ON CONSTRAINING THE CLASS OF TRANSFORMATIONAL LANGUAGES

1. Two Views of Constraints

The need to add constraints to the theory of transformational grammar has been one (perhaps the) central goal of research by generative grammarians over the last decade. A number of important proposals have resulted from this research, most notably those due to Bresnan (1976), Chomsky (1973), Culicover and Wexler (1977), Emonds (1976), and Ross (1967). The first section of this paper is devoted to distinguishing between and considering the relative merits of two different views of the purpose of such constraints. The second and third sections attempt to add substance to my position by showing how progress towards the goals defended in the first section can be achieved.

The key distinction I want to discuss in this paper is the difference between restricting the class of grammars made available by a theory of grammar and restricting the class of languages which can be generated by the grammars the theory makes available. These are not equivalent. For example, the literature provides two different characterizations of the notion of a context sensitive grammar: one definition (e.g. Wall, 1972, p. 212) requires that each rewrite rule be of the form \( xAy \rightarrow xwy \), where \( A \) is a non-terminal symbol, \( x, y, \) and \( w \) are strings of terminal and/or non-terminal symbols, and \( w \) is non-null; the other definition (e.g., Hopcroft and Ullman, 1969, p. 13) requires only that the right side of each rewrite rule be no shorter than the left side. Clearly, the class of grammars permitted by the first definition is a proper subset of that permitted by the second definition; but it is not difficult to prove that the two classes of grammars generate the same class of languages (see Kuroda, 1964). Or, to
pick a linguistically more interesting example, the class of transformational grammars, but not the class of languages generated, would be restricted by a constraint to the effect that no terminal symbol could be immediately dominated by a branching node; for if \( G \) is a grammar not satisfying the constraint, we can design a grammar \( G' \) which satisfies the constraint and generates the same language. This can be done as follows: for each terminal symbol, \( a \), of \( G \), (i) add a new non-terminal symbol \( A \) and a new base rule \( A \rightarrow a \); and (ii) substitute ‘\( A \)’ for all occurrences of ‘\( a \)’ in the rules of \( G \), except where \( a \) is deleted by a specified deletion. It is evident that \( G \) and \( G' \) will generate the same language, at least in any version of transformational grammar which has been proposed to date.

Although the class of grammars may be restricted without changing the class of languages, the converse is, of course, not true; that is, it is not possible to limit the class of languages without limiting the class of grammars. Thus, the goal of constraining the class of transformational languages is an inherently more ambitious one than that of constraining only the class of transformational grammars. We can now ask whether there is any reason to aspire to this more ambitious goal. Before responding affirmatively, I want to argue that the question posed is less esoteric than it appears, and that the answer that one gives to it will reflect one’s fundamental conception of what generative grammar is about.

Why seek to constrain transformational theory at all? The answer lies in what Chomsky (1972b, p. 67) calls “the fundamental problem of linguistic theory”, namely, that of accounting for the possibility of language acquisition. On the basis of exposure to a relatively small sample of a language, any normal child is able to attain mastery over the infinite set of sentences which constitute that language. Thus, the child “will know a great deal about phenomena to which he has never been exposed” (Chomsky, 1972a, p. 159). Furthermore, these phenomena “are not ‘similar’ or ‘analogous’ in any [as yet] well-defined sense to those to which he has been exposed. . . . This disparity between knowledge and experience is perhaps the most striking fact about human language. To account for it is the central problem of linguistic theory” (Chomsky, 1972a, pp. 159-160). The problem, then, is basically the problem of induction: how do children