From MPARSE to CONTROL:
deriving ungrammaticality

Cemil Orhan Orgun
UC Davis

Ronald Sprouse
UC Berkeley

1. Introduction[*]

One of the major insights of Optimality Theory (Prince and Smolensky 1993) is that grammatical constraints are ranked and violable. These ranked constraints evaluate an infinite set of candidate forms. The winning candidate is in effect a compromise between the potentially conflicting demands imposed by grammatical constraints. A question that has been only rarely addressed in the OT literature is how UNGRAMMATICALITY arises if all constraints are violable in principle and constraint violation does not entail ungrammaticality. In this paper, we point to some shortcomings of the only existing proposal to deal with ungrammaticality in OT, the special constraint MPARSE (Prince and Smolensky 1993), and propose a restructuring of EVAL.

We propose the addition of another constraint component called CONTROL, which contains only those inviolable constraints that may cause ungrammaticality (rather than repair). The winning candidate from EVAL, the usual ranked and violable constraint component, is submitted to CONTROL. If this candidate satisfies all the constraints in CONTROL, it is a grammatical output. If it violates a constraint in CONTROL, no grammatical output is possible. Our approach is not only empirically superior to MPARSE, but it also makes a clear distinction between two kinds of inviolable constraints. Inviolable constraints in EVAL (those that outrank all potentially conflicting constraints) cause repairs or block otherwise general alternations; inviolable constraints in CONTROL cause ungrammaticality, never repair.[1]

[*] Larry Hyman and Sharon Inkelas have provided much valuable input to this paper. Earlier versions of this paper were presented at the TREND conference at Stanford, and at WECOL. We thank both audiences, especially Junko Itô, Armin Mester and Jaye Padgett. We are also grateful to Sharon Rose for detailed comments on an earlier version of this paper.

[1] Much of this paper assumes the standard approach to OT (Generalized Correspondence; McCarthy and Prince 1994). Two recent developments, Sympathy Theory (McCarthy 1997, Itô and Mester 1997) and Enriched Input Theory (Sprouse 1997), introduce representations that correspond to neither the underlying representation nor the surface representation. The implications of these developments for the treatment of ungrammaticality in OT is the topic of work in progress by the authors.

2. MPARSE (Prince and Smolensky 1993, Raffelsiefen 1996)

Prince and Smolensky (1993) propose that the output of GEN always includes a special candidate called the Null Parse, which has no phonetic realization and is stipulated to satisfy all wellformedness and faithfulness constraints.[2] By definition, the Null Parse violates only the special constraint MPARSE, which no other candidate violates.[3] Ranking a phonological constraint C above MPARSE is equivalent to declaring it inviolable: any candidate that violates C is worse than the Null Parse. In (1), the Null Parse emerges as the winning candidate because all other candidates violate constraint C, which outranks MPARSE.

(1) C » MPARSE; ungrammaticality preferred over violation of C

	Constraint C	MPARSE
Candidate A	*!	
☞Null Parse		*

In the next section, we illustrate the use of MPARSE to deal with ungrammaticality by summarizing Raffelsiefen's (1996) analysis of morphological gaps in English -*ize* suffixation.

3. English -*ize* formation (Raffelsiefen 1996)

Raffelsiefen (1996) claims that the English verbalizing suffix -*ize* attaches productively to adjectives with non-final stress, but not to adjectives with final stress.

(2)	Non-final stress		Final stress	
	rándom	rándomìze	corrúpt	*corruptize
	vápor	váporìze	obscéne	*obscene-ize
	átom	átomìze	secúre	*secure-ize

Raffelsiefen argues that ungrammaticality in the case of final-stressed adjectives results from an irresolvable conflict between two constraints, *CLASH and IDENT.

(3) *CLASH: Two adjacent stressed syllables are prohibited.

(4) IDENT: The stem of the derived word must be identical to the base (i.e., no stress shift)

---

[2] P&S assume that the Null Parse is identical to the input but fails to be inserted into the morphological structure. In this paper, we abstract away from any specific approach to morphology and concentrate on the empirical question of how to identify ungrammatical outputs.

[3] For Raffelsiefen the candidate that violates MPARSE is identical to the input and may violate other constraints.

