

# Preliminary Project Description

## Generalized Quantifiers

### Their Complexity and Difficulty

Jakub Szymanik

December 5, 2006

In the first two weeks I will cover the following topics (according to the literature given in brackets) in the introductory lectures (some homeworks are possible). After that, the students will work on individual topics for final papers.

1. What are Generalized Quantifiers? (see Westerståhl and Stanley, 2006, chap. 0, 1.3, 2.2–2.4), (Krynicky and Mostowski, 1995b).
2. Monadic quantifiers (see Westerståhl and Stanley, 2006, chap. 3.1–3.3, 4.1, 4.7–4.8).
3. Crash course in automata theory (see Hopcroft et al., 2000, chap. 1.5, 2.2, 4.1, 6.1–6.2, 6.4, 7.2).
4. Monadic quantifiers recognizable by finite automata (van Benthem, 1986), (Mostowski, 1998).
5. Quantifiers accepted by Push-Down Automata (van Benthem, 1986), (Mostowski, 1998).
6. Neuroimaging studies on quantifier comprehension (McMillan et al., 2005), (McMillan et al., 2006), (Clark and Grossman, 2006), (Szymanik, 2006).
7. Branching quantifiers (see Westerståhl and Stanley, 2006, chap. 2.5), (Krynicky and Mostowski, 1995a).
8. Some results on the computational complexity of branching quantifiers in finite models (see Sevenster, 2006, chap. 5), (Mostowski and Wojtyniak, 2004).
9. Hintikka's Thesis (Hintikka, 1973), (Barwise, 1979).

## References

- Barwise, J. (1979). On branching quantifiers in English. *Journal of Philosophical Logic*, 8:47–80.
- Clark, R. and Grossman, M. (2006). Number sense and quantifier interpretation. *Submitted*.
- Hintikka, J. (1973). Quantifiers vs. quantification theory. *Dialectica*, 27:329–358.
- Hopcroft, J., Motwani, R., and Ullman, J. (2000). *Introduction to Automata Theory, Languages and Computation*. Addison Wesley.
- Krynicky, M. and Mostowski, M. (1995a). Henkin quantifiers. In Krynicky, M., Mostowski, M., and Szczurba, L., editors, *Quantifiers: Logics, Models and Computation*, pages 193–263. Kluwer Academic Publishers.
- Krynicky, M. and Mostowski, M. (1995b). Quantifiers, some problems and ideas. In Krynicky, M., Mostowski, M., and Szczurba, L., editors, *Quantifiers: Logics, Models and Computation*, pages 1–21. Kluwer Academic Publishers.
- McMillan, C., Clark, R., Moore, P., Devita, C., and Grossman, M. (2005). Neural basis for generalized quantifiers comprehension. *Neuropsychologia*, 43:1729–1737.
- McMillan, C., Clark, R., Moore, P., and Grossman, M. (2006). Quantifiers comprehension in corticobasal degeneration. *Brain and Cognition*, 65:250–260.
- Mostowski, M. (1998). Computational semantics for monadic quantifiers. *Journal of applied Non-Classical Logics*, 8:107–121.
- Mostowski, M. and Wojtyniak, D. (2004). Computational complexity of the semantics of some natural language constructions. *Annals of Pure and Applied Logic*, 127:219–227.
- Sevenster, M. (2006). *Branching Imperfect Information. Logic, Language, and Computation*. PhD thesis, Institute for Logic, Language, and Computation.
- Szymanik, J. (2006). A comment on a neuroimaging study of natural language quantifier comprehension. *Neuropsychologia*, To appear.
- van Benthem, J. (1986). *Essays in logical semantics*. Reidel.
- Westerståhl, D. and Stanley, P. (2006). *Quantifiers in Language And Logic*. Oxford University Press, Oxford.