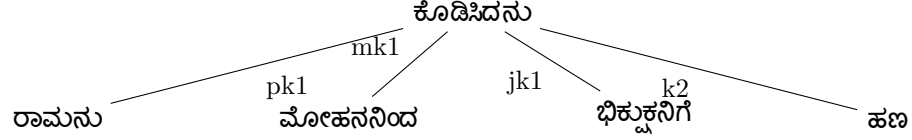
14

between a 'karta' and a 'prayojaka karta' is to be noted from the verb form. '-vA' suffix in the verb is a clear indicator of it being a causative.

19. ರಾಮನು ಮೋಹನನಿಂದ ಭಿಕ್ಷುಕನಿಗೆ ಹಣ ಕೊಡಿಸಿದನು.
    *rAmanu mohananiMxa BikRukanigeV haNa koVdisixanu*
    Ram erg Mohan by beggar acc money caused to give
    'Ram made Mohan give the alms to the beggar'

```
                          ಕೊಡಿಸಿದನು
                  mk1
            pk1              jk1      k2
      ರಾಮನು   ಮೋಹನನಿಂದ        ಭಿಕ್ಷುಕನಿಗೆ      ಹಣ
```

B. jk1 (prayojya karta 'causee')

The causee in a causative construction is annotated as jk1. All the tags capture the information of agentive participation in various nouns.
Example Id = Relation-DS-jk1-1:

20. ತಾಯಿಯು ಕೆಲಸದವಳಿಂದ ಮಗುವಿಗೆ ತಿಂಡಿ ತಿನಿಸಿದಳು.

    wAyiyu keVlasaxavalYiMxa maguvigeV wiMdi winnisixalYu
    mother erg child acc food caused to eat

    'Mother made the maid feed the child'

```
                          ತಿನಿಸಿದಳು
                  mk1
            pk1              jk1      k2
      ತಾಯಿಯು   ಕೆಲಸದವಳಿಂದ        ಮಗುವಿಗೆ       ತಿಂಡಿ
```
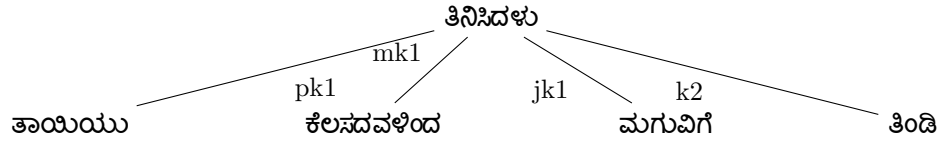
Example Id = Relation-DS-jk1-2:

21. ರಾಮನು ಮೋಹನನ ಮುಖಾಂತರ ಟಿಕೆಟ್ ಖರೀದಿಸಿದನು
    rAmanu mohanana muKAMwara/niMxa tiket KarIxisixanu
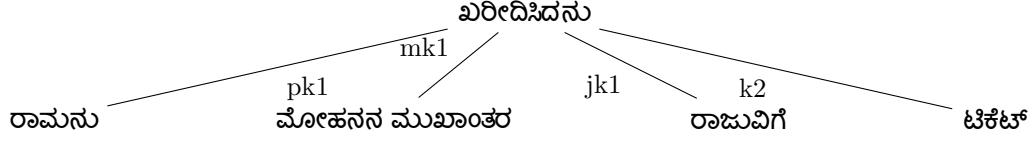   Ram erg Mohan by ticket caused-to-buy
    'Ram made Mohan buy tickets'

```
                          ಖರೀದಿಸಿದನು
               pk1      mk1         k2
      ರಾಮನು        ಮೋಹನನ ಮುಖಾಂತರ         ಟಿಕೆಟ್
```

Exmaple Id = Relation-DS-jk1-3:

22. ರಾಮನು ಮೋಹನನ ಮುಖಾಂತರ ರಾಜುವಿಗೆ ಟಿಕೆಟ್ ಖರೀದಿಸಿದನು

rAmanu mohanana muKAMwara / niMxa rAjuvigeV tiket KarIxisixanu
Ram erg Mohan by Raju ticket caused-to-give
'Ram made mohan buy tickets for Raju'

Syntactic cues: Syntactically, a causee would have either a 'ko' vibhakti or a 'se' vibhakti. The choice of 'nigeV' or 'niMxa' would depend on the type of verb. Therefore, there is no denite syntactic cue. In this case also, it is the verb form and its semantics which are the determining factors for identifying this relation.

C. mk1(madhyastha karta 'mediator causer') Causative constructions have at least one causer and one causee. However, more than one causers can also occur in a sentence. The second causer (a mediator) in such cases is a causee-causer. The mediator (causee-causer) is marked as mk1. It is possible that more than one causee-causers can occur in a sentence. In case there are more than one mediators in a causative construction they are all marked as mk1. See the examples below:
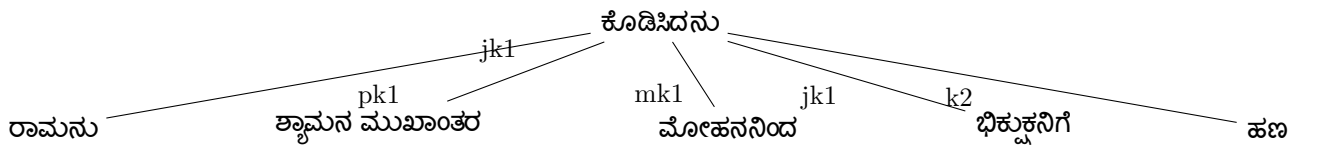
Example Id = Relation-DS-mk1-1:

23. ತಾಯಿಯು ಕೆಲಸದವಳಿಂದ ಮಗುವಿಗೆ ತಿಂಡಿ ತಿನಿಸಿದಳು.

wAyiyu keVlasaxavalYiMxa maguvigeV wiMdi winnisixalYu
mother erg child acc food caused to eat

'Mother made the maid feed the child'
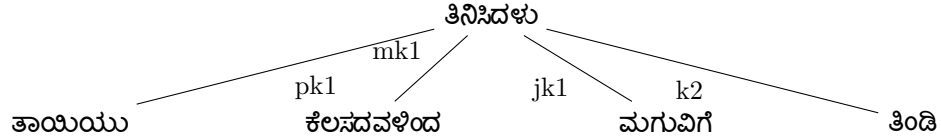
24. ರಾಮನು ಶ್ಯಾಮನ ಮುಖಾಂತರ ಮೋಹನನಿಂದ ಭಿಕ್ಷುಕನಿಗೆ ಹಣ ಕೊಡಿಸಿದನು.

rAmanu mohananiMxa BikRukanigeV haNa koVdisixanu
Ram erg Mohan by beggar acc money caused to give
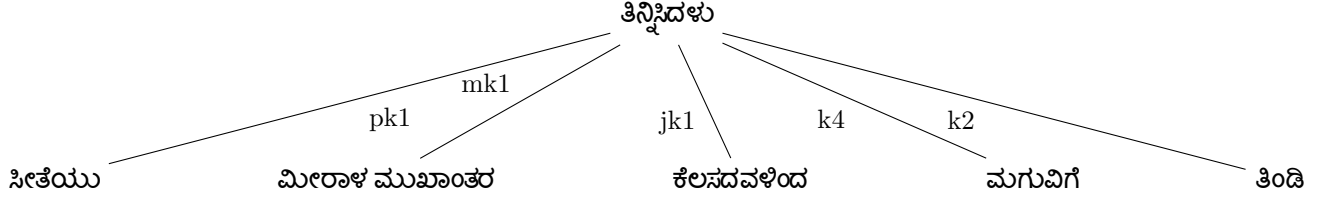'Ram made Mohan give the alms to the beggar'


Example Id = Relation-DS-mk1-3:

16

25. ಸೀತೆಯು ಮೀರಾಳ ಮುಖಾಂತರ ಕೆಲಸದವಳಿಂದ ಮಗುವಿಗೆ ತಿಂಡಿ ತಿನ್ನಿಸಿದಳು.

   sIweVyu mIralYa muKAMwara keVlasaxavalYiMxa maguvigeV wiMdi winnisixalYu
   Sita erg Mira by maid by child acc food caused to feed
   'Sita made Mira make the maid feed the child'

```
                            ತಿನ್ನಿಸಿದಳು
                  mk1
            pk1              jk1      k4       k2
   ಸೀತೆಯು   ಮೀರಾಳ ಮುಖಾಂತರ   ಕೆಲಸದವಳಿಂದ   ಮಗುವಿಗೆ      ತಿಂಡಿ
```

26. ತಾಯಿಯು ಮಗುವಿಗೆ ಊಟ ತಿನ್ನಿಸಿದಳು.

   wAyiyu maguvigeV Uta winnisixalYu
   mother erg child acc food caused to eat
   'The mother fed the child'

```
              ತಿನ್ನಿಸಿದಳು
         pk1   jk1    k2
   ತಾಯಿಯು   ಮಗುವಿಗೆ    ಊಟ
```
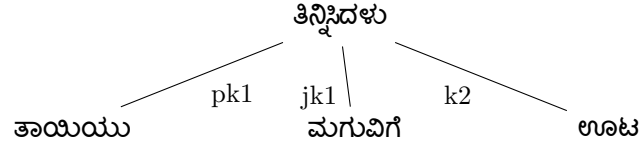
Possible cases of confusion:
1. Sometimes transitive verbs also end with -isu TAM. Also, sentences with passive voice construction be confused as causatives.

DRel-3. k1s (vidheya karta - karta samanadhikarana 'noun complement of karta')

Noun complements of karta are marked as 'k1s'. The term samanadhikarana indicates 'having the same locus'. Therefore, karta samanadhikarana indicates having the same locus as karta.
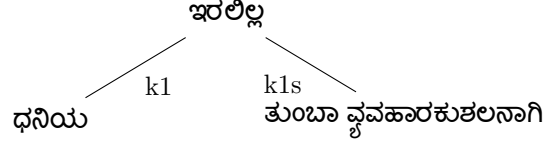
Example Id = Relation-DS-k1s-1:

27. ರಾಮ ಬುದ್ಧಿವಂತ.
   rAma buxxivaMwa
   Ram intelligent
   'Ram is intelligent'

```
              NULL
          k1      k1s
        ರಾಮ        ಬುದ್ಧಿವಂತ
```
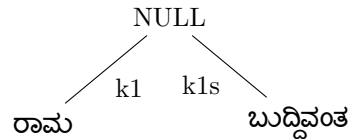
28. ಧನಿಯ ತುಂಬಾ ವ್ಯವಹಾರಕುಶಲನಾಗಿ ಇರಲಿಲ್ಲ.

   Xaniya wuMbA vyavahArakuSalanAgi iralilla
   Dhaniya so-much diplomatic not was
   'Dhaniya was not that diplomatic'.

ಇರಲಿಲ್ಲ

```
           ಇರಲಿಲ್ಲ
          /        \
      k1 /          \ k1s
        /            \
    ಧನಿಯ        ತುಂಬಾ ವ್ಯವಹಾರಕುಶಲನಾಗಿ
```

Robust cues: k1s can only be there when a k1 is marked for verb.

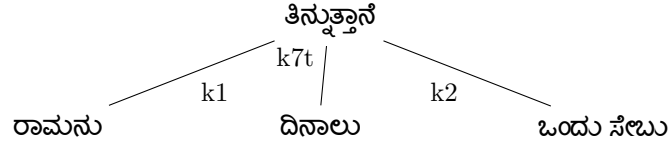### DRel-4. k2(karma 'object/patient')

The element which is the object/patient of the verb is marked as karma. Karma is the locus of the result implied by the verb root.
A. karma in active voice sentences:
Given below are some examples of the occurence of karma in active voice sentences:
Example Id = Relation-DS-k2-1:

29. ರಾಮನು ದಿನಾಲು ಒಂದು ಸೇಬು ತಿನ್ನುತ್ತಾನೆ.
    rAmanu xinAlu oVMxu seVbu winnuwwAneV
    Ram everyday one-apple eat-hab pres
    'Ram eats an apple everyday'

```
                  ತಿನ್ನುತ್ತಾನೆ
              k7t /    |      \
         k1   /       |       \ k2
            /        |        \
       ರಾಮನು     ದಿನಾಲು     ಒಂದು ಸೇಬು
```

30. ರಾಮನು ನಿನ್ನೆ ಒಂದು ಸಿನೆಮಾ ನೋಡಿದನು.
    rAmanu ninneV oVMxu sineVmA nodixanu
    Ram erg yesterday one movie saw
    'Ram saw a movie yesterday'

```
                  ನೋಡಿದನು
              k7t /   |      \
         k1   /      |       \ k2
            /       |        \
       ರಾಮನು     ನಿನ್ನೆ     ಒಂದು ಸಿನೆಮಾ
```

Example Id = Relation-DS-k2-3:

31. ರಾಮನು ಪೇಟೆಯಲ್ಲಿ ರವಿಯನ್ನು ನೋಡಿದನು
    rAmanu peteVyalli raviyannu nodixanu
    Ram erg market in Ravi acc saw
    'Ram saw Ravi in the market'.

```
                  ನೋಡಿದನು
                /    k7p |      \
         k1   /        |       \ k2
            /         |        \
       ರಾಮನು     ಪೇಟೆಯಲ್ಲಿ     ರವಿಯನ್ನು
```
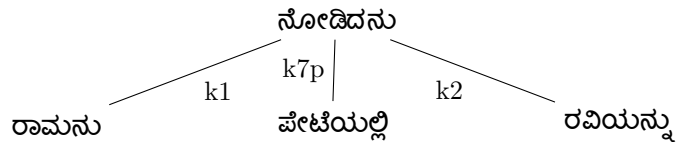
Syntactiv Cues: Karma occurs either with a zero vibhakti or a 'annu' vibhakti. Often in Kannada, both karta and karma occur without a postposition/vibhakti(zero vibhakti). In case both karta and karma occur with a zero vibhakti in a sentence and the two nouns are of different gender then the noun which does not agree with the verb would be karma(see example Relation-DS-k2-1 above).

If the karta is followed by a postposition in a sentence, then the noun which agrees with the verb would be karma(Relation-DS-k2-2). Karma can also occur with a 'annu' postposition. Karma would be marked by a 'annu' vibhakti when it is a human noun(Relation-DS-k2-3).B. In passive constructions, the noun which agrees with the verb is the karma.
Example Id = Relation-DS-k2-4:

32. **ದೀಪಾವಳಿ ಪ್ರಯುಕ್ತ ತುಂಬಾ ಸಿಹಿತಿಂಡಿಗಳನ್ನು ತಿನ್ನಲಾಯಿತು**.
   xIpAvalYi prayukwa wuMbA sihiwiMdigalYannu winnalAyiwu
   Deepavali on lots of sweets eat-Passv
   'Lots of sweets were eaten on Deepavali'
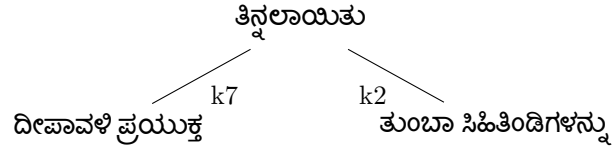
Example Id = Relation-DS-k2-5:

33. **ದೀಪಾವಳಿ ಪ್ರಯುಕ್ತ ತುಂಬಾ ಪಟಾಕಿಗಳನ್ನು ಸಿಡಿಸಲಾಯಿತು**.
   xIpAvalYi prayukwa wuMbA patAkigalYannu sidisalAyiwu
   Deepavali on lot of crackers burst Passv
   'Lots of crackers were burst on Deepavali'
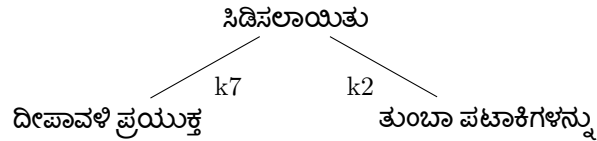
Syntactic Cues: If the verb in a sentence occurs with a passive TAM then the noun which agrees with the verb is the karma.
C. Vakya-karma (Sentential object 'complement clauses') Finite clauses occur as sentential object the verb of the subordinate clause is attached to the verb of the main clause and the arc is tagged as 'k2'. For example,

In kannada few conjunct verbs like prashn karna (praSne mAdu),snan karna(snAna mAdu),kAm karna(keVlasa mAdu) are 0 vibhakti but optional accusative marker can come along with these conjunct verbs so these are treated as 'karma karakas" for ex:

34. **ರಾಧಾಲು ಪ್ರಶ್ನೆ ಕೇಳಿದಲು**.
   rAXAlYu praSneV kelYixalYu
   radha asked questions

ಕೇಳಿದಳು
                           k1   k2
   ರಾಧಾಳು   ಪ್ರಶ್ನೆ
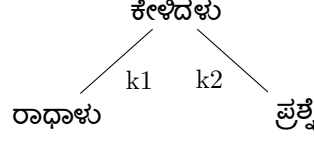
In this above example even though praSneV is a conjuct verb accusative marker can come along with that word so in dependency level it shoud be k2 not pof.

DRel-5. k2p (Goal, Destination)

The destination or goal is also taken as a karma in this framework. However, it is marked as k2p in the treebank. k2p is a subtype of karma (k2). The goal or destination where the action of motion ends is a k2p. These are mostly the objects of motion verbs. They also occur with other types of verbs. The syntactic behavior of k2p is slightly different from other k2. That is why a separate tag has been kept for them. Unlike other karma, the goal/destination karma do not agree with the verb under similar syntactic context (see example Relation-DS-k2p-2 below).

Example Id = Relation-DS-k2p-1:

35. ರಾಮನು ಮನೆಗೆ ಹೋದನು.
    rAmanu maneVgeV hoxanu
    Ram home went
    'Ram went home.'

                              ಹೋದನು
                           k1   k2p
                    ರಾಮನು   ಮನೆಗೆ
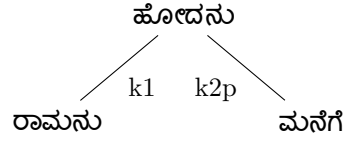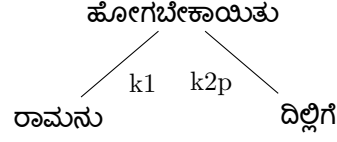
Example Id = Relation-DS-k2p-2:

36. ಆವನು ಎಲ್ಲರನ್ನು ತನ್ನ ಮನೆಗೆ ಕರೆಯುತ್ತಾನೆ.
    avanu eVllarannu wanna maneVgeV kareVyuwwAneV
    he all-acc his home invite-be-pres
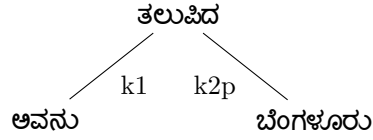   'He invites everybody to his home'

                              ಕರೆಯುತ್ತಾನೆ
                      k1   k2   k2p
              ಆವನು   ಎಲ್ಲರನ್ನು   ಮನೆಗೆ
                                                | r6
                                               ತನ್ನ
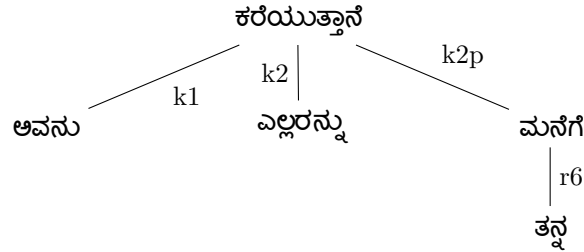
Example Id = Relation-DS-k2p-3:

37. ರಾಮನು ದಿಲ್ಲಿಗೆ ಹೋಗಬೇಕಾಯಿತು
    rAmanu xilligeV hogabekAyiwu
    Ram acc Delhi go had-to
    'Ram had to go to Delhi'.

ಹೋಗಬೇಕಾಯಿತು
- k1 → ರಾಮನು
- k2p → ದಿಲ್ಲಿಗೆ

Example Id = Relation-DS-k2p-4:

38. **ಅವನು ಬೆಂಗಳೂರು ತಲುಪಿದ**
    avanu beVMgalUru walupixa
    he Bangalore reached
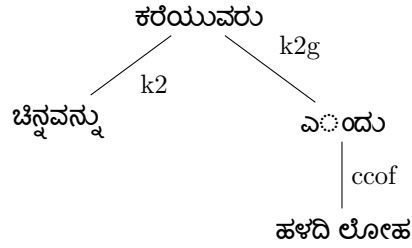   'he reached Bangalore'

ತಲುಪಿದ
- k1 → ಅವನು
- k2p → ಬೆಂಗಳೂರು

DRel-6. k2g(secondary karma)
It is possible to have more than one 'karma' of the same verb in a sentence. For example:

Example Id = Relation-DS-k2g-1:

39. **ಚಿನ್ನವನ್ನು ಹಳದಿ ಲೋಹ ಎಂದು ಕರೆಯುವರು.**
    cinnavannu halYaxi loha eVMxu kareVyuvaru.

ಕರೆಯುವರು
- k2 → ಚಿನ್ನವನ್ನು
- k2g → ಎಂದು
  - ccof → ಹಳದಿ ಲೋಹ

40. **ಆವರು ಗಾಂಧೀಜಿಯನ್ನು ಬಾಪೂ ಎಂತಲೂ ಕರೆಯುತ್ತಾರೆ.**
    avaru gAMXIjiyannu bApU eMwalU kareVyuwwAreV
    they Gandhi+hon acc Bapu also say+hab-pres
    'They also call Gandhiji Bapu'

ಕರೆಯುತ್ತಾರೆ
- k1 → ಆವರು
- k2 → ಗಾಂಧೀಜಿಯನ್ನು
- k2g → ಬಾಪೂ ಎಂತಲೂ
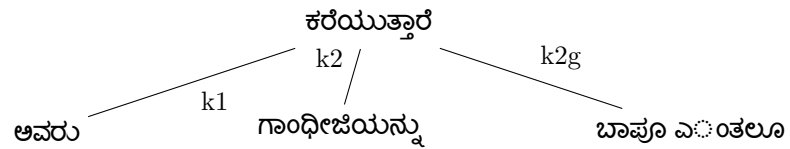
Verbs such as 'kareVyu' (to say / to call) can have two karma. In sentence Relation-DS-k2g-1 above, 'kareVyuwwAreV' (say/call) has two karmas - gAMXIji and bApU.