Both *CLASH and IDENT are ranked above MPARSE. Any candidate that violates either *CLASH or IDENT is worse than the Null Parse. Since it is impossible to simultaneously satisfy both *CLASH and IDENT for an input form with final stress, the Null Parse emerges as the winning candidate.

(5) Stem with final stress ⇒ no grammatical output[4]

	kərʌ́pt-áyz	IDENT	*CLASH	MPARSE
	kórəptàyz	*!		
	kərʌ́ptàyz		*!	
☞	Null Parse			*

When the input stem has non-final stress, however, it *is* possible to satisfy both *CLASH and IDENT. Therefore, a grammatical output is possible for adjectives with non-final stress.

(6) Stem with non-final stress ⇒ grammatical output

	rǽndəm-áyz	IDENT	*CLASH	MPARSE
☞	rǽndəmàyz			
	Null Parse			*!

We have seen that Prince and Smolensky's MPARSE approach handles ungrammaticality by ranking their special constraint MPARSE below other grammatical constraints. Whenever violation of one of those higher-ranked constraints is unavoidable, the MPARSE-violating Null Parse emerges as the winning candidate. No grammatical output is possible in such cases.

While MPARSE works for many cases of ungrammaticality, we will see that it is unable to handle all cases. In the remaining sections, we will present data from Turkish, Tagalog, and Tiene where an MPARSE account would predict a grammatical output where there is in fact no grammatical output.

[4] Raffelsiefen actually gives a phonological representation to the Null Parse, which is identical to the phonological input form, with the affixes unattached to their stems. This amounts to saying that the affix is unable to attach to the stem In this approach to MPARSE, the Null Parse does violate other constraints. This assumption makes it harder (in comparison with P&S's approach) for MPARSE to be the constraint causing ungrammaticality in other cases, as the Null Parse may be ruled out by higher-ranked constraints. As we will see, the problem with MPARSE is that it fails to rule out some ungrammatical candidates. Since Raffelsiefen's use of MPARSE is weaker than P&S's it can only do worse with regard to these problems, not better. Accordingly, we assume P&S's approach in the rest of this paper.

4. Challenges to MPARSE

Ranking a constraint C above MPARSE means that C can never be violated in any grammatical output in the language. The Null Parse will win over any candidate that violates C, as the Null Parse violates only MPARSE, which is ranked lower than C.

In this section, we show that there are cases of ungrammaticality in which the ungrammatical candidate could be repaired by violating a constraint independently known to be violable in other (grammatical) output forms in the language. If constraint C is violable, it has to be ranked below MPARSE. In that case, MPARSE cannot force ungrammaticality since violation of MPARSE (by the Null Parse) is more serious than violation of C (by another candidate). The Null Parse therefore cannot be the winning candidate.

4.1 Turkish

Our first challenge to MPARSE comes from Turkish, where subminimal forms are not repaired by epenthesis, even though epenthesis is found elsewhere in the language.

4.1.1 Minimal size condition

As Itô and Hankamer (1989) and Inkelas and Orgun (1995) observe, some speakers of Turkish impose a disyllabic minimal size constraint on suffixed forms.

(7)	Root	Suffixed form (σσ min)		
	sol^{y}	‘note G’	sol^{y}-üm	‘my G’
	do:	‘note C’	*do:-m	‘my C’

Ungrammatical monosyllabic forms are not augmented by epenthesis, as shown in (8), where epenthetic segments are enclosed in boxes:

(8) Repair by epenthesis is not possible

a) *do:[yu]m

b) *do:[u]m

c) *[i]do:m

d) *do:m[u]

The failure of epenthesis to augment subminimal forms implies that constraints barring epenthesis must outrank MPARSE, allowing the Null Parse to win. The relevant grammatical constraints are DEPRT, which disallows epenthesis of segments, and LEX≈PR and FTBIN, which together require each form to contain a disyllabic foot.

