Spatial Role Labeling

Extraction of Spatial Relations
from Natural Language
CS365 : Artificial Intelligence
Project

Submitted By : Amit Kumar (10074)

G Chandra Sekhar(10267)

Mentor : Amitabha Mukerjee

(amit@cse.iitk.ac.in)

Problem Statement

- We are mapping linguistic representation of natural languages to formal spatial representation.

- Definitions :

  1. **Spatial indicators** : signals a spatial relation between objects (trajectors and landmarks) of a spatial scene.

  2. **Trajector** :The entity, i.e., person, object or event whose location is described,.

  3. **Landmark**: The reference entity in relation to which the location or the motion of the

Example

- Sentence : "John is sitting on the ground"

  Spatial Indicator : "on"

  Landmark : "the ground"

  Trajector : "John"

Motivation

Spatial role labeling is a key task for applications that are required to answer questions or reason about spatial relationships between entities.

- We can control a robot by audio instructions.

- Helpful in systems that perform text-to-scene conversion and generation of textual descriptions from visual data.

- We can use this in geographical information systems (GIS).

Past work

- [Kordjamshidi et al., 2011c] was the first research in this field provides a domain independent linguistic and spatial analysis to this problem.

- Previous research has not systematically covered spatial relation and role extraction from unrestricted natural language.

Our Approach

- We are using machine learning approach to solve this problem.

- Assumptions :

1. There should be a Spatial indicator in the sentence.

2. We are not considering multi-word prepositions.

Method / Steps

- Identify the Spatial Indicator
  - Identify the preposition in the sentence.
  - Check that the preposition works as Spatial indicator or not.

  Note : We are learning the function from the training set which estimates whether it is a spatial indicator or not.

Method / Steps

- With the help of multi-class classifier, we can identify Landmarks and Trajectors.

- Why Multi - Class Classifier :

  - For both functions (to identify Landmarks and Trajectors) we have same input argument (i.e. Spatial Inndicator).

Multi-Class Classifier

- Feature Set : Centered on the Spatial Indicator.

   - Head1 : The words directly dependent on the preposition.

- Head2 : The words on which the preposition is directly dependent.

- By using Stanford Dependency Parser we can identify Head1 & Head2.

Future Scope

- If we can take verbs and nouns as spatial indicator then that approach will be better.

- We can include multi-word prepositions for the detection of Spatial Indicator.

Data set

- No Specific data set for spatial role labeling.

- The data we got from the organizers of SemEval is a subset of CLEF Corpus and Confluence Corpus in XML format.

- All the files in the training set have been split into sentences with proper tags.

References

- SemEval-2012 Task 3: Spatial Role Labeling.

- P. Kordjamshidi, M van Otterlo, and M. F. Moens. Spatial role labeling: task definition and annotation scheme. In LREC, 2010.

- Parisa Kordjamshidi, Martijn van Otterlo, and Marie-Francie Moens. Spatial role labeling: Towardsextraction of spatial relations from natural language. ACM Transactions on Speech and LanguageProcessing, TSLP 8(3) , Dec. 2011.

Thank You