**DRel-7. k2s (karma samanadhikarana 'object complement')**
The object complement is called as karma samanadhikarana and the tag used for it is 'k2s'.
Example Id = Relation-DS-k2s-1:

41. ಆವರು ಗಾಂಧೀಜಿಯನ್ನು ಬಾಪೂ ಎಂತಲೂ ಪರಿಗಣಿಸುತ್ತಾರೆ.
    avaru gAMXIjiyannu bApu eMwalU parigaNisuwwAreV
    they Gandhiji acc father also believe+hab
    'They consider Gandhiji as a father'.
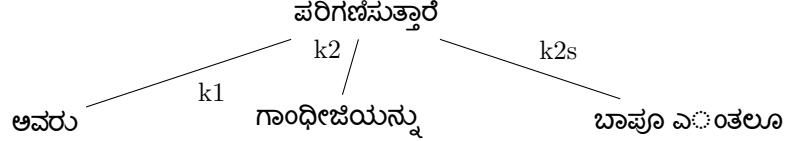
42. ರಾಮನು ಮೋಹನನನ್ನು ಬುದ್ಧಿವಂತ ಎಂದು ತಿಳಿಯುತ್ತಾನೆ.
    rAmanu mohananannu buxxivaMxa eVMxu wilYiyuwwAneV
    ram mohan-acc intelligent consider-Impf
    'Ram considers Mohan to be intelligent'.
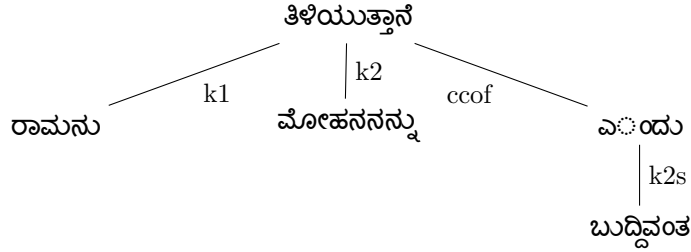
Notice that both kareVyu 'to say' and parigaNisu 'to believe' seem to have two karmas, but only kareVyu can be treated as taking two 'karma'. This is because in (Relation-DS-k2g-1), 'bApu' is a word or substance, whereas in (Relation-DS-k2s-1), 'bApu' is a property that resides in 'gAMXIji'. That is why is Relation-DS-k2s-1 'bApU' is the object of a ditransitive verb and in Relation-DS-k2s-1 'bApU' is the complement of 'gAMXIji' and thus would be marked as 'k2s'.

Robust cues:
1. k2s can only be there if there is a k2 in a sentence.

Possible case of confusion:
There may be some inconsistency in marking the additional argument in the form of either 'rs' or 'k2s' in the case of perception and communication verbs like, nodalu(to see), yocisalu(to think), keVlYalu(to hear/listen), keVlYalu(to ask), heVlYalu(to speak), etc. The additional argument should consistently be marked as 'k2s' and be directly attached to the main verb.

DRel-8. k3(karana 'instrument')

karana karaka denotes the instrument of an action expressed by a verb root. The activity of karana helps in achieving the activity of the main action. The karana karaka is annotated as k3. Some examples of sentences having karana karaka are given below.
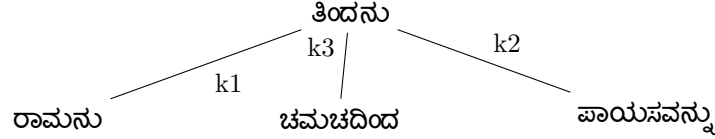Example Id = Relation-DS-k3-1:

43. ರಾಮನು ಚೂರಿಯಿಂದ ಸೇಬನ್ನು ಕತ್ತರಿಸಿದನು

   rAmanu cUriyiMxa sebannu kawwarisixanu
   Ram erg knife inst apple cut
   'Ram cut the apple with a knife'
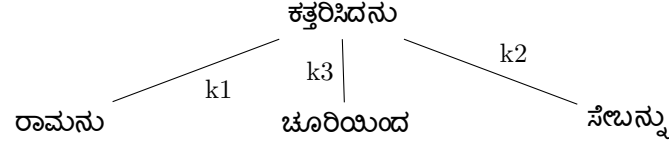
The element 'with a knife' in the above sentence is karana as with the help of the knife, the result, i.e. the 'pieces of the apple', is achieved. Some more examples of sentences having karana karana are given below.

44. ರಾಮನು ಚಮಚದಿಂದ ಪಾಯಸವನ್ನು ತಿಂದನು

   rAmanu camacaxiMxa pAyasavannu wiMxanu
   Ram erg sppon with rice-pudding ate
   'Ram ate the rice-pudding with a spoon'.

Example Id = Relation-DS-k3-3:

45. ಸೀತೆಯು ನೀರಿನಿಂದ ಮಡಿಕೆಯನ್ನು ತುಂಬಿಸಿದಳು

   sIweVyu nIriniMxa madikeVyannu wuMbisixalYu
   Sita erg water with clay-pot acc filled
   'Sita filled the clay-pot with water'.
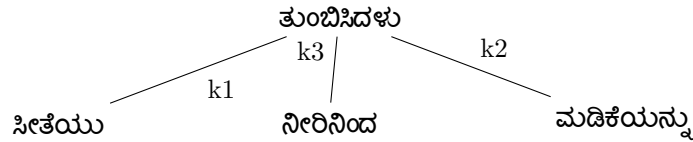
Example Id = Relation-DS-k3-4:

46. ಜಾಹೀರಾತಿನ ಮೂಲಕ ಪ್ರಚಾರ ಮಾಡಿದರು.

   jAhIrAwina mUlaka pracAra mAdixaru
   advertisement through campaign did.
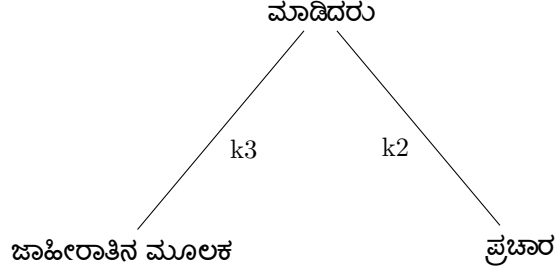
Any element/noun which is instrumental in achieving the result would be marked as 'k3' for karana. The noun need not necessarily denote a physical object which is an instrument. For example, the noun 'nIru' (water) in the sentence Relation-DS-k3-3,and jAhIrAwina mUlaka in the sentence Relation -DS-K3-4 is instrumental in achieving the action of 'wuMbisu' (to fill) and pracAra mAdixaru Thus 'nIru' and 'jAhIrAwina mUlaka' would be marked as 'k3' (karana).

Syntactic cues: In most of the case karana karaka takes a iMxa vibhakti(postposition) in Kannada.

Possible cases of confusion:

1. Many other non-k3 kArakas can also take 'iMxa' vibhakti. We saw this in the case of karta kAraka above. . It can also appear with rh(cf. section 4.1.23), and k5.
2. 'iMxa' is quite an ambiguous vibhakti. The following examples list out some varied cases. You will notice that one cannot solely depend on the vibhakti to decide the relations and that the semantics of the verb is an equally important factor.

- ಯಾರೋ [ಯಾರಿಂದಲೋ] ಸಂಪರ್ಕವನ್ನು ಬಯಸುತ್ತಿದ್ದಾರೆ.
  yAro [yAriMxalo]- saMparka bayasuwwixxAreV
  someone who wants to connection.

- ರಾಮನು [ಸೀತೆಯಿಂದ] ಪುಸ್ತಕ ಪಡೆದ
  rAmanu [sIweVyiMxa] puswaka padeVxa
  rama recieved book from sitha

- [ಆವನಿಂದ] ಪುಸ್ತಕ ಓದಲಾಯಿತು
  avaniMxa puswaka oxalAyiwu
  book read by him.

- ಆವನು [ಸಂತೋಷದಿಂದ] ಕುಣಿದು ಕುಪ್ಪಳಿಸಿದ
  avanu saMwoRaxiMxa kuNixu kuppalYisixa
  he jumped with joy

- ನನ್ನ [ತಪ್ಪಿನಿಂದ] ಆರಿವಾಯಿತು
  nanna wappiniMxa arivAyiwu
  I realized my mistake

- [ನನ್ನಿಂದ] ಸಾಧ್ಯವಾಗದ ಕೆಲಸ [ನಿನ್ನಿಂದ]ಆಯಿತು.
  nanniMxa sAXyavAgaxa keVlasa ninniMxa Ayiwu
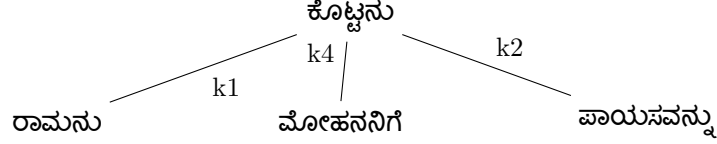 I was not being able to work

DRel-9.k4 (sampradana 'recipient')

Sampradana karaka is the recipient/beneficiary of an action. In other words, the person/object for whom the karma is intended for is sampradana.
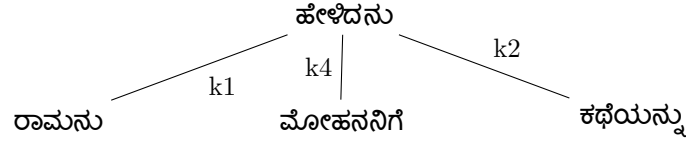
Example Id = Relation-DS-k4-1:

47. ರಾಮನು ಮೋಹನನಿಗೆ ಪಾಯಸವನ್ನು ಕೊಟ್ಟನು
rAmanu mohananigeV pAyasavannu koVttanu
Ram erg Mohan dat rice-pudding gave
'Ram gave rice-pudding to Mohan'.

Example Id = Relation-DS-k4-2:

48. ರಾಮನು ಮೋಹನನಿಗೆ ಕಥೆಯನ್ನು ಹೇಳಿದನು
rAmanu mohananigeV kaWeVyannu helYixanu
Ram-erg Mohan-dat story told
'Ram narrated a story to Mohan'.

The final destination of the action 'kottanu'(gave) in Relation-DS-k4-1 above is mohana 'Mohan' which is marked with igeV. Similarly the final destination of the action 'helixanu' (told) in Relation-DS-k4-2 is mohana 'Mohan' which is again marked with igeV.
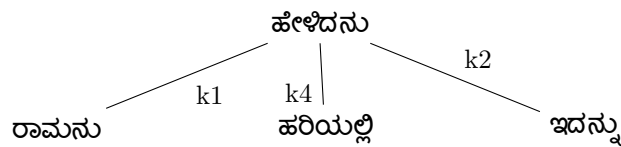
Syntactic Cue: sampradana karaka normally takes a igeV vibhakti in Kannada.
B. Certain cases where sampradana does not take a 'igeV' vibhakti
Verbs such as 'helixanu' take a 'alli' vibhakti for k4.
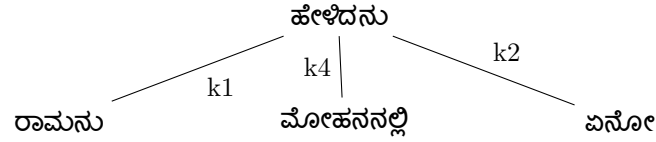Example Id = Relation-DS-k4-3:

49. ರಾಮನು ಹರಿಯಲ್ಲಿ ಇದನ್ನು ಹೇಳಿದನು
rAmanu hariyalli ixannu helYixanu
Ram-erg Hari this said
'Ram said this to Hari'.

It appears that some communication verbs take 'alli' vibhakti for k4 but not all. Therefore, k4 of verbs such as 'helixanu' does not take a 'alli' vibhakti. It takes a 'igeV' vibhakti in these cases also.

Robust cues: 1. For verbs like helYu, kelYu etc. noun with 'alli' vibhakti is k4. For example:

50. ರಾಮನು ಮೋಹನನಲ್ಲಿ ಏನೋ ಹೇಳಿದನು
rAmanu mohananalli eno helYixanu
Ram-erg Mohan-loc something said
'Ram told this(matter) to Mohan'.

DRel-10. k4a (anubhava karta 'Experiencer')

Perception verbs such as 'seem', 'appear' etc. have a perceiver/experiencer participant. In the Kannada example Relation-DS-k4a-1 below, rAma is k1, buxxivaMwa is k1s and nanageV 'I-Dat' is k4a(perceiver). Here nanageV 'I-Dat' is a passive agent i.e. experiencer who is not making any effort but just receiving or perceiving the activity carried out by another agent is identified as anubhava karta and is marked as k4a. The term anubhava karta does not occur in Sanskrit grammatical literature. This has been introduced here for Kannada based on the observations of Kannada syntax. Also, since the passive participation of perceiving is that of a receipient, it has been placed under sampradana here. The anubhava karta can be equated with a dative subject.

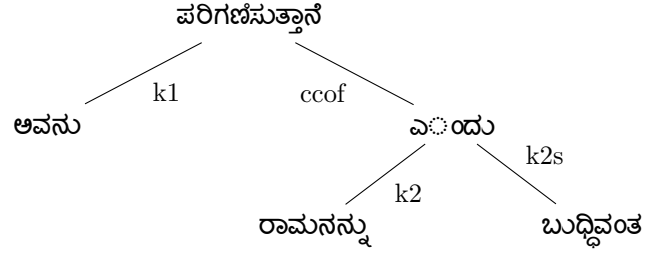Example Id = Relation-DS-k4a-1:

51. ನನಗೆ ರಾಮ ಬುದ್ಧಿವಂತ ಎಂದು ಕಾಣಿಸುತ್ತಾನೆ
nanageV rAma buxxivaMwa eVMxu kANisuwwAneV
I-Dat Ram intelligent seems be-Pres
'Ram seems intelligent to me'.
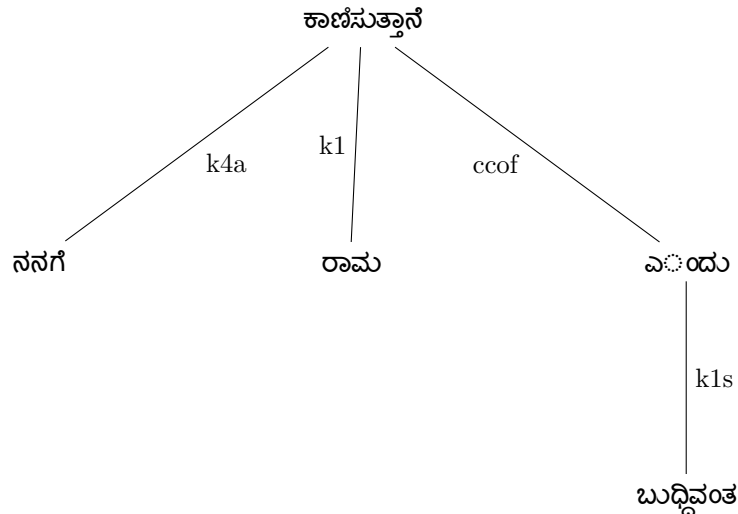
Syntactic cues: anubhava karta always takes a 'geV' vibhakti. Verbs such as 'kANisu' (to appear) take passive agents and would be marked 'k4a'. On the other hand, verbs such as 'parigaNisu' (to believe) take active agents and would be marked as 'k1'. See the following examples:
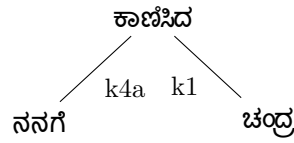
Example Id = Relation-DS-k1-10:

52. ಆವನು ರಾಮನನ್ನು ಬುದ್ಧಿವಂತ ಎಂದು ಪರಿಗಣಿಸುತ್ತಾನೆ
avanu rAmanannu buxxivaMwa eVMxu parigaNisuwwAneV
he Ram intelligent believe-be-Pres
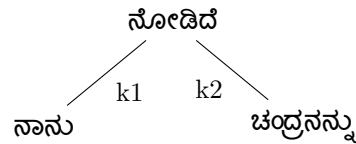'He believes that Ram is intelligent'.

Example Id = Relation-DS-k4a-2:

53. ನನಗೆ ಚಂದ್ರ ಕಾಣಿಸಿದ
nanageV caMxra kANisixa
I-Dat moon saw
'I saw the moon'

Example Id = Relation-DS-k1-13:

54. ನಾನು ಚಂದ್ರನನ್ನು ನೋಡಿದೆ
nAnu caMxranannu nodixeV
I-erg moon saw
'I saw the moon'.

In examples(Relation-DS-k1-10 and 11), avanu 'he' and nAnu 'I-erg' respectively are k1 as they are active agents. On the other hand, in examples Relation-DS-k4a-1 and 2, nanageV 'I-Dat' is k4a as in

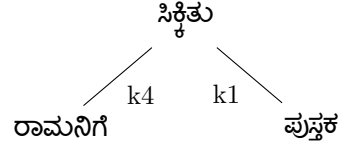both the examples it appears as a passive agent(experiencer). Some more examples of anubhava karta are :

Example Id = Relation-DS-k4a-3:

55. ರಾಮನಿಗೆ ಪುಸ್ತಕ ಸಿಕ್ಕಿತು

rAmanigeV puswaka sikkiwu
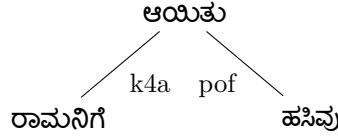Ram Dat book got
'Ram found a book'.

```
                    ಸಿಕ್ಕಿತು
                    /      \
                k4 /        \ k1
                  /          \
            ರಾಮನಿಗೆ          ಪುಸ್ತಕ
```

Example Id = Relation-DS-k4a-4:

56. ರಾಮನಿಗೆ ಹಸಿವು ಆಯಿತು

rAmanigeV hasivu Ayiwu
Ram Dat hungry happened
'Ram felt hungry'

```
                    ಆಯಿತು
                    /     \
               k4a /       \ pof
                  /         \
            ರಾಮನಿಗೆ         ಹಸಿವು
```
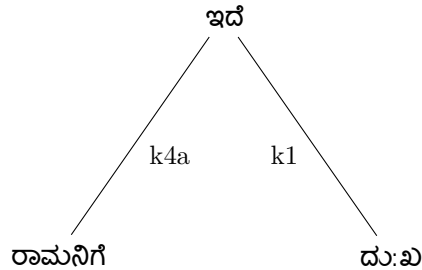
Example Id = Relation-DS-k4a-5:

57. ರಾಮನಿಗೆ ದು:ಖ ಇದೆ

rAmanigeV xuKavixeV
Ram Dat unhappiness-is
'Ram is unhappy'.

```
                    ಇದೆ
                    /    \
               k4a /      \ k1
                  /        \
            ರಾಮನಿಗೆ        ದು:ಖ
```
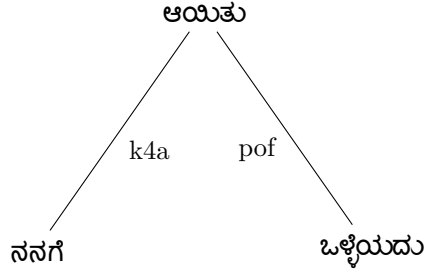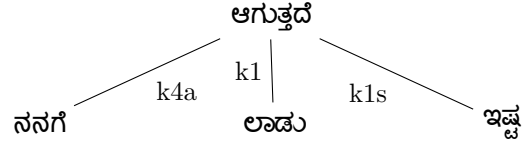
Example Id = Relation-DS-k4a-6:

58. **ನನಗೆ ಒಳ್ಳೆಯದು ಆಯಿತು**
   *nanageV oVlYlYeVyaxu Ayiwu.*
    I-Dat good-felt
    'I felt good'

ಆಯಿತು

k4a   pof

ನನಗೆ   ಒಳ್ಳೆಯದು

Example Id = Relation-DS-k4a-7:

59. **ನನಗೆ ಲಾಡು ಇಷ್ಟ ಆಗುತ್ತದೆ**
    nanageV lAdu iRta AguwwaxeV
    I-Dat sweet like happen-Pres
    'I like sweets'

ಆಗುತ್ತದೆ

k1

k4a   k1s

ನನಗೆ   ಲಾಡು   ಇಷ್ಟ

DRel-11. k5 (apadana 'source') Apadana karaka indicates the source of the activity, i.e. the point of departure. A noun denoting the point of separation for a verb expressing an activity which involves movement 'away from' is apadana. In other words, the participant which remains stationary when the separation takes place is marked k5.
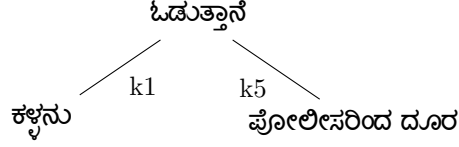
Example Id = Relation-DS-k5-1:

60. **ಮೋಹನನು ಬಸ್ಸಿನಲ್ಲಿ ಮುಂಬಯಿಂದ ಹೋದನು**
    mohananu bassinalli muMbayiMxa hoxanu
    Mohan bus-loc mumbai-gen went
    'Mohan went in bus from Mumbai'

ಹೋದನು

k3

k1   k5

ಮೋಹನನು   ಬಸ್ಸಿನಲ್ಲಿ   ಮುಂಬಯಿಂದ
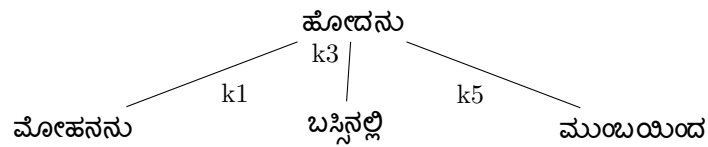
Example Id = Relation-DS-k5-2:

61. ಕಳ್ಳನು ಪೋಲೀಸರಿಂದ ದೂರ ಓಡುತ್ತಾನೆ

kalYlYanu polisariMxa oduwwaneV

thief police from run-away

'A thief runs away from police'

Syntactic Cues: apadana karaka always takes a iMxa vibhakti in Kannada. However, since 'iMxa' postposition in Kannada is functionally overloaded, it is not a very reliable clue for identifying a karaka. Therefore,one has to look for additional cues in cases where 'iMxa' is a vibhakti. The other cue in case of apadana karaka would be the verb semantics. If the verb denotes some motion, then the point of departure would be marked with 'iMxa' and that would be apadana karaka.