(9) DEPRT Do not insert segments (McCarthy and Prince 1995)
LEX≈PR, FTBIN Every word must contain a disyllabic foot (Prince and Smolensky 1993)

Since violating these constraints in order to create a grammatical output form is not possible, they must all outrank MPARSE (10):

(10) DEPRT, LEX≈PR, FTBIN » MPARSE

The tableau in (11) shows how this ranking accounts for the failure of subminimal forms to be repaired by epenthesis—all epenthetic candidates violate a constraint ranked above MPARSE, as does the subminimal candidate. The Null Parse therefore emerges as the winning candidate:

(11) Tableau for input /do: - m/

/do:-m/	DEPRT	LEX≈PR, FTBIN	MPARSE
do:m		*!	
do:yum			
do:um			
ido:m	*!*		
do:mu	*!		
☞ Null Parse			*

While this analysis accounts for the current set of data, it suffers from a crucial flaw: the ranking of DEPRT above MPARSE implies that epenthesis is never possible. However, epenthesis is in fact allowed to avoid vowel hiatus or illicit coda clusters in suffixed forms:

(12) /araba + a/ → araba[y]a ‘car-dative’
/it + m/ → it[i]m ‘my dog’

If MPARSE were to allow epenthesis, it must outrank DEPRT. This ranking is shown in (13), where the candidate with epenthesis is the winner.

(13) Tableau for input /it - m/ ⇒ different ranking required

/it-m/	MPARSE	DEPRT	LEX≈PR, FTBIN
☞ itim		*	
Null Parse	*!		

This results in a ranking paradox. The analysis in (13) requires that MPARSE outrank DEPRT, whereas (11) requires that DEPRT outrank MPARSE. An MPARSE account must either overgenerate, allowing subminimal forms to be augmented by epenthesis, or undergenerate, disallowing epenthesis into clusters.

In the following section, we propose a solution to this dilemma.

4.1.2 Solution: CONTROL

Even when there is no grammatical output, speakers often have judgments about what the output would have been if a grammatical output were possible. Our proposal takes these intuitions as a starting point in developing an empirically superior alternative to MPARSE. Specifically, we propose that the ranked constraint component EVAL always produces a winning candidate, an optimal form with respect to the given constraint ranking. In order to deal with ungrammaticality, we introduce a new inviolable constraint component, CONTROL. Winning candidates from EVAL must satisfy all constraints in CONTROL in order to be accepted as grammatical output forms.[5] This proposal is based on the important but not immediately obvious observation that natural language grammars contain two different types of inviolable constraints. The first type of these is more commonly discussed in OT—constraints that force violation of lower-ranked constraints but are never violated themselves.[6] The second kind, which has not received as much attention in the literature, causes ungrammaticality but never repair. Placing both types of constraints in EVAL leads to ranking paradoxes, as in Turkish. Placing the second (ungrammaticality-causing) type of inviolable constraint into the new component CONTROL avoids these paradoxes. In order to be grammatical, an output must satisfy two conditions: (1) it must be the optimal candidate chosen by EVAL; and (2) it must satisfy all constraints in CONTROL.

(14) Conditions required for grammatical output: The output must
i) be the optimal candidate chosen by EVAL;
ii) satisfy all constraints in CONTROL

[5] CONTROL superficially resembles Halle's (1973) notion of the Filter in that a portion of the grammar is allowed to overgenerate and ungrammatical forms are filtered out, but the formal mechanism is quite different. CONTROL is more restricted in its use, and, unlike Halle's Filter, cannot alter the phonological, morphosyntactic or semantic properties of its inputs.

[6] The Turkish constraint causing epenthesis in (12) is an example of an inviolable constraint that always triggers repair.

The resolution to the Turkish problem is in (15). Since the minimality conditions on derived surface forms in Turkish never force augmentation of a subminimal form, or any other kind of repair, minimality constraints belong in CONTROL, not EVAL. In (15) the winning candidate of EVAL is *do:m*, which violates neither of the constraints in EVAL. However, when this winning candidate is submitted to evaluation in CONTROL, it fails to satisfy the minimality conditions and is therefore ungrammatical, as indicated by the ✂ symbol.

(15) Input /do:-m/

EVAL /do:-m/	*VV	DEPRT
☞ do:m		
do:um	*!	*
do:yum		*!*

CONTROL	LEX≈PR, FTBIN
✂	*!

