

Table of Contents

1. Introduction	1
1.1. Grammar based translation methodologies	4
1.2. Applications of bi-directional translators	8
1.3. Related work	11
1.4. Overview of thesis	18
2. Grammar based translation methodologies and RIFs	20
2.1. Grammar based translation methodologies	22
2.1.1. Attribute Grammars	22
2.1.1.1. A formal definition of AGs	27
2.1.1.2. Translations defined as ERROR	28
2.1.2. Syntax-Directed Translation Schema	29
2.1.3. RIFs	31
2.2. The equivalence of RIFs and Attribute Grammars	36
3. The inversion of RIF grammars	43
3.1. The RIF inversion algorithm	43
3.2. Properties of inverted RIFs	46
3.3. Syntactic and semantic evaluability of inverted RIFs	54
4. Generalizing RIFs	62
4.1. GRIF grammars	64
4.1.1. A definition of GRIFs	66
4.1.2. The inversion of GRIFs	71
4.1.3. An evaluator for inverted GRIFs	74
4.1.4. A proof of correctness	79
4.2. Summary and additional remarks	88
5. The INVERT system	93
5.1. Additive and deletive token permuting functions	94
5.1.1. Additive token permuting functions	95
5.1.2. Deletive token permuting functions	102
5.2. Invertive token permuting functions	106
5.3. Mechanisms for dealing with ambiguity	111
5.4. Summary	117
6. Translating between programming languages	118
6.1. Constructing a greatest common divisor canonical form	121
6.2. ABSIM: a canonical form for Pascal and C	125

6.3. Source-to-source translators for Pascal and C	132
6.4. Denesting Pascal procedures and functions	136
6.4.1. The denesting algorithm	137
6.4.2. The DNEST pre-processor	142
6.5. Summary	143
7. Conclusions and future directions	144
7.1. Many-to-one translations and the ambiguity problem	146
7.2. Alternatives to a GCD canonical form	150
7.3. AG inversion, source-to-source translators, and software reusability	152
References	154
Appendix A. AGs using ERROR and computability	161
Appendix B. Pascal-to-C and C-to-Pascal translations	166