B. Emotional verbs such as sittAgu 'to be angry', saMwOshavAgu 'to be happy' also take an apadana karaka. The entity which triggers these emotions is annotated as k5

Example Id = Relation-DS-k5-3

62. ರಾಮನು ಮೋಹನನಿಂದ ಸಿಟ್ಟಾದನು

rAmanu mohananiMxa sittAxanu

Ram Mohan-gen got angry

'Ram got angry with Mohan'
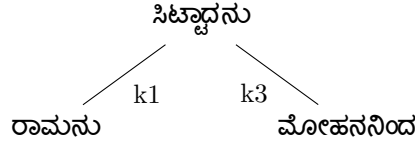
The example Relation-DS-k5-3 shows a case where there is no explicit point of separation from the noun 'mohana' (Mohan). However, it will still be marked as 'k3' since it expresses the source of anger. At an abstract level, the anger is triggered from Mohan. Thus, 'mohana' (Mohan) would be the point of departure for the emotion of anger triggered in 'rAma' (Ram) and will be marked as 'k3'.

C. Verbs such as kelYu 'to ask' also take a k5. The entity from which the information has to be elicited is marked as k5 as it functions as the source.

Example Id = Relation-DS-k5-4:

DRel-12. k5prk (prakruti apadan 'source material' in verbs denoting change of state)

Examples such as the following pose an interesting problem for appropriate karaka assignment.
Example ID = Relation-DS-k5prk-1:

63. ಚಪ್ಪಲಿಗಳನ್ನು ಚರ್ಮದಿಂದ ಮಾಡುತ್ತಾರೆ
    cappaligalYannu carmaxiMxa mAduwwAreV
    shoes leather from make-hab
    'Shoes are made of leather.'
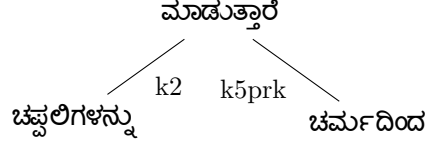
The issue here is whether 'charmaxiMxa' (leather) in the above example is karana karaka or apadana. Both these karakas in Kannada take a 'iMxa' postposition. Therefore, how do we decide what role 'charma' (leather) is playing in the action of 'mAdu' (make). An instrument participates in an action as a mediator for accomplishing the result of the action and is not itself affected by it, i.e., it does not undergo a change. However, 'charmaxiMxa' as a participant in the action of 'mAdu' (make) undergoes a change and also has a relation with the finished product. Change of state verbs such as 'make' require at least two participants 'a raw material' ('leather' in this case) with the aid of which a finished product ('shoes' in this case) is made. Hence, it is a relation which involves a kind of separation from the larger raw material from which a product is made. The karaka relation will then be a special case of apadaana i.e k5. This is because there is a conceptual separation point from the original raw material 'charma' (leather) to the finished product 'chappali' (shoes). The two states in this change of state action are referred to as prakriti 'natural' and vikruti 'change'. Therefore the tag for this type of apadana is named as 'k5prk'.

NOTE: Currently, this distinction of k5 is not being annotated in the treebank.

DRel-13. k7t (kAlAdhikarana 'location in time')

Adhikaran karaka is the locus of karta or karma. It is what supports, in space or time, the karta or the karma. The participant denoting the time of action is marked as 'k7t'. For example,
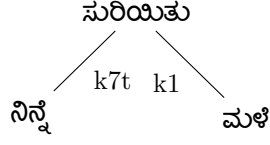
Example Id = Relation-DS-k7t-1:

64. ರಾಮನು ನಾಲ್ಕು ಘಂಟಿಗೆ ಬರುತ್ತಾನೆ
    rAmanu nAlku gaMteVgeV baruwwAneV
    Ram 4'o clock come
   'Ram will come at 4'o clock.'
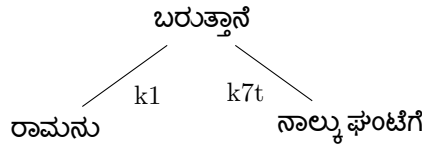
In the example above, 'nAlku GhaMtegeV' is k7t. adhikarana can be of time or space. It is not mandatory of adhikarana to always take a vibhakti. Therefore, even k7t may occur with or without a vibhakti. For instance, in example Relation-DS-k7t-2 and 3 there are no vibhaktis, whereas Relation-DS-k7t-4 and 5 take a 'alli'.
Example Id = Relation-DS-k7t-2:

65. ನಿನ್ನೆ ಮಳೆ ಸುರಿಯಿತು
    ninneV malYe suriyiwu
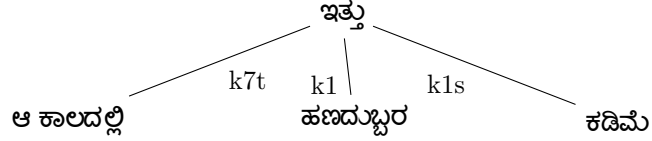   yesterday rain drop-past
    'It rained yesterday.'

```
                    ಸುರಿಯಿತು
                   /        \
              k7t /  k1       \
                /              \
            ನಿನ್ನೆ              ಮಳೆ
```

66. ರಾಮನು ಮುಂಚೆ ಬಂದನು
    rAmanu muMceV baMxanu
    rAm first came
    'Ram came first'

```
                    ಬಂದನು
                   /      \
               k1 /   k7t   \
                /            \
            ರಾಮನು           ಮುಂಚೆ
```
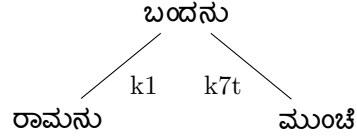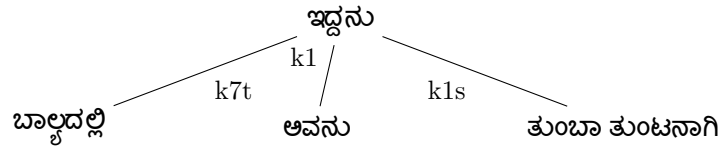
Example Id = Relation-DS-k7t-4:

67. ಆ ಕಾಲದಲ್ಲಿ ಹಣದುಬ್ಬರ ಕಡಿಮೆ ಇತ್ತು
    A kAlaxalli haNaxubbara kadimeV iwwu
    That period expensive-ness less be-Past
    'The cost of living was less those days'

```
                       ಇತ್ತು
                     / |    \
              k7t /  k1|      \ k1s
                /      |        \
        ಆ ಕಾಲದಲ್ಲಿ  ಹಣದುಬ್ಬರ      ಕಡಿಮೆ
```

Example Id = Relation-DS-k7t-5:

68. ಬಾಲ್ಯದಲ್ಲಿ ಆವನು ತುಂಬಾ ತುಂಟನಾಗಿ ಇದ್ದನು
    bAlyaxalli avanu wuMbA wuMtanAgi ixxanu
    childhood-in he very naughty was
    'He was very naughty in his childhood'

```
                       ಇದ್ದನು
                    /  k1 |    \
              k7t /      |      \ k1s
                /        |        \
        ಬಾಲ್ಯದಲ್ಲಿ     ಆವನು    ತುಂಬಾ ತುಂಟನಾಗಿ
```

32

Syntactic Cue: As mentioned above, 'k7t' is often marked by a 'alli' vibhakti. Some time expressions (such as 'beliggeV' morning, 'muMcheV' before/first, 'nAlyeV' yesterday/today, 'wiMgalyu' month etc) when participating in an adhikarana role do not take any vibhakti. However, there are some specific cases where 'k7t' has other vibhaktis as well. For example,
Example Id = Relation-DS-k7t-6:

69. ನೀನು ನನ್ನ ಮನೆಗೆ ಸಂಜೆ ಬಾ
    nInu nanna maneVgeV saMjeV bA
    you my home evening come
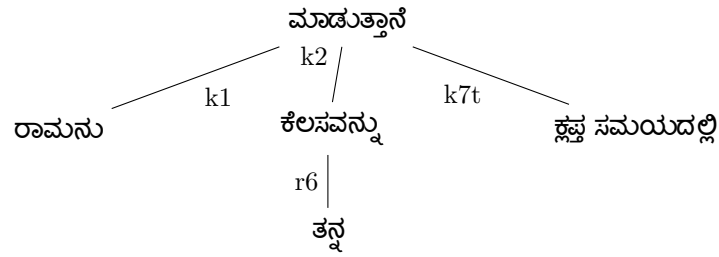   'You come to my home in the evening'
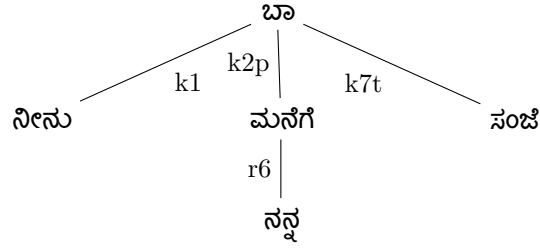
Example Id = Relation-DS-k7t-7:

70. ರಾಮನು ತನ್ನ ಕೆಲಸವನ್ನು ಕ್ಲಪ್ತ ಸಮಯದಲ್ಲಿ ಮಾಡುತ್ತಾನೆ
    rAmanu wanna keVlasavannu klapwa samayaxalli mAduwwAneV
    Ram own work correct time do-pres
    'Ram does his work on time'

DRel-15. k7p (deshadhikarana 'location in space')

The participant denoting the location of karta or karma at the time of action is called as deshadhikarana. It will be marked as 'k7p'. Some examples of 'k7p' are given below.
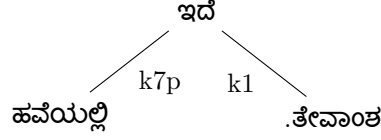
Example Id = Relation-DS-k7p-1:

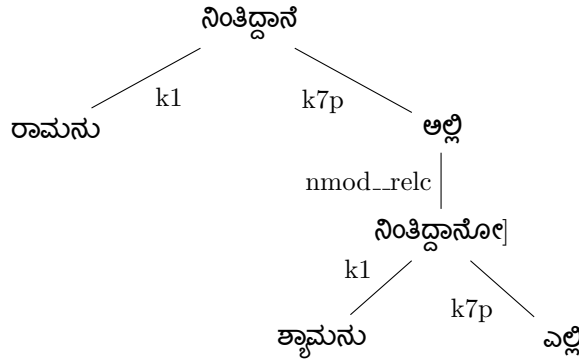71. ಹವೆಯಲ್ಲಿ ತೇವಾಂಶ ಇದೆ
    haveVyalli wevAMSa ixeV
    air-in chill is
    'The air is chilly.'

33

ಇದೆ

ಹವೆಯಲ್ಲಿ ——k7p——— k1——— .ತೇವಾಂಶ

Example Id = Relation-DS-k7p-2:

72. ರಾಮನು ಶ್ಯಾಮನು ಎಲ್ಲಿ ನಿಂತಿದ್ದಾನೋ ಆಲ್ಲಿ ನಿಂತಿದ್ದಾನೆ
rAmanu SyAmanu eVlli niMwixxAno alli niMwixxAneV
Ram Shyam where standing there standing
'Ram is standing where Shyam is standing'.

ನಿಂತಿದ್ದಾನೆ

ರಾಮನು ——k1——— k7p——— ಆಲ್ಲಿ

nmod_relc

ನಿಂತಿದ್ದಾನೋ|

ಶ್ಯಾಮನು ——k1——— k7p——— ಎಲ್ಲಿ

Syntactic Cues: Like location of time(k7t), some locations of place carry explicit vibhaktis (case markers) and some don't. When a location of place does take an explicit vibhakti then most of the postposition would be 'alli' 'in' or 'meleV' 'on'. In example Relation-DS-k7p-3 'k7p' has no vibhakti. The tag k7p refers to a location of place which is an actual physical place and not a metaphorical or abstract place.

DRel-15. k7 (vishayadhikarana 'location elsewhere')
Another kind of adhikarana is vishayadhikarana which can be roughly translated as 'location in a topic'. For example:
Example Id = Relation-DS-k7-1:

73. ಆವರು ರಾಜಕೀಯದ ಮೇಲೆ ಚರ್ಚೆ ಮಾಡುತ್ತಿದ್ದಾರೆ
avaru rAjakIyaxa meleV carceV mAduwwixxAreV
They politics on discussion do-prog
'They are discussing politics'.

ಮಾಡುತ್ತಿದ್ದಾರೆ

ಆವರು ——k1——— k7| .ರಾಜಕೀಯದ ಮೇಲೆ ——k2——— ಚರ್ಚೆ
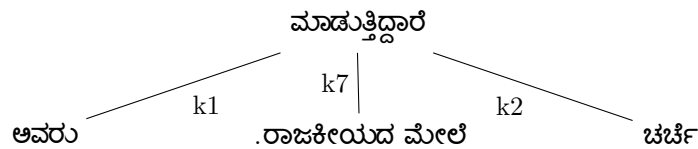
However, the term 'topic' can be misleading as it is not restricted to the 'topic' of discourse alone. It is in fact a location other than time and place. Some more examples of *vishayadhikarana* are:
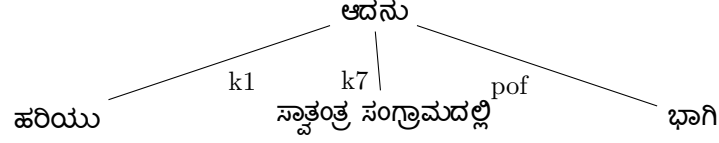
Example Id = Relation-DS-k7-2:

74. ಹರಿಯು ಸ್ವಾತಂತ್ರ ಸಂಗ್ರಾಮದಲ್ಲಿ ಭಾಗಿ ಆದನು
    hariyu svAwaMwrya saMgrAmaxalli BAgi Axanu
    Hari-erg independence movement part took
    'Hari took part in the independence movement'.

Example Id = Relation-DS-k7-3:

75. ಆವರು ತನ್ನ ಶಿಷ್ಯನನ್ನು ಆಶ್ರಮದ ಸೇವೆಯಿಂದ ಮುಕ್ತಿ ಮಾಡುವಲ್ಲಿ ದಾಕ್ಷಿಣ್ಯ ತೋರಲಿಲ್ಲ
    avaru wanna SiRyanannu ASramaxa seveVyiMxa mukwi mAduvalli xAkRiNya woralilla
    he-erg own student-acc ashram-of services-from free doing hesitate not
    'He didn't hesitate in freeing his student from the services of the ashram'.
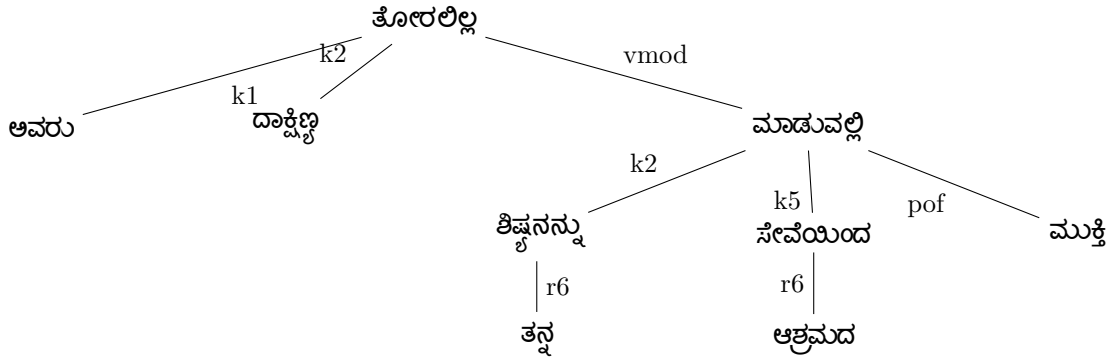
Example Id = Relation-DS-k7-4:

76. ನನ್ನ ಮನಸ್ಸಿನಲ್ಲಿ ಕೋಪ ಇದೆ
    nanna manassinalli kopa ixeV
    my mind-in anger is
    'I am angry'.

35

Example Id = Relation-DS-k7-5:

77. ನನ್ನ ಮನಸ್ಸು ಅಮೆರಿಕದಲ್ಲಿ ಇದೆ
nanna manassu ameVrikaxalli ixeV
My mind america in
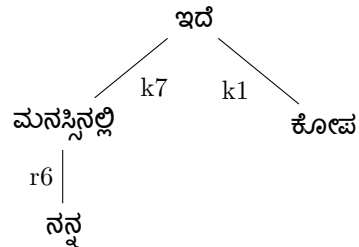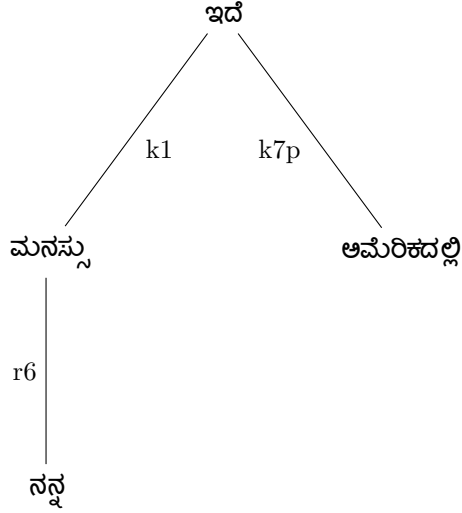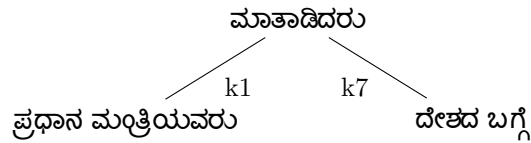'My mind is in America'.

ಇದೆ

k1   k7p

ಮನಸ್ಸು   ಅಮೆರಿಕದಲ್ಲಿ

r6

ನನ್ನ

78. ಪ್ರಧಾನ ಮಂತ್ರಿಯವರು ದೇಶದ ಬಗ್ಗೆ ಮಾತಾಡಿದರು
praXAnamaMwriyavaru xeSaxa baggeV mAwAdixaru
prime minister spoke about nation

ಮಾತಾಡಿದರು

k1   k7

ಪ್ರಧಾನ ಮಂತ್ರಿಯವರು   ದೇಶದ ಬಗ್ಗೆ

In the example (4) above 'manassinalli' is not a concrete physical place, therefore, it will be marked as k7. In the example (5), 'amerikA' is an actual physical place, but this will also be NOT marked as k7p. Instead, it will be marked as k7. The reason for marking it as k7 is that though America is an actual physical place, but the entity (manassu in this case) which is in America is not. So, for a participant to be marked as k7p there has to be an actual physical contact, i.e., the located and the location have to be concrete objects. If they are not, then the location would be marked as k7.

Syntactivc Cue: Like other types of adhikarana, vishayAdhikarana also takes 'alli' and 'mele' baggeV,kuriwu postpositions as its case markers.

DRel-16. k7a(according to)

For noun chunks with vibhaktis, na_prakhara, na_reethi, ra_hAgeV should be marked as k71. For example,

Example Id = Relation-DS-k71-1:

79. ರಾಮನ ಪ್ರಕಾರ ಸೀತೆ ಮನೆಯಲ್ಲಿ ಇಲ್ಲ
    rAmana prakAra sIweV maneVyalli illa
    Ram accroding Sita home-loc not-is
    'According to Ram, Sita is not at home'.
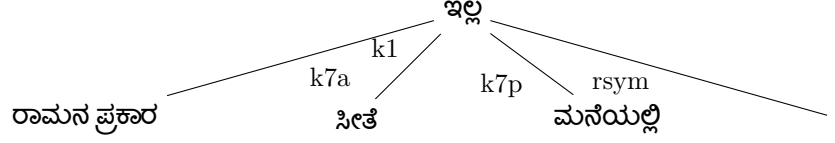
DRel-17. k*u (sAdrishya 'similarity/comparison')
The tag to mark similarity is 'k*u'. This can be used for annotating both similarity and comparison. The tag is marked on the 'comparand' in a comparative construction. Since the compared entity can compare with any karaka, the tag includes a star. '*' in the tag label is a variable for whichever karaka is the comparee of the comparand. Therefore, while marking the comparand (the compared entity), the * would be replaced by the appropriate karaka label. For example,

Example Id = Relation-DS-k*u-1:

80. ರಾಧ ಮೀರಾಳಂತೆ ಸುಂದರಿ ಆಗಿದ್ದಾಳೆ
    rAXa mIrAlYaMweV suMxara AgixxAlYe
    rAXA mIrA like beautiful
    'Radha is beautiful like Mira.'

Example Id = Relation-DS-k*u-2:

81. ಸೀತಾಳಿಗೆ ಮೀರಾ ರಾಧಳಂತೆ ಸುಂದರ ಎನಿಸಿದಳು
    sIwAlYigeV mIrA rAXalYaMweV suMxara eVnisixalYu
    Sita Dat mIra like beautiful appeared.
    To Sita Mira appeared as beautiful as Radha.
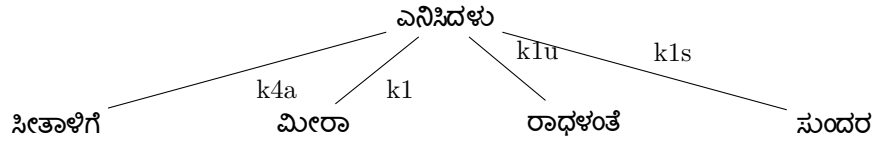
Example Id = Relation-DS-k*u-3:

82. ಸೀತಾ ಮೀರಾಳನ್ನು ರಾಧಳಂತೆ ಸುಂದರಿಯೆಂದು ಭಾವಿಸುತ್ತಾಳೆ
    sIwA mIrAlYannu rAXAlYaMweV suMxariyeVMxu BAvisuwwAlYeV
    Sita Mira acc Radha like beautiful consider.
    Sita considers Mira as beautiful as Radha.

