Automatic Generation of Typicality Measures for Spatial Language in Grounded Settings

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• Modelling spatial prepositions ('in', 'inside', 'on', 'on top of', 'against', 'above', 'over', 'below' & 'under') in situated dialogue - in particular in referring expressions

• Spatial prepositions exhibit vagueness

• Simple models do not align with human usage
Semantic Complexity

- Many features may influence spatial preposition usage with no clear boundaries demarcating when a preposition is, or is not, appropriate to use.
- As well as representing geometric concepts, spatial prepositions denote functional relationships.

Figure 1: Example given in Garrod et al., 1999

Figure 2: Examples from Bowerman and Choi, 2001
Modelling Issues

- Existing models are limited with regards to functional relationships
- Features are crudely approximated

Figure 3: Containment issues
Framework
• Virtual environments built in Unity3D
• Provides a task for generating models and a task for testing models

Figure 4: Preposition Selection Task

Figure 5: Comparative Task
Cognitive Models

Three main approaches:

- Rule-based
- Exemplar
- Prototype
- Conceptual Space

Figure 6: Instances of 'on'
Scores Using Repeated K-Fold Validation. K = 2 N = 100

Figure 7: Scores with 100 repetitions of 2-fold cross validation
Future Work


• Explore the relation between categorisation and typicality in more detail

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