ಭಾವಿಸುತ್ತಾಳೆ

k1 — ಸೀತಾ

k2 — ಮೀರಾಳನ್ನು

k2u — ರಾಧಾಳಂತೆ
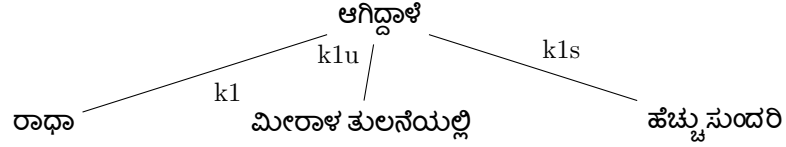
k2s — ಸುಂದರಿಯಿಂದು
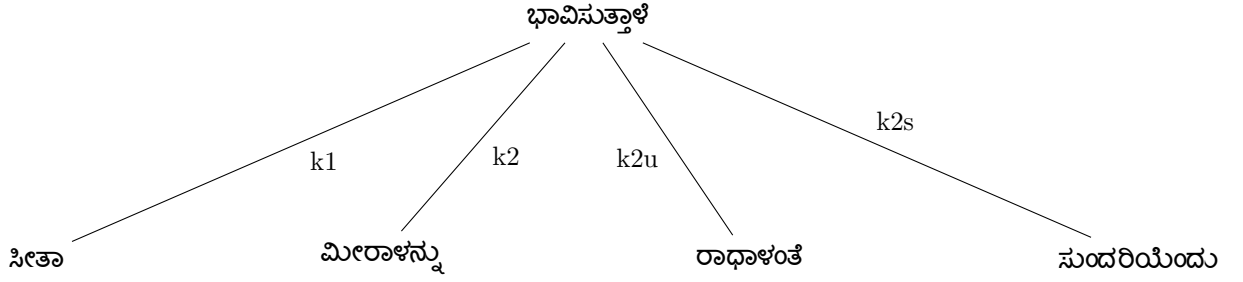
Example Id = Relation-DS-k*u-4:

83. ರಾಧಾ ಮೀರಾಳ ತುಲನೆಯಲ್ಲಿ ಹೆಚ್ಚು ಸುಂದರಿ ಆಗಿದ್ದಾಳೆ.
    rAXA mIrAlYa wulaneVyalli heVccu suMxari AgixxAlYeV.
    Radha Miira's of comparison in more beautiful is.
    Radha is more beautiful in comparison to Mira.

ಆಗಿದ್ದಾಳೆ

k1 — ರಾಧಾ

k1u — ಮೀರಾಳ ತುಲನೆಯಲ್ಲಿ

k1s — ಹೆಚ್ಚು ಸುಂದರಿ

Example Id = Relation-DS-k*u-7: ಸಂಪೂರ್ಣ ಭಾರತದಲ್ಲಿ ಲೇಹ್–ಲಡಾಕ್ ನಂತಹ ಪರಿಸ್ಥಿತಿ ಜಾರಿಯಲ್ಲಿರಲಿ
India in Leh-Laddakh like condition prevail 'Like Leh-Laddakh conditions should prevail through out India.'

84. ಸಂಪೂರ್ಣ ಭಾರತದಲ್ಲಿ ಲೇಹ್–ಲಡಾಕ್ ನಂತಹ ಪರಿಸ್ಥಿತಿ ಜಾರಿಯಲ್ಲಿರಲಿ
    saMpUrNa BArawaxalli leha-laDAkanaMwaha parisWiwi jAriyallirali
    All India in Leh-Ladak like condition prevail .
    Like Leh-Laddakh conditions should prevail through out India.

ಜಾರಿಯಲ್ಲಿರಲಿ

k7p — ಸಂಪೂರ್ಣ ಭಾರತದಲ್ಲಿ

k7pu — ಲೇಹ್–ಲಡಾಕ್ ನಂತಹ

k1 — ಪರಿಸ್ಥಿತಿ
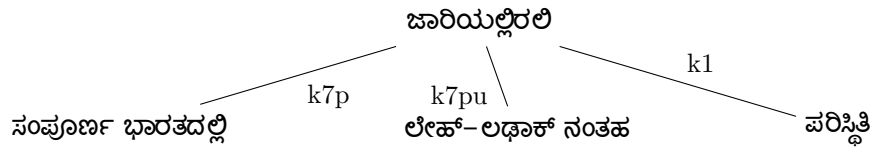
Example Id = Relation-DS-k*u-6:

85. ರಾಮನು ಹೇಳಿದನು ಏನೆಂದರೆ ಅವನಿಗೂ ಕೂಡ ಸೀತಾಳಂತೆ ಉಡುಗೊರೆ ಕೊಡಬೇಕು
    rAmanu helYixanu eVneMxareV avanigU kUda sIwAlYaMweV udugoVreV beku.
    Ram erg said that he-dat emph Sita of like gift should be given
    Ŕam said that he should be given gifts like Sita.´

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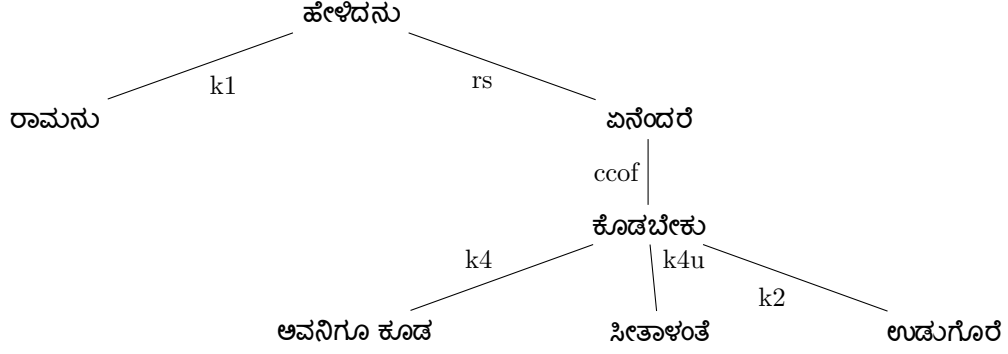
Similarly, in the example Relation-DS-k*u-2, 'mIrA' is the comparee and 'rAXA' comparand. Therefore, 'rAXA' would be marked as 'k1u'. However, in example Relation-DS-k*u-3, 'Mira', the comparee is 'k2', thus 'rAXA', the comparand will be annotated as 'k2u'. In example, Relation-DS-k*u-5, 'BArawa' the comparee is 'k7p', and 'leha-ladAKZa', the comparand will be annotated as 'k7pu'. In example, Relation-DS-k*u-6, 'use' the comparee is 'k4', and 'sIwA', the comparand will be annotated as 'k4u'. Syntactic Cue: In the comparative constructions the comparand will take either 'aMwe' or 'giMwa' post- position

DRel-18. r6 (shashthi 'genitive/possessive')
The genitive/possessive relation which holds between two nouns has to be marked as 'r6'. For example:
Example Id = Relation-DS-r6-1:

86. ಆದರದ ಭಾವನೆ
    Axaraxa BAvaneV.
    Respect of feeling.
    Feeling of respect.
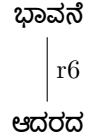
Example Id = Relation-DS-r6-2:

87. ಪುಸ್ತಕದ ಬೆಲೆ
    puswakaxa beVleV.
    book of price.
    Price of the book.
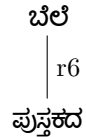
Syntactic Cues: This is one of an easy to identify relation. It has a relatively reliable syntactic cue. It mostly occurs with a 'nA' postposition. A reliable cue for its identification is that the postposition 'nA' agrees with the noun it modifies in number and gender. Thus, in example Relation-r6-1 above 'nA' has masculine gender and singular number which agrees with the following noun (its modified) ''. In Relation-r6-2 and 3, the postposition 'xa' agrees with 'bele'.

Possible case of confusion:
The 'a' vibhakti can occur with relations other than r6. We see this in section DRel-18, DRel-19. Sometimes, this vibhakti can also be taken up by a k1 (cf. example Relation-DS-k1-8)

DRel-19. r6-k1, r6-k2 (karta or karma of a conjunct verb (complex predicate)) Indian languages have extensive use of conjunct verbs. A conjunct verb is composed of a noun or an adjective followed by a verbalizer. Some times the argument (karta or karma) occur in a genitive case. Whenever the argument of a conjunct verb is in genitive case it will have a dependency relation with the noun of the conjunct verb. This is because the argument in the genitive case agrees with the noun of the conjunct verb and not with the verb. The noun of the conjunct verb agrees with the verb. In the exmple Relation-DS-r6-k1-1 below, maMxiraxa 'temple of' will be marked as r6-k1with uxGAtana 'inauguration'. maMxira has r6 relation with the noun of conjunct verb and in the sentence, maMxira has karaka relation k1 of the conjunct verb 'uxGAtane maduvuwu'. In example Relation-DS-r6-k2-1, maMxiraxa 'temple of' will be marked as r6-k2 with uxGAtana 'inauguration'. maMxira has r6 relation with the uxGAtana 'inauguration' which is the noun of conjunct verb and in the sentence, maMxira has karaka relation of k2.
Example Id = Relation-DS-r6-k1-1:

88. ನಿನ್ನೆ ಮಂದಿರದ ಉದ್ಘಾಟನೆ ಆಯಿತು.
    ninneV maMxiraxa uxGAtaneV Ayiwu.
    Yesterday temple of inauguration happened.
    'Yesterday, the temple got inaugurated.'
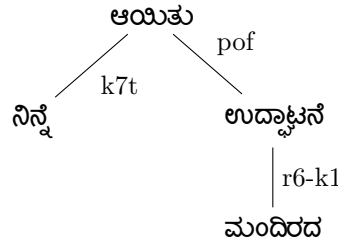
Example Id = Relation-DS-r6-k2-1:

89. ಮಂತ್ರಿಯವರು ನಿನ್ನೆ ಮಂದಿರದ ಉದ್ಘಾಟನೆ ಮಾಡಿದರು
    maMwriyavaru ninneV maMxiraxa uxGAtaneV mAdixaru.
    minister yesterday temple of inauguration did.
    'The minister inaugurated the temple yesterday.'
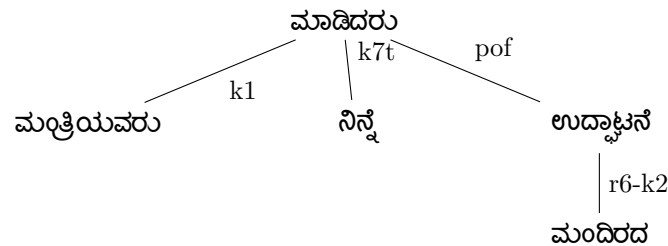
Possible case of confusion: 1. r6-k* and pof should not have the same parent.

DRel-20. r6v ('a' relation between a noun and a verb) There are instances where a noun with 'a' is attached to the verb but does not have any karaka relation. Instead, it does indicate a sense of possession.

we are not finding any example for r6v in kannada

DRel-21. adv (kriyAvisheSaNa 'adverbs - ONLY 'manner adverbs' have to be taken here')
Adverbs of manner are marked as 'adv'. Note that the adverbs such as place, time, etc. are not marked as 'adv' under this scheme. Place adverbs are assigned 'k7p' tag and time adverbs are marked as 'k7t'. Example Id = Relation-DS-adv-1:

90. ಅವನು ಬೇಗ ಬೇಗನೆ ಬರೆಯುತ್ತಿದ್ದನು
    avanu bega beganeV bareVyuwwixxanu.
    he fast fast writing be-past.
    'he was writing fast.'

91. ಅವನು ತುಂಬಾ ವೇಗವಾಗಿ ಮಾತನಾಡುತ್ತಾನೆ
    avanu wuMbA vegavAgi mAwanAduwwAneV.
    he fastly speaks.
    'He speaks very fast.'

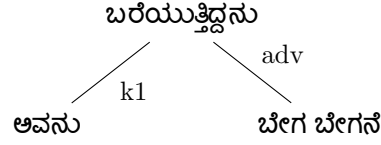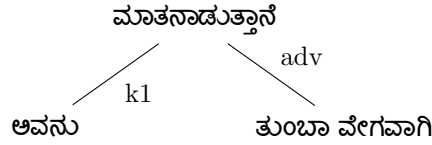Remarks: 1. Sometimes an adv can occur with a 'ixa' vibhakti such as in jANme iMxa

DRel-22. sent-adv (Sentential Adverbs) Some adverbial expressions have the entire sentence in their scope. For example:
Example Id = Relation-DS-sent-adv-1:

92. ಇದರ ಹೊರತು ಭಾರತದಲ್ಲೂ ಪ್ರತಿಕೂಲ ವಾತಾವರಣ ಇತ್ತು
    ixara hoVrawu BArawaxallU prawikUla vAwAvaraNa iwwu.
    this-of apart, hostile environment in India.
    'Apart from this, there was a hostile environment in India.'
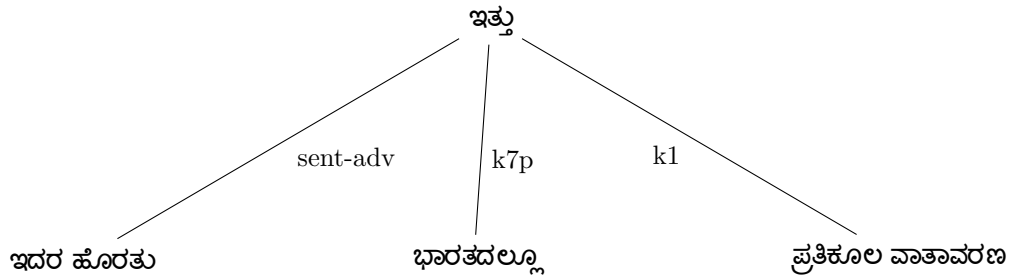
In the above example, phrase 'isake alAvA' is a connective which is modifying the verb but has the entire clause in its scope. Such expressions would be attached to the verb of the sentence they are modifying and the attachment would be labeled as 'sent-adv'.

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93. ಸಾಮಾನ್ಯವಾಗಿ ಹುಣಸೆ ಹಣ್ಣಿನಲ್ಲಿ ವಿಟಮಿನ್ 'ಸಿ' ಜೀವಸತ್ವ ಇರುತ್ತದೆ

    sAmAnyavAgi huNaseV haNNinalli vitamin si jevasawva iruwwaxeV.

ಇರುತ್ತದೆ

    sent-adv   k1   k7p

ಸಾಮಾನ್ಯವಾಗಿ   ವಿಟಮಿನ್ 'ಸಿ' ಜೀವಸತ್ವ   ಹುಣಸೆ ಹಣ್ಣಿನಲ್ಲಿ
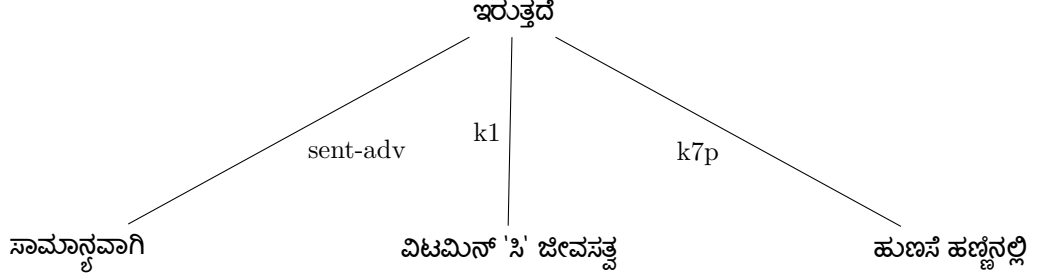
DRel-23. rd (relation prati 'direction') The participant indicating 'direction' of the activity has to be marked as 'rd'. The label 'rd' stands for 'relation direction'. Example Id = Relation-DS-rd-1:

94. ಸೀತಾ ಗ್ರಾಮದ ಕಡೆಗೆ ಹೋಗುತ್ತಿದ್ದಳು.

    sIwA grAmaxa kadeVgeV hoguwwixxalu.
    sIwA village-of direction go prog be-past
    'Sita was going towards the village.'

ಹೋಗುತ್ತಿದ್ದಳು

              rd

    k1

ಸೀತಾ   ಗ್ರಾಮದ ಕಡೆಗೆ
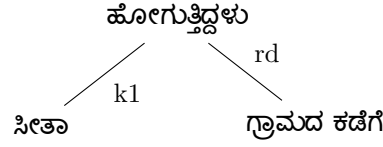
Example Id = Relation-DS-rd-2:

95. ಮರದ ಮೇಲೆ ಪಕ್ಷಿ ಹಾರುತ್ತಿದೆ

    maraxa meleV pakRi hAruwwixeV. birds are flying above tree

ಹಾರುತ್ತಿದೆ

    rd   k1

ಮರದ ಮೇಲೆ   ಪಕ್ಷಿ
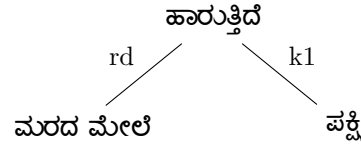
Syntactic cues: An element having postpositions such as 'kade' or 'mEle' awwa, AceV, is to be marked as 'rd'.

DRel-24. rh (hetu 'reason') The reason or cause of an activity is to be marked as 'rh'. Example Id = Relation-DS-rh-1:

96. ನಾನು ಮೋಹನನಿಂದಾಗಿ ಪುಸ್ತಕ ಖರೀದಿಸಿದೆ

    nAnu mohananiMxAgi puswaka KarIxisixeV.
    I Mohan of because book bought
    'I bought the book because of Mohan'

ಖರೀದಿಸಿದೆ

k1   rh   k2

ನಾನು   ಮೋಹನನಿಂದಾಗಿ   ಪುಸ್ತಕ
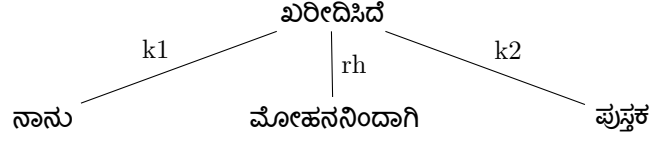
97. ಮೋಹನ ವೃತ್ತಿಪರ ಲಕ್ಷದಿಂದ ಕೆಲಸ ಮಾಡುತ್ತಾನೆ

mohana vruwwipara lakRyaxiMxa keVlasa mAduwwAneV.
Mohan Professional goal because of do-Impf be-Pres.
'Mohan works with professional goals.'

ಮಾಡುತ್ತಾನೆ

k1   rh   k2

ಮೋಹನ   ವೃತ್ತಿಪರ ಲಕ್ಷದಿಂದ   ಕೆಲಸ
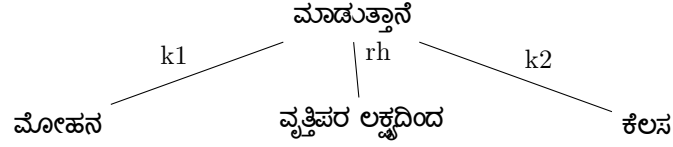
Syntactic cues: Complex postpositions such as 'niMxAgi', 'kAraNa' etc are indicators of 'rh' relation.

DRel-25. rt (**tadarthya 'purpose'**) The purpose of an action is called as tadarthya which is marked as 'rt'. Example Id = Relation-DS-rt-1:

98. **ನಾನು ಹೋಗಲಿಕ್ಕಾಗಿ ಟಿಕೆಟ್ ಖರೀದಿಸಿದೆನು**
nAnu hogalikkAgi tiket KarIxisixeVnu
I-erg going for ticket bought
'I bought the ticket for going'

ಖರೀದಿಸಿದೆನು

k1   rt   k2

ನಾನು   ಹೋಗಲಿಕ್ಕಾಗಿ| ಟಿಕೆಟ್
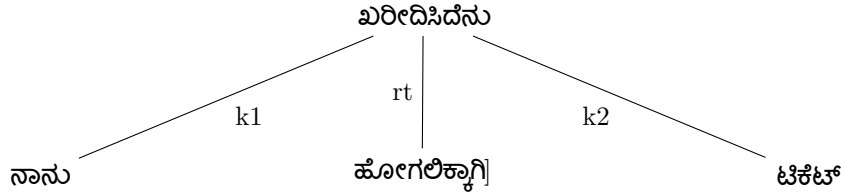
Example Id = Relation-DS-rt-3:

99. **ಮೋಹನನು ಓದಲಿಕ್ಕಾಗಿ ಶಾಲೆಗೆ ಹೋಗುತ್ತಾನೆ** *mohananu oxalikkAgi SAleVgeV hoguwwAneV*
Mohan studying school go-hab
'Mohan goes to school for studying'.

ಹೋಗುತ್ತಾನೆ

k1   rt   k2p

ಮೋಹನನು   ಓದಲಿಕ್ಕಾಗಿ| ಶಾಲೆಗೆ
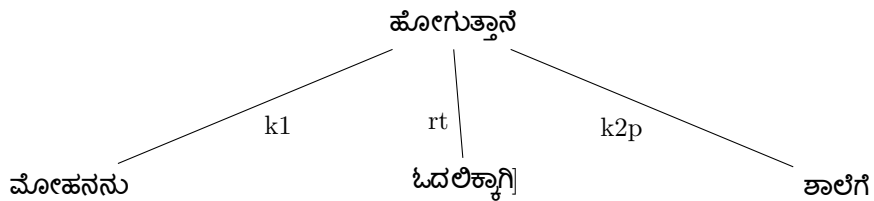
Notice that in the second and third examples above, have words which are purpose of the action. For example in the example Relation-rt-2 'hOgalikkAgi' 'for going' is the purpose of the action KArIxi 'bought'.

Syntactic cue: Most often 'ikkeV' vibhakthi in Kannada indicates a 'rt' relation.

DRel-26. ras-k* (upapada_sahakArakatwa 'associative')

In sentences where two participants perform the same action but syntactically one is expressed as primary and the other as its associate, the associate participant is marked as 'ras-k*'. k* can be any karaka of which it is an associative. In this tag 'r' stands for relation and 'as' stands for 'associative'. The associative, like comparative can be for any relation, karaka or non-karaka. The * stands for the label whose associative it is.

Example Id = Relation-DS-ras-k1-1:

100. ರಾಮನು ತನ್ನ ತಂದೆಯ ಜೊತೆ ಸಂತೆಗೆ ಹೋದನು
rAmanu wanna waMxeVya joVweV saMweVgeV hoxanu
Ram own father with market went
'Ram went to the market with his father'.
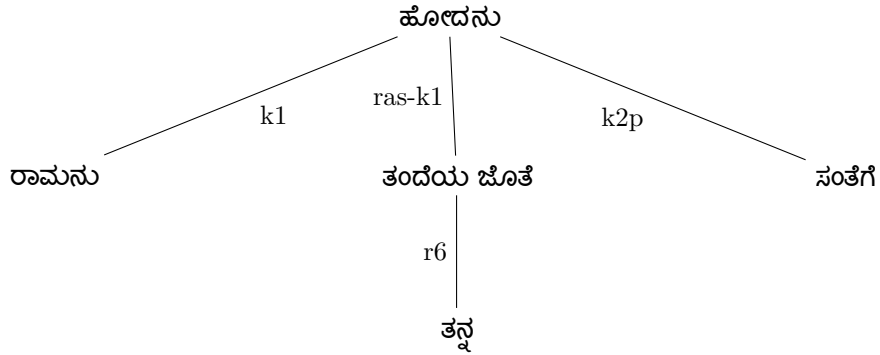
Example Id = Relation-DS-ras-k1-2:

101. ರಾಮನ ಜೊತೆ ಮೋಹನನು ಕೂಡ ಹಾಲಿನ ಒಟ್ಟಿಗೆ ಬಾಳೆ ಹಣ್ಣನ್ನು ತಿಂದನು
rAmana joVweV mohananu kUda hAlina oVttigeV bAlYe haNNannu wiMxanu
Ram along with mOhan also milk along banana fruit ate 'Along with Ram, Mohan also ate bananas with milk'.
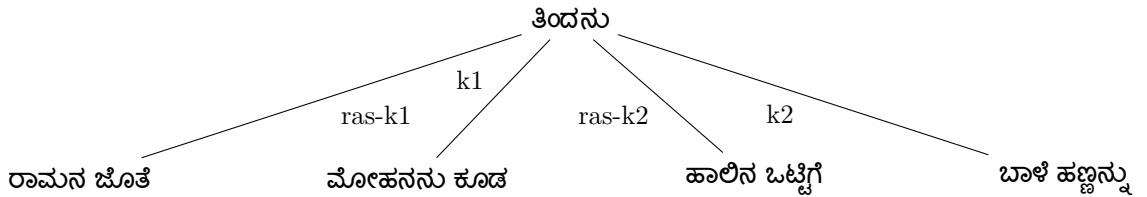
In the first example rAma is 'k1' of the action 'hoxanu' (went) and since taMxeVyu 'father' is associative of rAma so it will be marked as 'ras-k1'. The second example (Relation-ras-2) has two instances of asso-

ciative karakas. 'rAma' is associative of 'mohana', thus will be marked as 'ras-k1' and 'k1' respectively. Also, xUXa 'milk' is associative of balye haNNannu 'bananas' which is k2 so hAlu will be marked as 'ras-k2'.

Similarly, we can have associatives for other tags as well. Given below are examples for 'ras-k4', and 'ras-k7'.

Example Id = Relation-DS-ras-k4-1:

102. ಪ್ರಧಾನಮಂತ್ರಿಯವರು ಪತ್ರಕರ್ತರ ಜೊತೆ ಪ್ರಕಾಶರಿಗೂ ಭೇಟಿಯ ಸಮಯ ಕೊಟ್ಟರು
praXAna maMwriyavaru pawrakarwrara joVweV prakASakarigU Betiya samaya koVttaru
Prime minister other reporters prakash meeting time gave
Prime Minister had given Prakash for meeting like he had given to other reporters
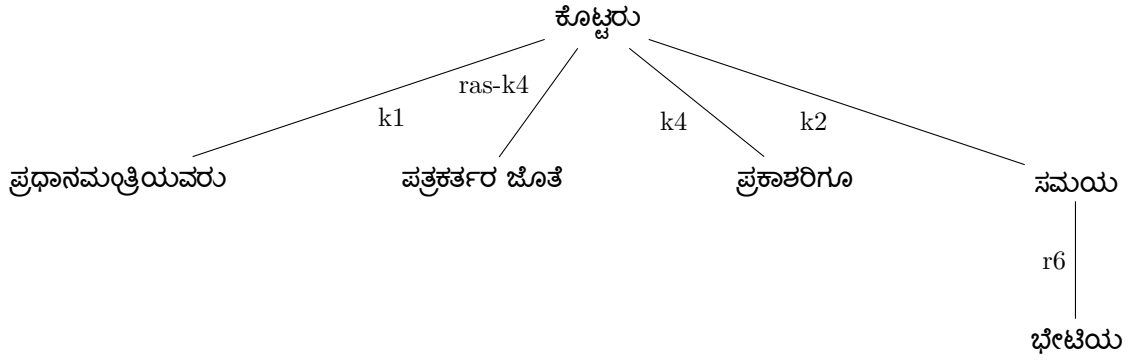
In the above example, ulyixa 'other reporters' is associative of Prakash 'PrakAsh' which is 'k4' so anya pawrakArwaru 'other reporters' will be marked as 'ras-k4'.

Example Id = Relation-DS-ras-k7-1:

103. ಆವರು ರಾಜಕೀಯದ ಜೊತೆ ಜೊತೆಗೆ ಬೇರೆ ವಿಚಾರದ ಮೇಲೂ ಪುಸ್ತಕಗಳನ್ನು ಬರೆದರು
avaru rAjakIyaxa joVweV joVweVgeV bereV vicAraxa melu puswakagalYannu bareVxaru
He-erg political with with other topics on books wrote
'He has written books on other topics along with political issues'.
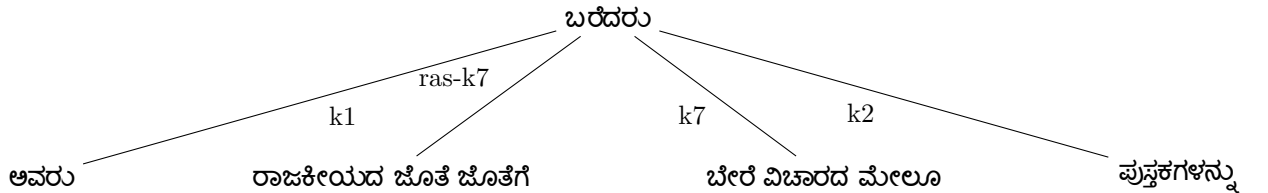
rAjanIwiya viSaya 'political topics' is associative of bereV viSaya 'other topics' which is k7 so rAjanIwiya viSaya 'political topics' will be marked as 'ras-k7'.

Syntactic cues: Postposition 'joweV', 'joweV-joweVgeV' and 'ra hAge' normally marks an associative relation.

DRel-27. ras-NEG(Negation in Associatives)

In sentences where a karaka and its associative participate in an action but the associative does not perform the action, the associative is participant is marked as 'ras-NEG'.

Example Id = Relation-DS-ras-NEG-1:

104. ರಾಮನು ತಂದೆಯ ಹೊರತು ಹೋದನು
rAmanu waMxeVyillaxeV hoxanu
Ram father without went
'Ram went without his father'.
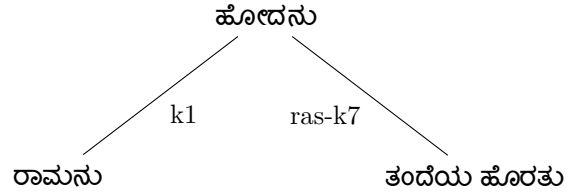
rAma is 'k1' and *taMxeyillaxe* 'without his father' has an associative relationship with rAma. The relation is denoted by 'ras-NEG'.

Syntactive cues: Postpositin ke binA 'without' indicates the sense of negation of associative.
DRel-28. rs (relation samanadhikaran 'noun elaboration')

Elements (normally clauses) which elaborate on a noun/pronoun are annotated as 'rs'.

Example Id = Relation-DS-rs-1:

105. ವಿಷಯವೇನು ಎಂದರೆ ಆವರು ನಾಳೆ ಬರುವುದಿಲ್ಲ
viRayavenu eVMxareV avaru nAlYe baruvuxilla
fact they tomorrow not-come
'The fact is that he will not come tomorrow'
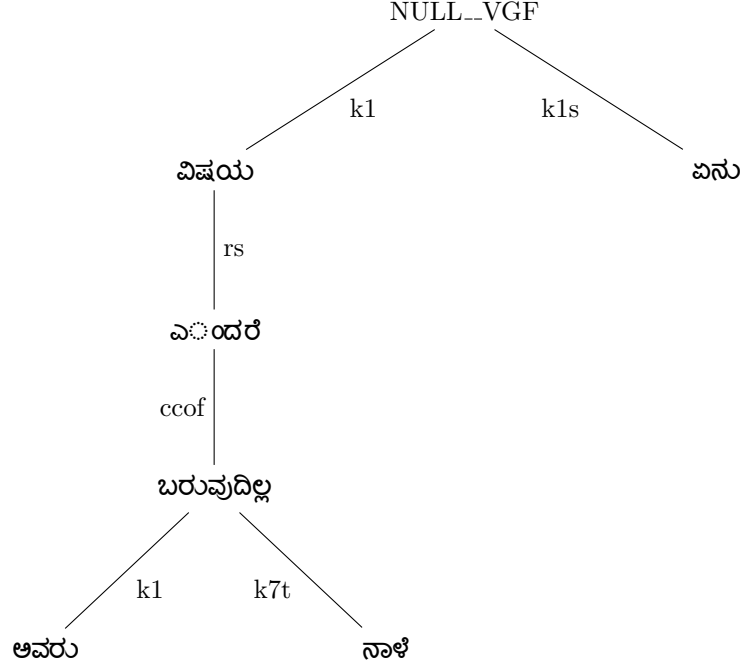
vishaya 'fact' is 'k1' (karta) in the above example and *ixu* 'this' is its 'k1s' (k1 samanadhikaran). The relations 'k1' and 'k1s' will be attached to the verb whereas the clause *eneVMxare avaru nAlye baruvuxilla* 'that he will not come tomorrow' will have a dependency relation with *ixu* 'this'. The relation is denoted by 'rs' (relation samanadhikaran). The main verb will take one samanadhikaran as its argument. If there are two samanadhikarans then the second samanadhikaran is related with one of karakas with which it is associated.

Example Id = Relation-DS-rs-2:

106. **ರಾಮನು ನಾಳೆ ಬರುವುದಿಲ್ಲ ಎಂದು ಆವನು ಹೇಳಿದನು**
rAmanu nAlYe baruvuxilla eVMxu avanu helYixanu
Ram tomorrow will-not-come he told
'He told that Ram will not come tomorrow'

In Relation-DS-rs-2 above, the complement clause is the complement of the karma pronoun ixu 'this'. Therefore it will be attached to the pronoun 'avanu' and would be labeled as 'rs'. While annotating the sentence, the conjunct 'eVMxareV' will be annotated as 'rs' will be attached to the 'ixu' which is the k2 of the verb of the main clause ('heVlyixanu' in this case). The finite verb of the complement clause('baruvuxu illa' in the above example) will be attached to the conjunct 'eVMxareV' (that) and would be labeled as 'ccof'.

Remarks:

Possible case of confusion:

(a) There may be some inconsistency in marking the additional argument in the form of either 'rs' or 'k2s' in the case of perception and communicaiton verbs like, nOdixa, Alochisixa, kelyixa, kelyixa, helyixa etc. The additional argument should consistently be marked as 'k2s' and be directly attached to the main verb.

DRel-29. rsp(relation for duratives)

The durative expressions have twon points a point of starting and an end point. The expression as a whole may express time, place or manner etc. The tag 'rsp' shows the relation between the starting point and the end point of a durative expression. For example:

Example Id = Relation-DS-rsp-1:

107. 1990ರಿಂದ 2000ವರೆಗೆ ಭಾರತದ ಪ್ರಗತಿ ತೀವ್ರ ಗತಿಯಲ್ಲಿ ನಡೆಯಿತು

1990riMxa 2000 vareVgeV BArawaxa pragawi wIvra gawiyalli nadeVyiwu
1990 from 2000 till India development fast phase happened
'India was fast developing from 1990 till 2000.'

Example Id = Relation-DS-rsp-2:

108. ಮಾಚ್೯ನಿಂದ ಮೇ ತಿಂಗಳವರೆಗೆ ಆವರಿಗೆ ಪರೀಕ್ಷೆ ಇದೆ.
mArcniMxa me wiMgalYavareVgeV avarigeV parikReV ixeV.

The entire expression *ninneVyiMxa iMxina vareVgeV* 'from yesterday till today' is a time expression. There are two parts in this time expression, one is starting point(ninneV) and the other is the ending point(iMxu). The vibhaktis *iMxa* 'from' and *'vareVgeV'* 'till' give us the information of starting point and ending point in time. As the entire expression *ninneVyiMxa iMxinavareVgeV* is a time expression it will have a relation k7t(time relation) with the verb. Now internally the two parts of the time expressions are related to each other. So the relation of *ninneyiMxa hidixu* 'from yesterday' with *iMxinavarege* 'will today' will be rsp(relation source of a durative).

Syntactic cues: Duratives will have 'iMxa... vareVgeV' construction.

DRel-30.rad(address terms)

Terms such as 'Sri', 'paMdiwareV' etc. are the address terms. Such terms are annotated as 'rad'.

Example Id = Relation-DS-rad-1:

109. ಅಮ್ಮಾ ನನಗೆ ನಾಳೆ ಬೆಂಗಳೂರಿಗೆ ಹೋಗಬೇಕು

ammA, nanageV nAlYe beVMgalYUrigeV hogabeku
mother, I-Dat tomorrow Delhi to go be-pres
'Mother, I have to go to Delhi tomorrow.'
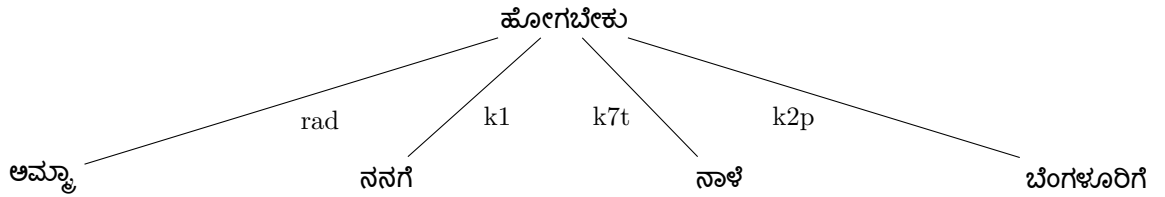
Example Id = Relation-DS-rad-2:

110. ಮಾಸ್ತರರೇ, ನಾಳೆ ಶಾಲೆ ಇದೆಯಾ ?
mAswarare, nAlYe SAleV ixeVyA ?
master, tomorrow school is-there ?
'Teacher, is tomorrow school is there?'.

ಇದೆಯಾ

rad   k7t   k1

ಮಾಸ್ತರರೇ ,   ನಾಳೆ   ಶಾಲೆ

eVMWa-aMWa
yAva-avanu

DRel-31, nmod_relc, jjmod_relc, rbmod_relc(relative clauses)

A relative clause construction in Kannada has a question pronoun. Typically, the modified element has a pronoun 'alli' in it. Such relative clauses where there is a corresponding 'alli' pronoun in the main clause are called relative-correlative constructions. The elli-alli constructions in Kannada are highly productive. These occur not only as noun modifiers but also as modifiers of adjectives and manner adverbs.
ex eVlli-alli
eVRtu-aRtu
hegeV-hAgeV
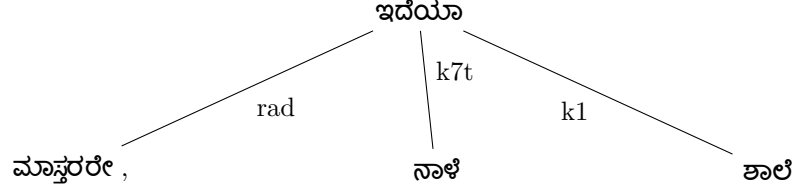yAvanu-avanu
yAra-avara
yAvuxu-axu
elation between 'yAva' and 'avanu' is marked by showing a co-referential tag (coref). Therefore, a tree representation for the above example would be as follows:

a. nmod_relc(relative clause constructions modifying a noun)

Relation DS nmod_relc-1

Since it is an entire clause which modifies a element in the main clause, the convention which is followed in the current annotation scheme is to attach the verb of the subordinate clause to the element it modifies

111. ಆಲ್ಲಿ ಯಾವ ಹುಡುಗ ಕುಳಿತಿದ್ದಾನೋ ಆವನು ನನ್ನ ಸಹೋದರ alli yAva huduga kulYiwixxAno avanu nanna sahoxara the boy who is sitting there is my brother

```
                              NULL
              k1s                        k1
         ಸಹೋದರ                        ಅವನು
            │                             │
            │ r6                          │ nmod_rlec
          ನನ್ನ                      ಕುಳಿತಿದ್ದಾನೋ
                                    k1              k7p
                              ಯಾವ ಹುಡುಗ              ಅಲ್ಲಿ
```
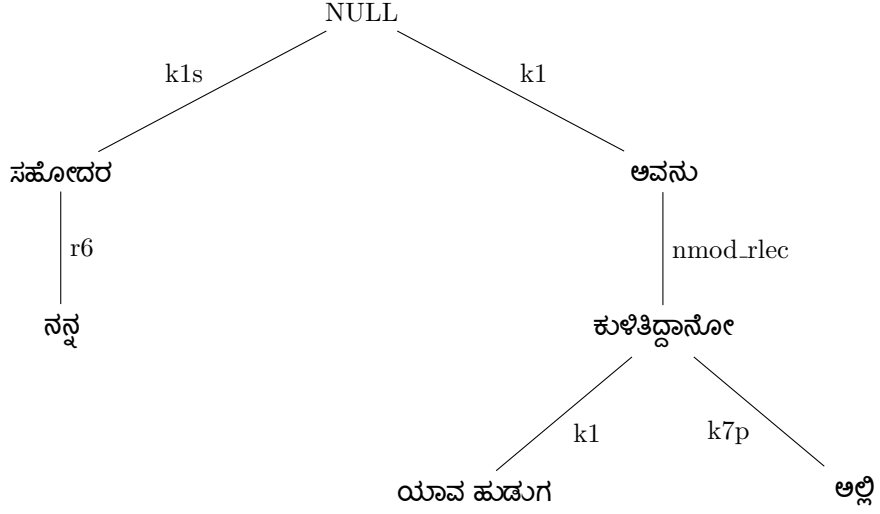
Relation-DS-nmod_relc-2 :

112. **ಯಾರ ಹತ್ತಿರ ಚೆಂಡು ಬರುತ್ತದೋ ಅವರು ಓಡಬೇಕು**
    yAra hawwira ceVMdu baruwwaxo avaru odabeku.
    whoever has the ball must run.

```
                  ಓಡಬೇಕು
                    │
                    │ k1
                  ಅವರು
                    │
                    │ nmod_rlec
                ಬರುತ್ತದೋ
                    │
                    │ k1
                  ಚೆಂಡು
                    │
                    │ r6
               ಯಾರ ಹತ್ತಿರ
```
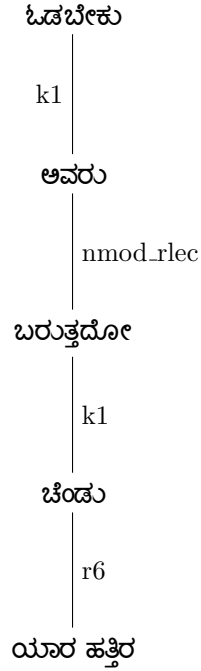
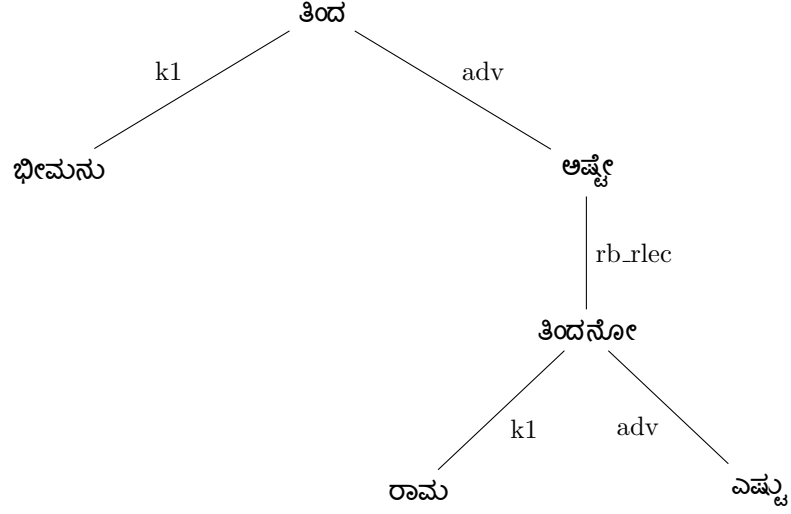The relation between 'yAra' and 'avaru' is marked by showing a co-referential tag (coref).

b.rbmod_relc
('jo' construction modifying an adverb)
A relative-corelative construction can occur for an adverbial expression as well. Such 'eRtu'and 'aRtu'
clauses would be attached under the adverb they modify with a tag.

Relation-DS-rbmod_relc-1 :

113. ರಾಮ ಎಷ್ಟು ತಿಂದನೋ ಅಷ್ಟೇ ಭೀಮನು ತಿಂದ.
      rAma eVRtu wiMxano aRte BImanu wiMxa.
   rama how much ate that much bhima ate.

```
                            ತಿಂದ
                   k1 /            \ adv
                     /              \
                ಭೀಮನು              ಅಷ್ಟೇ
                                     |
                                     | rb_rlec
                                     |
                                 ತಿಂದನೋ
                              k1 /    \ adv
                               /       \
                            ರಾಮ        ಎಷ್ಟು
```

c.jjmod_relc
('jo' construction modifying an adjective) A 'eVRtu' clause can also modify an adjective. It will be
annotated as jjmod_relc
Adjective clauses (or relative clauses) are a type of subordinate clause that act as adjectives. The
whole clause does the job of an adjectives.

Relation-DS-jjmod_relc-1 :

114. ಸೀತೆ ಎಷ್ಟು ಸುಂದರಿಯೋ ಅಷ್ಟೇ ಸುಂದರಿ ಮೀರಾ ಆಗಿದ್ದಾಳೆ.
      sIweV eVRtu suMxariyo aRte suMxari mIrA AgixxAlYeV.
   sita is as beautiful as mira
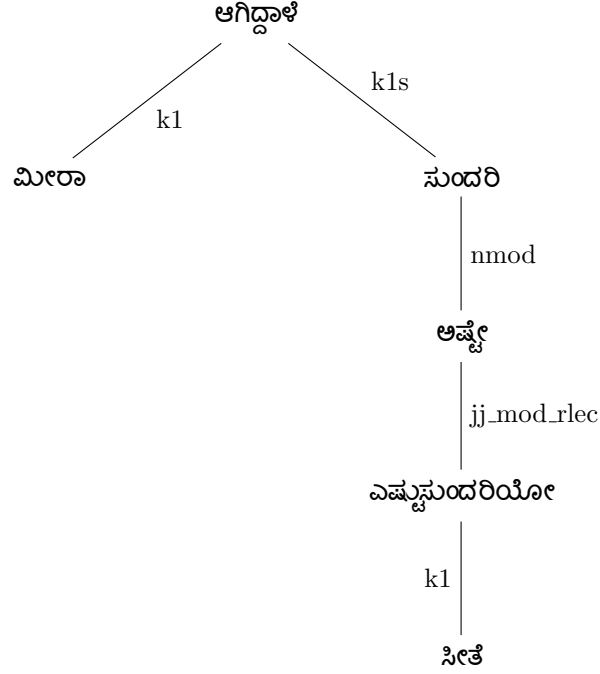
DREL-32 nmod

(participles etc modifying nouns)nmod is an underspecified relation employed to show general noun modification without going into a finer type. Since the dependency relations are being marked at the chunk level, simple adjective modifiers do not normally occur at this level. An adjective noun sequence is already chunked and their dependency relations

are marked only when the chunks are expanded into dependency sub-trees. A tag 'adj' is used for marking simple adjective – noun modification. This tag is not discussed in this document. The nominal modification by adjectival participles falls within the purview of this document. However, an underspecified tag 'nmod' is used to show these dependencies.

Relation-DS-nmod-1

115. ಮರದಲ್ಲಿ ಕುಳಿತ ಹಕ್ಕಿಗಳು ಹಣ್ಣುಗಳನ್ನು ತಿನ್ನುತ್ತಿವೆ.

maraxalli kulYiwa hakkigalYu haNNugalYannu winnuwwiveV.

'The bird sitting on the tree was eating fruits'
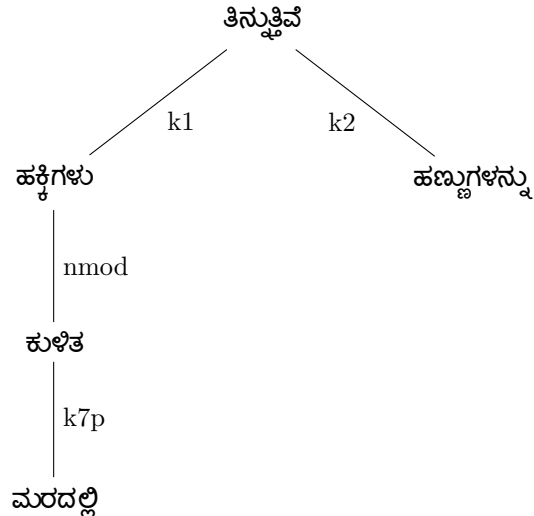
In the above example, the participle clause 'maraxalli kulYiwa' is modifying the noun 'hakkigalYu'. Following a tree representation of the above sentence:

Syntactic cues :
The non-finite verb form of such participial modifiers agree in gender and number with the noun it modifies. The gender and number of the verb 'kulYiwa' in the above example agrees with the gender and number of the noun 'hakkigalYu'.In kannada most of the past tense non finite verbs like 'wiMxa' 'mAdixa' 'nodixa' 'vivarisixa' etc are the examples for noun modifiers.
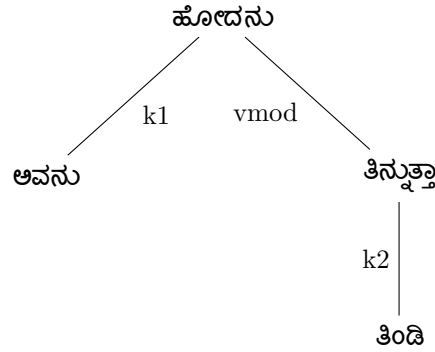
DREL-33 vmod (verb modifier)
'vmod' is another underspecified tag.For some relations getting into finer subtypes is not yet possible. Such relations are annotated with slightly underspecified tag. A verb (especially non-finite) that modifies another verb is thus marked as 'vmod'. There can be two types of verb modifiers:

(a) Simultaneous :where the actions denoted by the two verbs modifier and modified happen simultaneously.
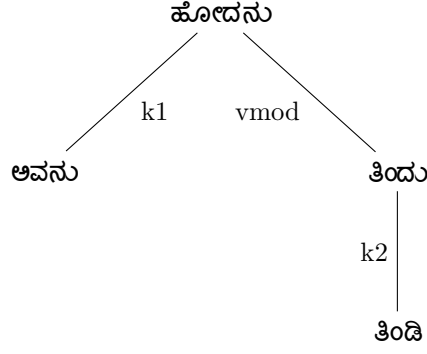
Relation-DS-vmod-1 :

116. **ಅವನು ತಿಂಡಿ ತಿನ್ನುತ್ತಾ ಹೋದನು.**
avanu wiMdi winnuwwA hoxanu.
'He left while eating'

```
                        ಹೋದನು
                       /      \
                   k1 /        \ vmod
                     /          \
                 ಅವನು          ತಿನ್ನುತ್ತಾ
                                  |
                               k2 |
                                  |
                                ತಿಂಡಿ
```

(b) Sequential :
where one action happens after the completion of the another action.

Relation-DS-vmod-1 :

117. **ಅವನು ತಿಂಡಿ ತಿದು ಹೋದನು**
avanu wiMdi wiMxu hoxanu
he left after eating.

ಹೋದನು

k1   vmod

ಅವನು   ತಿಂದು

k2

ತಿಂಡಿ

(c) 'uwwA', 'u' and 'i' ending participles in kannada:
Most Indian languages have a high frequency of participles usages. So does Kannada. Of various participles in Kannada, 'uwwA' is one of the most frequent one. It also serves several semantic functions.Other than sequential, kara participle has other senses also. They are

(i) Consequential: In case of a 'uwwA' participle modifying another verb, 'uwwA' participle expresses the causality of the other action.
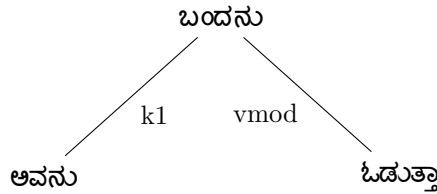
Consequential_uwwA-DS-1 :

118. ಅವನು ಹೆದರುತ್ತಾ ಹೋದನು
     avanu heVxaruwwA hoxanu
     he left with fear

ಹೋದನು

k1   vmod

ಅವನು   ಹೆದರುತ್ತಾ
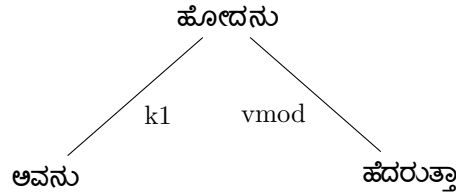
(ii) Manner : 'uwwA' participle in certain cases expresses the manner of the verb it modifies

119. ಅವನು ಓಡುತ್ತಾ ಬಂದನು.
     avanu oduwwA baMxanu.
     Ram running came
     'Ram came running.

ಬಂದನು

k1   vmod

ಅವನು   ಓಡುತ್ತಾ

'u' and 'i' ending participles such as 'wiMxu' 'mugixu' nadeVxu 'mAdi',mugisi, odi etc are vmods.

DREL-34 pof (part of units such as conjunct verbs)

A conjunct verb is a verb that is formed by combining a noun or an adjective with a verb. Therefore, the internal structure of a conjunct verb would be [noun/adj +verbalizer].

In the current scheme a special tag 'pof' has been introduced to mark the conjunct verbs. 'pof' does not exactly denote a dependency. It rather represents that the two elements related by this tag are part of a multi word expression (MWE).
In Kannada most of the conjuncts verbs like bath(snAna), meal(Uta),waiting(prawIkRa) are followed by optional accusative marker. hence it is not possible to consider them as conjunct verbs. But few words like sAxya(possible), BAgi(participate) ets can be marked as conjunct verbs.
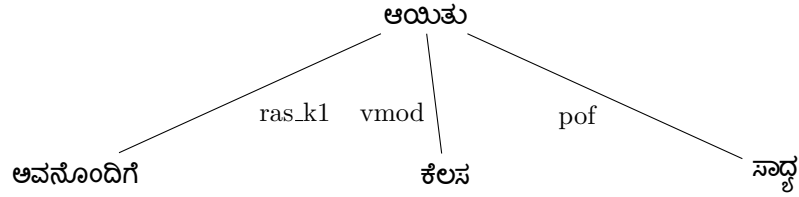
Some examples of conjunct verb constructions are given below
Relation-DS-pof-1
ಅವನೊಂದಿಗೆ ಕೆಲಸ ಸಾಧ್ಯ ಆಯಿತು.
avanoVMxigeV keVlasa sAXyavAyiwu.
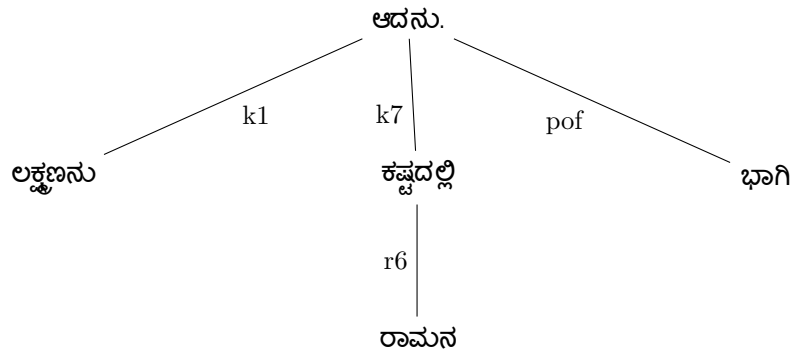it is possible to work with him

Relation-DS-pof-2

120. ಲಕ್ಷಣನು ರಾಮನ ಕಷ್ಟದಲ್ಲಿ ಭಾಗಿ ಆದನು.
lakRmaNanu rAmana kaRtaxalli BAgi Axanu.
lakshman incur in ram's difficulty

In Relation-DS-pof-1,sAxya'to possible' is a conjunct verb. The relationship between sAxya and the verb Ayiwu 'do' will be marked as pof.In the second example above 'Bagi' is a conjunct verb.

**DREL-35 ccof(co-ordination and sub-ordination)**

another special tag which does not exactly reflects a dependency relation is ccof'. This is used for coordinating as well as subordinating conjunctions. The Dependency trees will show the conjuncts asheads.

In case of coordinating conjuncts,the conjunct is the head and takes the coordinating elements as its children. Likewise,a subordinating conjunction would take the clause to which it is syntactically attached(the subordinate clause) as its child.

(a) co-ordinating conjunct :
Relation-DS-ccof-1 :

121. ರಾಮ ಸೇಬು ತಿನ್ನುತ್ತಿದ್ದಾನೆ ಮತ್ತು ಸೀತಾ ಹಾಲು ಕುಡಿಯುತ್ತಿದ್ದಾಳೆ
it Ram apple eat-hab be-pres and Sita milk drink-Imp
'Ram eats apple and Sita drinks milk.'
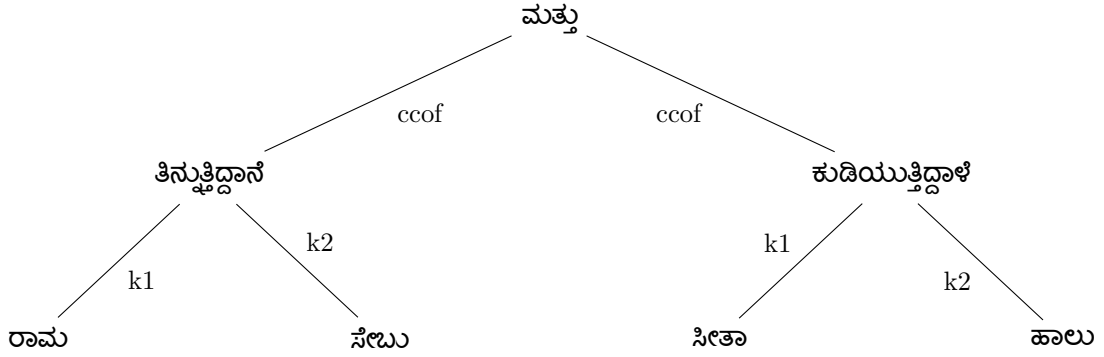
The above example is an example of co-ordination of two clauses. However, the tag 'ccof' would be used for any co-ordination. Therefore, co-ordination of nouns, adjectives or adverbs will all be tagged with a 'ccof' tag. Following is an example of noun co-ordination :
Relation-DS-ccof-2:

122. ರಾಮ ಮತ್ತು ಶಾಮ ಶಾಲೆಗೆ ಹೋದರು
rAma mawwu SAma SAleVgeV hoxaru
Ram and Shyam school go-hab be-pres
'Ram and Shyam go to school.
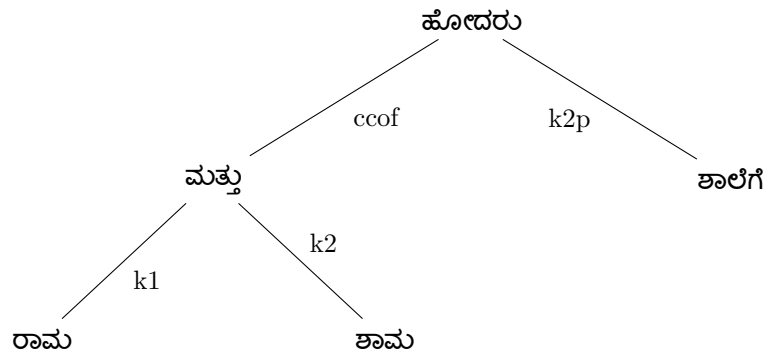
(b) sub-ordinating conjunct :

Relation-DS-ccof-3

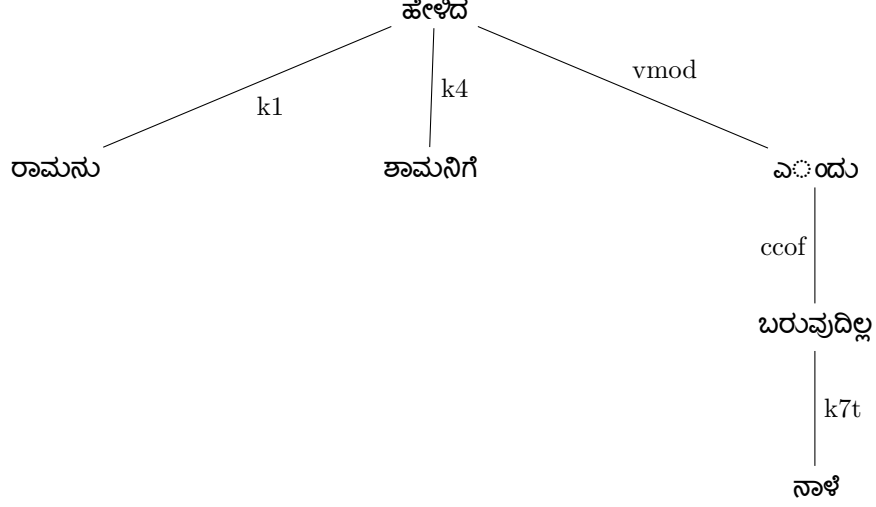123. ರಾಮನು ಶಾಮನಿಗೆ ನಾಳೆ ಬರುವುದಿಲ್ಲ ಎಂದು ಹೇಳಿದ

rAmanu SAmanigeV nAlYeV baruvuxilla eVMxu helYixa

'Ram told Shyam that he will not come tomorrow.'

A coordinating conjunct would have two or more branches which would be labeled as 'ccof' and a subordinating conjunction would have only one branch.

DREL-36 fragof (Fragment of)

'frag of' is a tag which has been included to handle some very special cases. There are examples in the corpus where a postposition, a negative particle or an auxiliary are separated from the NP or VP of which normally they are a part of.Thus, they do not occur as part of the chunk where they belong. For example,

Relation-DS-fragof-1

- ಬಕಪ (ಮಾವೋವಾದಿ)ಯ ರಾಮಬಕನ ಯಾದವನನ್ನು ಬಂಧಿಸಲಾಯಿತು.

  BKP (maoist) of Rambakana yAxav acc arrest do reflex-perf go-perf

  'Rambakana Yadav of BKP (Maoist) has been arrested.'

58
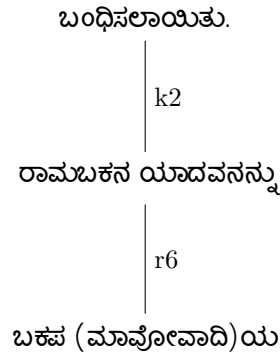
In the above example, the NP chunk 'BAkapA ke'has been broken through the insertion of additional information(mAovAxI)about'BakapA'.The noun'(mAovAxI)'itself forms a separate NP chunk.
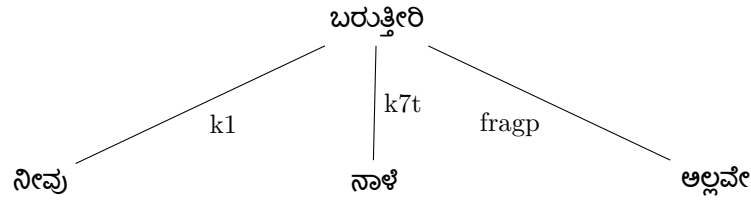
B.There are also instances where the main part of the chunk is missing. It normally happens in cases of gapping particularly with negative particles.

Relation-DS-fragof-2

124. **ನೀವು ನಾಳೆ ಬರುತ್ತೀರಿ ಅಲ್ಲವೇ**

nIvu nAlYeV baruwwIri allave?

is it you are coming tomorrow

In the current scheme, the negative particles are chunked with the verb, this intra-chunk relation would then be represented by marking the negative particle with 'frag of'.

DREL-37 enm(enumerator)

The tag 'enm' is another special tag.This tag also does not represent a dependency in the strict sense. Although, this again is a value for the attribute 'drel'. of the word. This tag is used to mark the enumerators such as 1, 2, 3 or a, b, c, etc in a text. These enumerators occur in the beginning of a sentence and they need to be attached to the root node. Inthe treebank, the root node normally, is either a verb or a conjunct. Therefore, it has been decided to attach the enumerators to the verb with a label 'enm'. For example,

Example Id = Relation-DS-enm-1:

1.ನೀವು ನಿಮ್ಮ ತೆರಿಗೆಯನ್ನು ಸಮಯಕ್ಕೆ ಸರಿಯಾಗಿ ಪಾವತಿಸಬೇಕು.

it nivu nimma weVrigeVyannu samayakkeV sariyAgi pAvawisabeku

You can pay your taxes on time.

In the above example, numeral '1.' has occurred as an enumerator. This will be chunked separately with a chunkd label 'BLK'. At the dependency level, this chunk will be attached to the verb 'pAvawisabeku'. Therefore, the annotated example

ಪಾವತಿಸಬೇಕು
k7t
ek1n k1

1   ನೀವು   ತೆರಿಗೆಯನ್ನು   ಸಮಯಕ್ಕೆ ಸರಿಯಾಗಿ
                              r6

                          ನಿಮ್ಮ
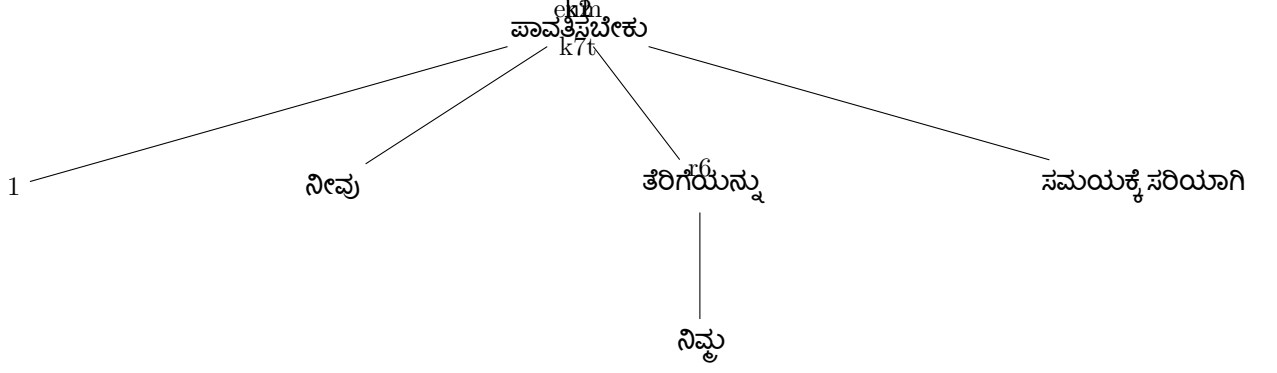
DREL-38 rsym (tag for a symbol)

'rsym' is a label that marks the arc attaching a sentence end marker to the verb.

Example Id = Relation-DS-rsym-1:

125. ರಾಮನು ಮನೆಗೆ ಹೋದನು.

rAmanu maneVgeV hoxanu.

rama went to home

ಹೋದನು
rsym
k7 k1

ರಾಮನು   ಮನೆಗೆ   .
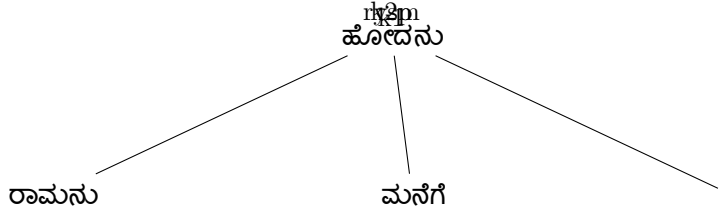
Here the relation rsym exists between hoxanu 'went' and the fullstop (.) of Kannada ' | .

psp cl (postposition)

'psp cl' is the relation marked between a clause and the postposition following that clause.

Example Id = Relation-DS-pspc l−1:

ದೇಶ ಬಿಟ್ಟು ತೊಲಗಿ ಆವರು ಗಲಭೆ ಎಬ್ಬಿಸಿದರು.

xeSa bittu woVlagi avaru galaBeV eVbbisixaru.

Here the relation psp cl is marked between avaru postposition and the verb of the clause preceding it, i.e., woVlagi 'leave' and the whole clause ' xeSa bittu woVlagi' will be marked as karta of 'eVbbisixaru'.

How to Mark Elided Elements

How to Mark Elided Elements marking a missing element in the tree for the following cases:
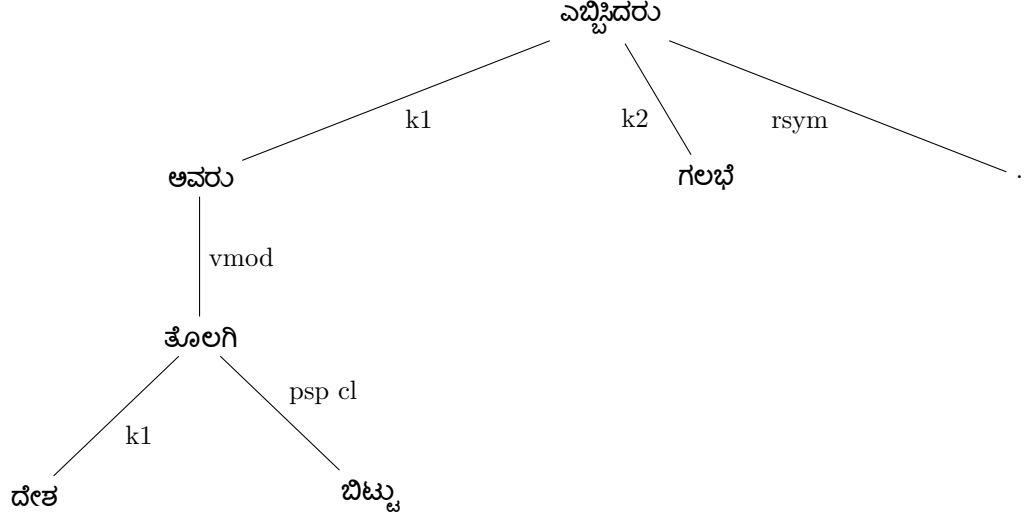(a) In case of a missing verb since a verb forms the root node of a tree/subtree (see Section ?? on Gapping for more details)
(b) In case of a missing co-ordinating conjunct since it also forms the root of a co-ordinating tree underthe current scheme.
(c) In case of any other node which may be a root node for a tree or a sub-tree. For example, 'ulleKanIyahE ki. . . ',
(d) In case of missing arguments of a verb. Amongst the missing arguments, it was decided to markonly k1 and k2. However, The missing arguments will be inserted only in the following cases:
(i) Shared arguments
(ii) Gapping
(iii) Also in finite subordinate clauses
For making the above missing elements explicit it was decided to introduce a NULL node in the tree.The node would be chunked and the relevant features would be annotated at the chunk level dependingon the type of the node inserted. The details of the features to be annotated for various types have beenprovided under the cases discussed below.
In the following sub-sections each of the above, except 'shared arguments', is discussed in more details.

Gapping

Gapping is a type of ellipses where a verb is omitted in its repeat occurrences. Sometimes the arguments of the verb may also be omitted along with the verb.
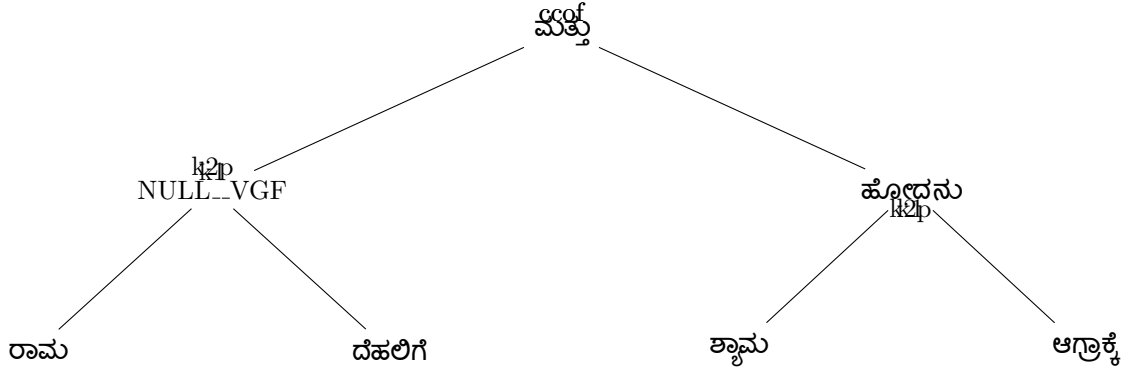
Gapping-DS-1:

126. ರಾಮ ದೆಹಲಿಗೆ ಮತ್ತು ಶ್ಯಾಮ ಆಗ್ರಾಕ್ಕೆ ಹೋದರು.
rAma xeVhaligeV mawwu SAma AgrAkkeV hoxaru
Ram Delhi went and Shyama Agra

'Ram Delhi went and Shyama Agra.'

Missing arguments in a co-ordinating construction
The example Gapping-DS-2 above shows a case of an elided argument along with the gapped verb. Incase of gapping, the verb is same in both the clauses and consequently its repeat occurrence is omitted.

It is also possible that the two clauses in a co-ordinate structure may have two different verbs. In sucha situation both the verbs are realized explicitly. However, the repeated arguments in a co-ordinated construction are dropped even if the verb is different and is realized on surface. For example, Elided-arg-DS-1:

127. ಮೋಹನನು ಪುಸ್ತಕವನ್ನು ಓದಿದನು ಮತ್ತು ಮಲಗಿದನು

mohananu puswakavannu oxixanu mawwu malagixanu

In the above example the occurrence of the verb 'hoxanu' (went) in the second clause of the co-ordinating construction has been elided. To complete the dependencies of the second clause, it is essential to explicitly show the verb which would be the root node of the tree. The missing verb can be retrieved from the previous clause. Thus, the gapped element would be marked as follows: (i) First a new node would be created: NULL VM No other information about this node would be provided. (ii) Next, the above node would be chunked. The chunk would be annotated for the following features: <name='' troot='' mtype=''> Of the three attributes given above, 'name' is an attribute which is annotated on all chunk nodes. The Attribute 'troot' is to be added for a gapped verb as it is retrievable from the context. The attribute's type' is to mark every missing element for whether it is a case of 'gap' or 'not'. Therefore, this attribute would have only two values (1) gap and (2) non-gap. In case the gapped verb is also a dependent of a higher node, an additional attribute of 'dmrel'would be annotated as well. The attribute 'dmrel' is same as 'drel'. The attribute 'drel' is for the words in a sentence and the attribute 'dmrel' would be on elements which are not present in the sentence explicitly.

The example below is another case of gapping.
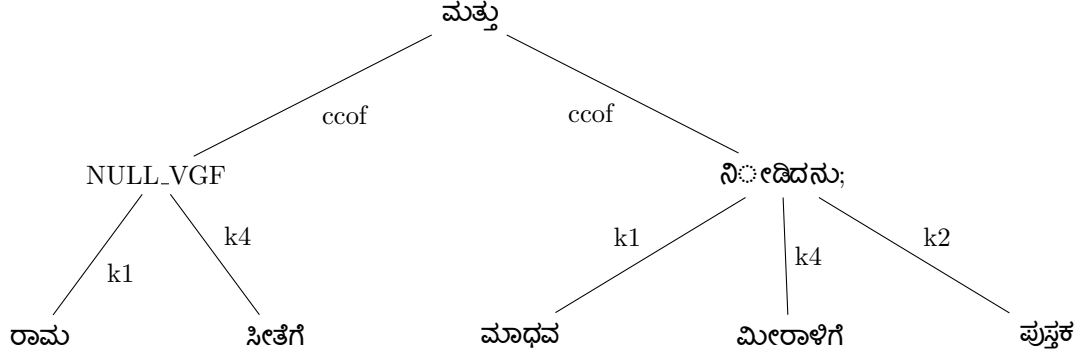Gapping-DS-2:

128. ರಾಮ ಸೀತೆಗೆ ಮತ್ತು ಮಾಧವ ಮೀರಾಳಿಗೆ ಒಂದು ಪುಸ್ತಕ ನಿ‌ೀಡಿದನು

rAma sIweVgeV mawwu mAXava mIrAlYigeV oVMxu puswaka nIdixanu
Ram Erg Sitaacc. book gave and madhav Erg mira acc.
'Ram gave a book to Sita and madhav to mira.'

However, in the above example, an argument is also dropped in the second clause. This argument and the verb can be retrieved from the previous clause. To build a complete dependency tree for the above example, the following items will be inserted in the the tree, the missing verb.

Missing co-ordinating conjunct
Some times the co-ordinating conjunct is implicit and does not occur in the sentence explicitly. For example,
Elided-conjunct-DS-1:

129. ಮಕ್ಕಳು ದೊಡ್ಡವರು ಆಗಿದ್ದಾರೆ ಮತ್ತು ಯಾರ ಮಾತು ಕೇಳುವುದಿಲ್ಲ.
    makkalYu xoVddavaru AgixxAreV mawwu yAra mAwannU kelYuvuxilla.
    children bighappen go-perf be-pres no-one's of talk not listen to.
    'The children have grown big and do not listen to anyone.'

In the above example, the co-ordinator 'mawwu' is missing. Since co-ordinating conjunct forms the root node, a NULL node will be inserted to represent it. Thus, the example after the insertion of NULL would appear as:

Elided-conjunct-DS-1makkalYu xoVddavaru AgixxAreV mawwu yAra mAwannU kelYuvuxilla.
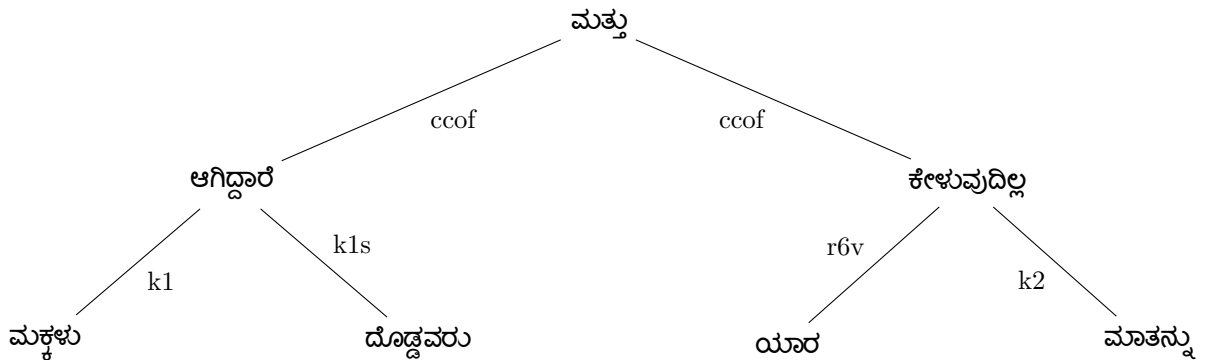
Missing root node
A commonly occurring construction in Hindi is:
Missing-yaha-DS-1:

In the belowexample, the sentence begins with an adjective and has a complement clause in the predicative position. The highlighted words show the adjective, verb be and the complement 'ki'. The complement clause in such sentences is actually an NP complement of the subject, which is missing. To represent this a NULL node is to be inserted and the clause is can then be attached to it as its modifier.

130. ಮಿಂಚಿನಂತೆ ಫಳಫಳನೆ ಹೊಳೆಯುತ್ತಿದೆ.
miMcinaMweV suMxaravAgi hoVlYeVyuwwixeV.
sparkles beautifully
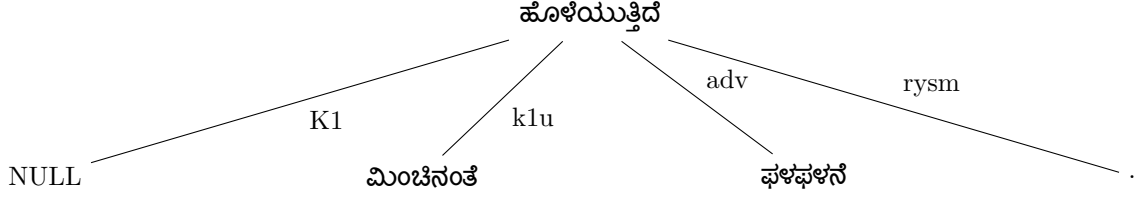
Missing arguments in a co-ordinating construction

The example Gapping-DS-2 above shows a case of an elided argument along with the gapped verb. Incase of gapping, the verb is same in both the clauses and consequently its repeat occurrence is omitted.

It is also possible that the two clauses in a co-ordinate structure may have two different verbs. In sucha situation both the verbs are realized explicitly. However, the repeated arguments in a co-ordinated construction are dropped even if the verb is different and is realized on surface. For example, Elided-arg-DS-1:

131. ಮೋಹನನು ಪುಸ್ತಕವನ್ನು ಓದಿದನು ಮತ್ತು ಮಲಗಿದನು
mohananu puswakavannu oxixanu mawwu malagixanu

In the above example the occurrence of the verb 'hoxanu' (went) in the second clause of the co-ordinating construction has been elided. To complete the dependencies of the second clause, it is essential to explicitly show the verb which would be the root node of the tree. The missing verb can be retrieved from the previous clause. Thus, the gapped element would be marked as follows: (i) First a new node would be created: NULL VM No other information about this node would be provided. (ii) Next, the above node would be chunked. The chunk would be annotated for the following features: <name='' troot='' mtype=''> Of the three attributes given above, 'name' is an attribute which is annotated on all chunk nodes. The Attribute 'troot' is to be added for a gapped verb as it is retrievable from the context. The attribute's type' is to mark every missing element for whether it is a case of 'gap' or 'not'. Therefore, this attribute would have only two values (1) gap and (2) non-gap. In case the gapped verb is also a dependent of a higher node, an additional attribute of 'dmrel'would be annotated as well. The attribute 'dmrel' is same as 'drel'. The attribute 'drel' is for the words in a sentence and the attribute 'dmrel' would be on elements which are not present in the sentence explicitly.

Mohan Erg book read and sleep go-Past.

Mohan read the book and slept

In the above case both the verbs 'oxixanu' (read) and 'malagixanu' (slept) have Mohan as their karta (k1). However, the second occurrence of Mohan is omitted. In such cases also, the missing argument would be inserted and would be represented as follows:

However, as mentioned above, such missing arguments are not posited at the dependency level of annotation.

ಮತ್ತು
  ccof   ccof
ಮಲಗಿದನು   ಓದಿದನು
                    k2   k1
              ಪುಸ್ತಕವನ್ನು   ಮೋಹನನು
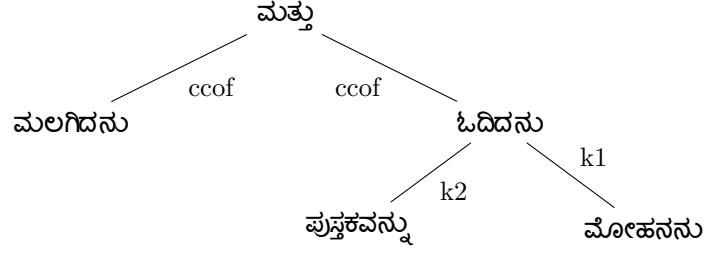
How to mark shared arguments:

Since kannada allows omitting of mandatory arguments, there are a number of sentences with missing arguments. Missing arguments in a sentences could be due to being shared between two or more verbs oR due to ellipsis. The difference between sharing and omitting is that in sharing the argument occurs once which is shared by two verbs ie. main verb which would be finite and the participle clause which would have a non-finite verb. In sharing the second argument can not be realized syntactically. The other case of missing argument is when the argument can (in principle) occur twice but it has been dropped in the second clause (as in case of gapping).

Since k1 and k2 are otherwise mandatory arguments for several verbs and these two arguments also play a crucial role in several linguistic decisions, it was decided to make them explicit in case they were missing in a sentence. For making the missing k1 and k2 explicit the following procedure has to be followed.

(a) Insert a NULL node in the tree for a missing argument.

(b) Assign it appropriate POS tag, normally a NN.

(c) Chunk the NULL node and assign it appropriate chunk label. However, it has to be prefixed with NULL . As shown above (in 4.1), the label for missing verb chunk would be 'NULL VGF'. For a missing nominal argument, it would be 'NULL NP'.

(d) As mentioned earlier, a new dependency attribute is introduced in the scheme to mark the dependency relations of the inserted nodes. The attribute is 'dmrel'. 'dmrel' stands for 'dependency relation for a missing element'.

(a) Missing argument could either be co-referential with another element in the tree or could be of the same type but not exactly co-referential. Thus, to mark this distinction an attribute 'reftype' has been introduced. The values for the 'reftype' would be 'core fn:X' or 'cotype:X'. The value has three parts to it. The first part (corfen, cotype) indicates the 'type' of reference, the second part (:) indicates 'of' and the third part 'X' stands for 'what'. Please see example under section on shared argument for more clarity.

NOTE: The attribute 'troot' is not annotated for a missing argument as it is captured by the 'reftype'. In principle, the morph features (root, number, gender, person) of the corresponding element in the sentence can be copied to the inserted node and need not be manually annotated.

Coming back to the sharing of arguments, the sharing of arguments can be of two types:

Sharing in non-adjectival participles

In non-adjectival participles, an argument of a verb(main) is shared with another verb(participle). The argument occurs only once in the sentence but is semantically related to both the verbs. The shared argument syntactically always attaches with the main verb. For the other verb this argument is semantically realized but not syntactically. Arguments of uwwA constructions constructions in kannada would fall under this type. Note the following sentence: Non-adjectival-Shared-arg-DS-1:

132. ರಾಮನು ಊಟ ಮಾಡಿ ನೀರನ್ನು ಕುಡಿದ.
it rAmanu Uta mAdi nIrannu kudixa
Ram Erg food having eaten water drank.
'Ram drank water after eating the food.'

It may be noted that linguistically rAma ne is explicit karta of only 'drank' and not of 'having eaten', even though, semantically it is the agent for both wiMxu and kudixa. Since agreement and its

vibhakti are controlled by the main verb '   ' (drank) it will be attached to it. However, its semantic presence of being an argument of 'mAdi' will be annotated by following the steps given above.

ಕುಡಿದ

ರಾಮನು —k1— ಮಾಡಿ (vmod) —k2— ನೀರನ್ನು

ಮಾಡಿ —k2— ಊಟ
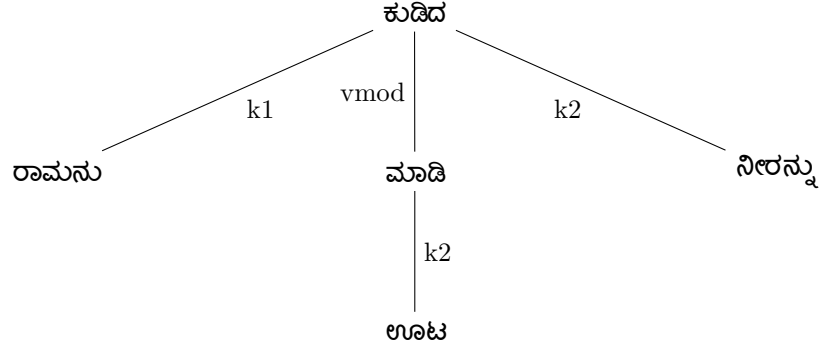
Non-adjectival-Shared-arg-DS-2:

133. ರಾಮ ಊಟ ಮಾಡಿದ ನಂತರ ನೀರು ಕುಡಿಯುತ್ತಾನೆ.
rAma Uta mAdixa naMwara nIru kudiyuwwAneV Ram food eating after water drinks be-Prs.Sg. 'Ram drinks water after eating food.' Noun 'Ram' in the above example is shared by 'wiMxa' (eating) and 'kudiyuwwAneV' (drinks)

ಕುಡಿಯುತ್ತಾನೆ

ರಾಮ —k1— ಮಾಡಿದ ನಂತರ (nmod) —k2— ನೀರು

ಮಾಡಿದ ನಂತರ —k2— ಊಟ
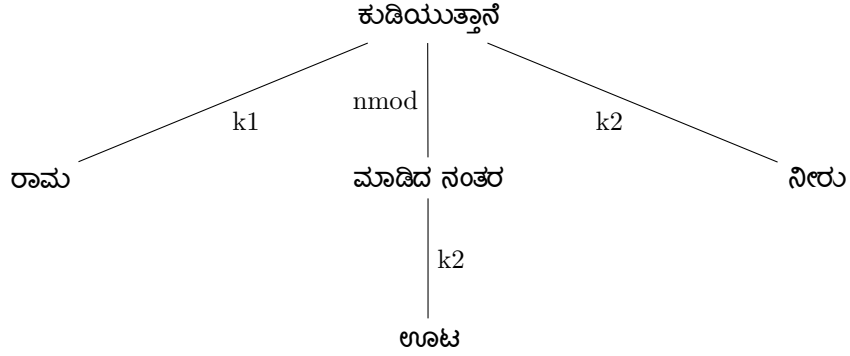
Non-adjectival-Shared-arg-DS-3:

134. ರಾಮ ದಿಲ್ಲಿಗೆ ಹೋಗಲು ಇಷ್ಟ ಪಡುತ್ತಾನೆ.
rAma xilligeV hogalu iRta paduwwAneV
Ram delhi to-go want-hab be-Pres. 'Ram wants to go to Delhii.'

ಪಡುತ್ತಾನೆ

ರಾಮ —k1— ಹೋಗಲು (vmod) —pof— ಇಷ್ಟ

ಹೋಗಲು —k2p— ದಿಲ್ಲಿಗೆ
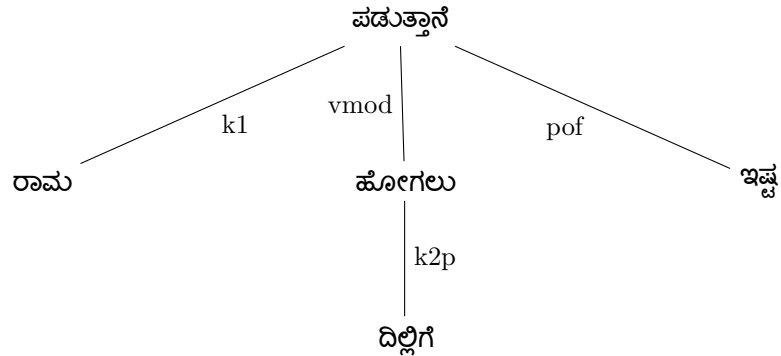
Sharing in adjectival participles

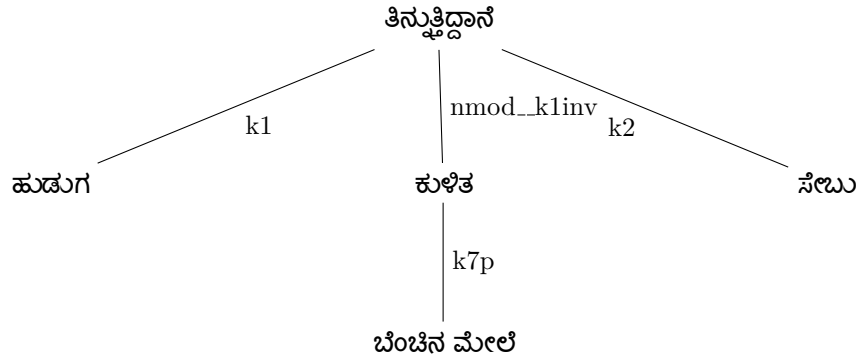(winnuwwiruva constructions, wiMxa constructions) In another kind of sharing of arguments, a participle clause modifies the noun and the modified noun, apart from being an argument of a higher verb, is also an argument of the verb in the participle clause. Therefore, the noun is shared by the main verb and its modifier verb. The adjectival participle, obviously, does not have the modified noun as its explicit argument. Again, although the argument in this case also is semantically realized but cannot occur syntactically. For example,

Adjectival-Shared-arg-DS-1:

135. ಬೆಂಚಿನ ಮೇಲೆ ಕುಳಿತ ಹುಡುಗ ಸೇಬು ತಿನ್ನುತ್ತಿದ್ದಾನೆ.
    beVMcina meleV kulYiwa huduga sebu winnuwwixxAneV
    bench on sit-perf be-ptpl boyapple eat prog pres. 'The boy sitting on the bench is eating an apple.'

```
                          ತಿನ್ನುತ್ತಿದ್ದಾನೆ
                         /        |        \
                    k1      nmod_k1inv   k2
                   /            |            \
              ಹುಡುಗ           ಕುಳಿತ          ಸೇಬು
                               |
                              k7p
                               |
                          ಬೆಂಚಿನ ಮೇಲೆ
```
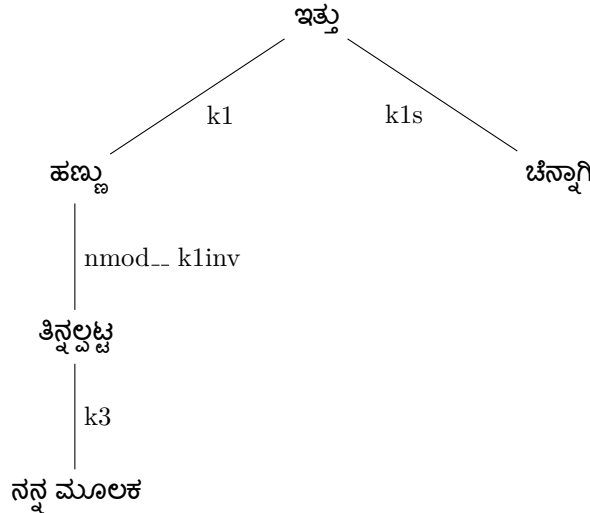
Adjectival-Shared-arg-DS-2:

136. ನನ್ನ ಮೂಲಕ ತಿನ್ನಲ್ಪಟ್ಟ ಹಣ್ಣು ಚೆನ್ನಾಗಿ ಇತ್ತು.
    nanna mUlaka winnalpatta haNNu ceVnnAgi iwwu
    My-obl byeat-perf go-Perf fruits goodpast. 'The fruits eaten by me were good.'

```
                          ಇತ್ತು
                         /      \
                     k1         k1s
                    /              \
                 ಹಣ್ಣು             ಚೆನ್ನಾಗಿ
                   |
              nmod__ k1inv
                   |
              ತಿನ್ನಲ್ಪಟ್ಟ
                   |
                  k3
                   |
              ನನ್ನ ಮೂಲಕ
```

In example (Adjectival-Shared-arg-DS-1) above, kulYiwa 'sit-perf be-ptpl' is modifying the noun huduga 'boy'. Noun huduga 'boy' is an argument of the higher verb winnuwwixxAneV 'eat prog pres'. huduga 'boy' is also an argument of the non-finite verb kulYiwa 'sit-perf be-ptpl'. Similarly, in example (Adjectival-Shared-arg-DS-2) the noun haNNu 'fruits' is an argument of both, the finite verb We

'were' and the non-finite verb winnalpatta 'eaten'. As in the case of shared arguments of the non-adjectival participles, the arguments of this type will also be annotated. However, for such shared arguments, a new node will not be created. Instead, it will be captured by the label on the arc between the modifying clause and the modified noun. For example, the karaka relation of huduga 'boy' with winnuwwiruva 'eat.Impf.Ptpl' (in Adjectival-Shared-arg-DS-1) is k1 (karta karaka relation), it will be represented as nmod k1inv. Similarly, in example (Adjectival- Shared-arg-DS-2), winnalpatta 'ate go-Prf.' is the participle which modifies the noun haNNu 'fruit', the noun haNNu 'fruit' is k2 (karma karaka relation) of the verb winnalpatta 'eaten'. The relation between haNNu 'fruits' and winnalpatta 'eaten' will be represented as nmod k2inv. Therefore, we have one more tag 'nmod k*inv, which means nmod of the type k*inv, where k* stands for the type of karaka relation i.e. k1 or k2 etc. and inv stands for inverse. Along with the karaka relation we also specify inv which denotes that, here the relation arc is going from child to the parent instead of parent to the child. In this type of sharing a new node is not created, the label nmod k*inv is sufficient.
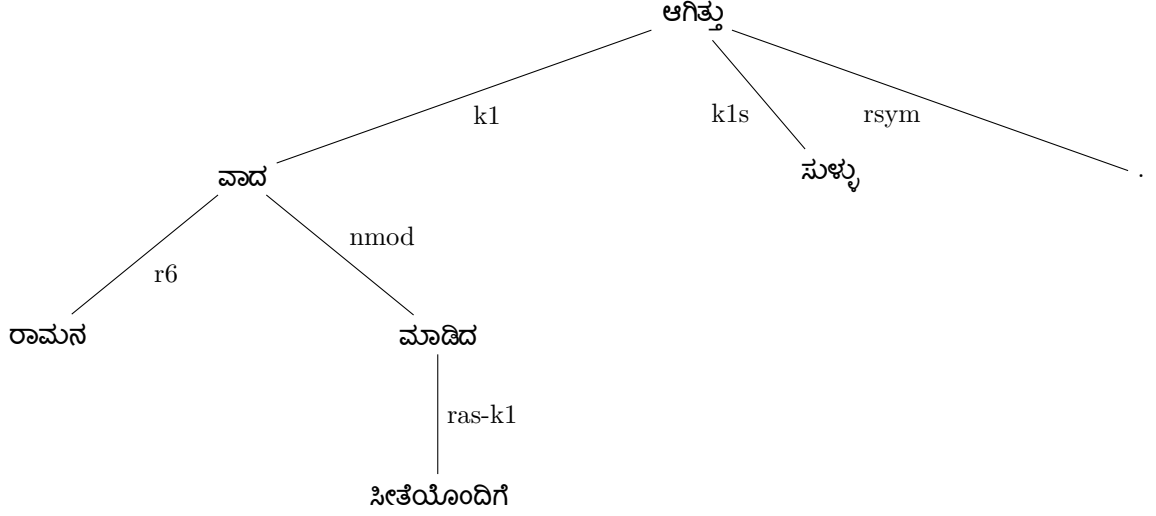
Adjectival-Shared-arg-DS-3:

137. **ಕೊಂಬೆಗಳಲ್ಲಿ ಅರಳಿದ ಹೂ ಗಳು ಶೋಭಿಸುತ್ತಿವೆ**.
koVMbeVgalYalli aralYixa hUgalYu SoBisuwwiveV branches on blossomed flowers smell prog past. 'The flowers flowering on the branches were spreading a scent.' In the above example, PUla 'flowers' is the shared argument. Verb Kile 'blossomed' is modifying PUla 'flowers'.
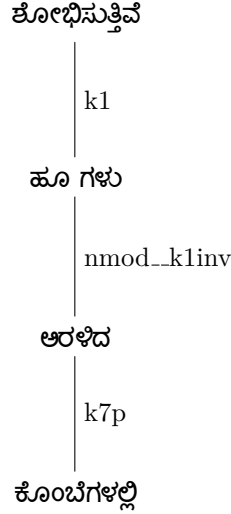
138. **ರಾಮನ ಸೀತೆಯೊಂದಿಗೆ ಮಾಡಿದ ವಾದ ಸುಳ್ಳು ಆಗಿತ್ತು**

Some Additional Features During the discussion on what all information would be useful for various applications, it was decided to add two more features on every finite verb clause. The two features are:

stype (Sentence type) The attribute 'stype' is to be annotated on every finite verb chunk. The values for this are: declarative, imperative, interrogative etc. A complete list of the sentence type is provided separately. For example,

Sentence-type-DS-1:

ನನ್ನ ಆಜ್ಞೆಯನ್ನು ಪಾಲಿಸಿ.
nanna AjneVyannu pAlisi
my command+acc follow 'Follow my command'

The attribute 'stype' will be marked on the verb chunk. Thus, the annotated verb chunk with the 'stype' attribute would be as follows:

((VGF <stype imperative> ಪಾಲಿಸಿ V__VF))

Sentence-type-DS-2:

ನೀನು ದುಃಖ ಪಡಬೇಡ
nInu xuhKa padabeda
you sad do not be
'You do not be sad'

The attribute 'stype' will be marked on the verb chunk. Thus, the annotated verb chunk with the 'stype' attribute would be as follows:

((VGF <stype imperative> k   V__VF))

Sentence-type-DS-3:

ಬಡವರಿಗೆ ಸಹಾಯ ಮಾಡು.
it badavarigeV sahAya mAdu
the poor help
'Help the poor'

The attribute 'stype' will be marked on the verb chunk. Thus, the annotated verb chunk with the 'stype' attribute would be as follows:

((VGF <stype imperative> ಮಾಡು V__VF))

voicetype (Voice type)

The other feature to be annotated on every finite verb chunk is 'voicetype'. The values for this are only two (1) active and (2) passive. For example,

Voice-type-DS-1:
ಮನೆಯು ಹೂವಿನಿಂದ ಅಲಂಕರಿಸಲ್ಪಟ್ಟಿತು.
it maneVyu hUviniMxa alaMkarisalpattiwu
house by flower was decorated
'House was decorated by flower'

((VGF <voicetype=passive>

ಅಲಂಕರಿಸಲ್ಪಟ್ಟಿತು V__VM__VF))

Voice-type-DS-2:

ಆವರು ಕೆಲಸವನ್ನು ಮುಗಿಸಿದರು.
it avaru keVlasavannu mugisixaru
they work+accu finished
'They finished the work'

((VGF <voicetype=active> ಮುಗಿಸಿದರು V__VM__VF))

coref (Coreference)

As mentioned in the section DRel-28, relative clauses are attached to the noun they modify with a label 'nmod relc'. The attachment is between the main verb of the relative clause and the noun it modifies. Thus, an important information about the relative pronoun playing a crucial role in this relation is missed out. To capture this information, it has been decided to annotate the relative pronoun of the relative clause with an additional attribute of 'coref'. The value for the attribute 'coref' would be the referent noun in the main clause, i.e. the noun modified by the relative clause. An example of the same is:

Relative clause-DS-1:

ಯಾರು ನಿನ್ನೆ ಊರಿಗೆ ಬಂದಿದ್ದಳೋ ಆವಳು ಇಂದು ಹಿಂತಿರುಗುತ್ತಾಳೆ.
yAru ninne UrigeV baMxixxalYO avalYu iMxu hiMtiruguwwAlYe

ಹಿಂತಿರುಗುತ್ತಾಳೆ
    k1   k7t
ಅವಳು   ಇದು
nmod_ relc
ಬಂದಿದ್ದಳೋ
  k1   k2p   k7t
ಯಾರು   ಊರಿಗೆ   ನಿನ್ನೆ
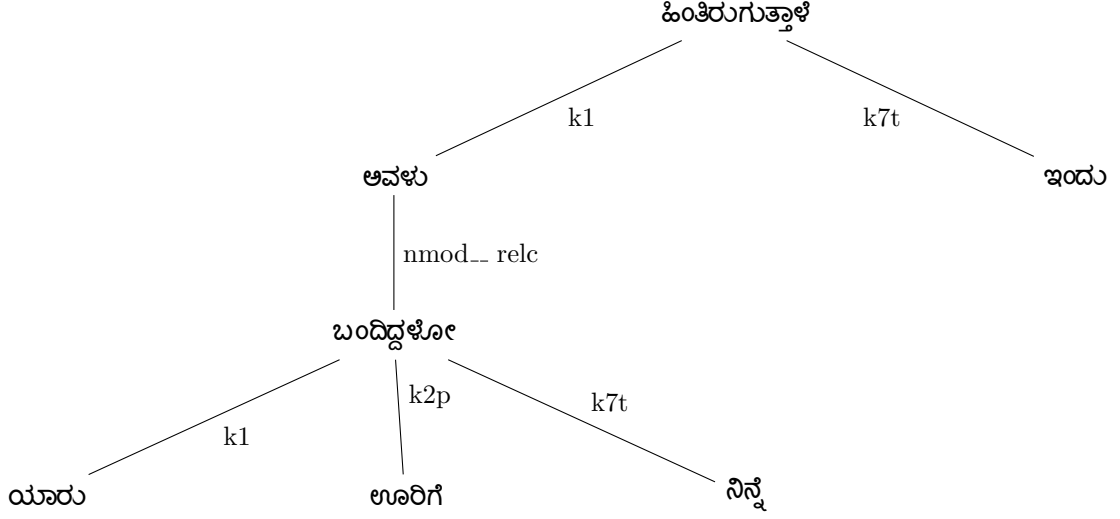
In the above example, the relative pronoun will, in addition to other features will also be marked with the attribute coref. Thus,

PART − 2 : Kannada Example Constructions

This section of the document contains some example constructions of Kannada and their relevant dependency analyses.The constructions given here are based on criteria normally considered for identifying construction types. Broadly these are :
(a) For simple sentences, realization of a syntactic structure based on the verb type such as transitive, unergative, unaccusative etc.
(b) For complex sentences, the type of subordination a clause may have. For example, relative clause, complement clause etc.
(c) Constructions which result due to certain linguistic operations such as ellipsis, sharing of arguments etc.

Simple Transitives

Simple transitives in Kannada have mostly both karta and karma taking nominative case (0 vibhakti).

a. Nominative
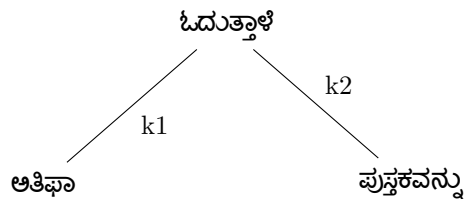Transitive-Verbs-DS-1 :
ಅತಿಫಾ ಪುಸ್ತಕವನ್ನು ಓದುತ್ತಾಳೆ
AwifA puswakavannu oxuwwAlYeV
'Atif will read (a/the) book.'

DS analysis (only the relevant dependency features are shown)
AwiPZa <drel=k1:VGF> puswakavannu <drel=k2:VGF> oxuwwAlYeV <name=VGF>

ಓದುತ್ತಾಳೆ
   k1   k2
ಅತಿಫಾ   ಪುಸ್ತಕವನ್ನು

b. Dative
Transitive-Verbs-DS-2 :
ಅತಿಫಾಳಿಗೆ ಪುಸ್ತಕವನ್ನು ಓದಲಿಕ್ಕಿದೆ.
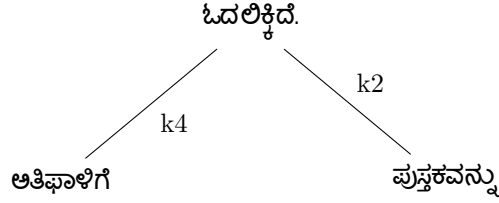awiFAlYigeV puswakavannu oxalikkixeV
Atif-Dat book.f read-Inf.f be.Prs.Sg
'Atif has to read (a/the) book.'
DS analysis ;
awIFAlYigeV <drel=k1:VGF> puswakavannu <drel=k2:VGF> oxalikkixeV <name=VGF>

c. Ergative
An ergative construction in Hindi occurs when the verb is transitive and its TAM is past perfective.
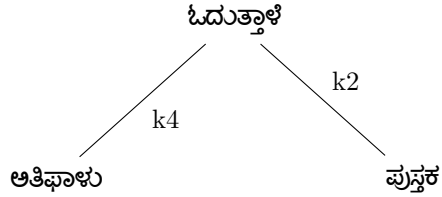
Transitive-Verbs-DS-3 :
ಅತಿಫಾಳು ಪುಸ್ತಕ ಓದುತ್ತಾಳೆ
awiFAlYu puswaka oxuwwAlYeV
AwiPZa ne kiwAba paDZI
Atif-Erg book.f read-Pfv.F
'Atif read (a/the) book.'

DS analysis ; AwIPAlYu <drel=k1:VGF> puswaka <drel=k2:VGF> oxuwwAlYeV <name=VGF>

d. Unergatives
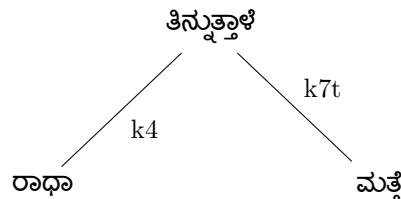a. Nominative
Unergatives-DS-1 :

ರಾಧಾ ಮತ್ತೆ ತಿನ್ನುತ್ತಾಳೆ
rAXA mawweV winnuwwAlYeV. rAXA.M later eat-Fut.3MSg
'rada will eat later.'

DS Analysis ;

rADA <drel=k1:VGF> mawweV <drel=k7t:VGF> winnuwwAlYeV <name=VGF>

Dative

Unergatives-DS-2 :

ರಾಧಾಳಿಗೆ ಸ್ನಾನ ಮಾಡಲಿಕ್ಕಿದೆ rAXAlYigeV snAna mAdalikkixeV radha-Dat bathe-Inf be.Prs 'radha has to bathe.' DS Analysis ;

rADAlYigeV <drel=k1:VGF> snAna hE <name=VGF> The analysis of the dative construction within Paninian dependency framework would remain same for both transitives and unergatives as within Paninian framework what is considered as a syntactic cue for identifying the k1 of a verb is its TAM and the postpositions of the participating nouns.

Copular constructions

Kannada sentences have two basic parts: the subject and the predicate. The subject consists of the central topic of the sentence, declined to the nominative case, while the predicate consists of a verb, often with an object (which formally should be in the accusative case), or may have no verb and object at all but rather simply have another noun declined in the nominative case, known as the predicate nominative, where an equivalency statement is intended.

Example: **ನಾನು** (subject) **ಮೇಜನ್ನು** (object) **ಕಟ್ಟಿದೆನು** (verb). ('I built the table.' Here, the subject is 'I' and 'built the table' is the predicate, with 'built' as the verb and 'the table' as the object.

Example: **ನಾನು** (subject) **ಕನ್ನಡದ ವಿದ್ಯಾರ್ಥಿಯು** (predicate nominative). ('I (am) a student of Kannada.' Note that there is no direct Kannada equivalent for the verb 'to be' as a copula [linking verb], because Kannada is a zero-copula language, although the sentence may be alternatively written '**ನಾನು ಕನ್ನಡದ ವಿದ್ಯಾರ್ಥಿಯನ್ನು ಆಗಿದ್ದೇನೆ**.' literally meaning 'I am/exist having become a student of Kannada.'

Causatives

The causative suffix 'isu' or 'yisu' can be added to any verb stems to make causative verbs out of non causative ones
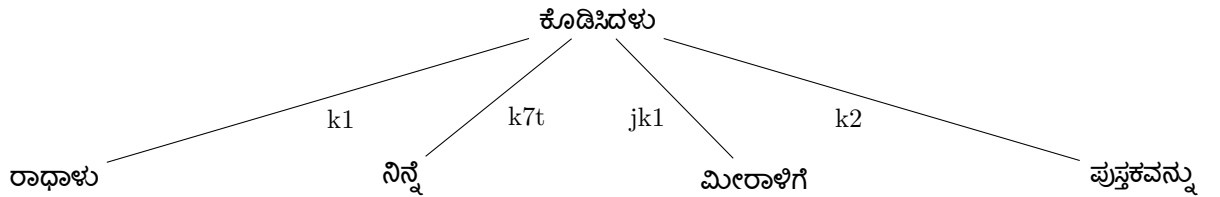
ರಾಧಾಳು ನಿನ್ನೆ ಮೀರಾಳಿಗೆ ಪುಸ್ತಕವನ್ನು ಕೊಡಿಸಿದಳು

rAXAlYu ninneV mIrAlYigeV puswakavannu koVdisixalYu

'radha caused Mira to buy a book yesterday.'

DS Analysis ;

rADAlYu ne <pk1:VGF> ninneV <k7t:VGF> mIrAlYigeV <jk1:VGF> puswakavannu <k2:VGF> koVdisixalYu <name=VGF>

Conclusion

The tagging scheme presented above has been designed to annotate syntactic analysis within a dependency framework. The task of annotation for Hindi is underway. The basic scheme developed

initially has been improved and revised. It is planned to conduct some experimental annotation on other languages and test if it can be applied to other Indian languages as well