The winning candidate from EVAL is submitted to CONTROL strictly for grammaticality judgments. Unlike EVAL, CONTROL evaluates a single form, and therefore does not choose between candidates; it can only declare the single winning candidate from EVAL grammatical or ungrammatical. Therefore, no repair is possible to satisfy constraints in CONTROL. If the winning candidate from EVAL violates a constraint in CONTROL, ungrammaticality results.

The MPARSE account was confounded by the fact that epenthesis is possible elsewhere in Turkish even though it is not used to augment subminimal forms. Our solution is not subject to this difficulty. By ranking CODACOND above DEPRT in EVAL, for example, we can account for the fact that epenthesis is used in order to avoid illicit coda clusters (16):

(16) Input /it + m/

EVAL /it + m/	CODACOND	DEPRT
☞ itim		*
itimi		*!*

CONTROL	LEX≈PR, FTBIN
✓ itim	*!

This example illustrates the important difference between two types of inviolable constraints that our proposal seeks to capture. CODACOND is never violated in Turkish. It is always obeyed, even at the expense of violating lower-ranking faithfulness constraints in EVAL. The prosodic minimality condition is also never violated, but forms that violate it are judged ungrammatical and never repaired. We account for this by placing the minimal size constraints in Control rather than Eval. CodaCond, on the other hand, must be in Eval, since it demonstrably interacts with other constraints in Eval.

4.1.3 Constraining Gen: a failed attempt to save MParse

Inviolable constraints have sometimes been suggested to be a part of Gen (for example, McCarthy and Prince 1995 propose placing their "m-scope p-scope concordance" condition in Gen). These proposals have usually been intended to capture cross-linguistic universals, but it is also worth considering whether appropriately constraining Gen might resolve the Turkish ranking paradox without requiring the use of Control. Suppose Gen were prohibited from creating derived output candidates of less than two syllables. While this move successfully removes the subminimal candidates, it incorrectly predicts that the epenthetic candidate in (20) will win over the Null Parse. MParse must still outrank DepRt since epenthesis is allowed in order to prevent CodaCond violations. Consequently, the candidate that violates only DepRt is preferred over the Null Parse.[7]

(17) Tableau for input /do: - m/

/do:-m/	MParse	DepRt
💣 do:um		*
Null Parse	*!	

Constraining Gen, therefore, cannot be the right approach.

4.1.4 Another failed attempt to save Gen: constraint conjunction

In this section, we consider another possible, but equally flawed, attempt to save MParse. This new method consists of using constraint conjunction, a mechanism proposed to deal with other phenomena by Smolensky (1995) and further developed in Itô and Mester (1996).[8]

The main idea in constraint conjunction is the following: when two constraints, C and D, are conjoined, the new conjoined constraint [C|D] is violated only when C and D are *both* violated. By ranking [C|D] above C and D, we can derive *gang effects*, where violation of either C or D is allowed, but violation of both is not possible. Constraint conjunction might help with the MParse ranking paradox by allowing C and D to be ranked below MParse while ranking [C|D]

[7] We cannot constrain Gen to prevent it from performing epenthesis, which, as we have already seen, is possible in Turkish.

[8] Thanks to Junko Itô, who suggested we evaluate whether constraint conjunction is a viable alternative to Control.

above MPARSE. In the Turkish case, for example, DEPRT could be ranked below MPARSE, as required by grammatical outputs containing epenthesis. If the conjunction of DEPRT with other constraints is ranked above MPARSE, we potentially could rule out ungrammatical *do:u̲m* without ruling out grammatical *iti̲m*.

We start by reconsidering Turkish minimality with an eye towards which constraints may be conjoined in order to salvage the MPARSE account. To this end, we repeat the ungrammatical epenthetic candidates here (the subminimal form **do:-m* is not considered, since ruling that form out poses no challenge to MPARSE or CONTROL):

(18) Repair by epenthesis is not possible

a) *do:[yu]m

b) *do:[u]m

c) *[i]do:m

d) *do:m[u]

Of these candidates, we may rule out (c) and (d) by observing that initial and final epenthesis are never found in Turkish morphophonemic epenthesis[9]. Alignment constraints ranked above MPARSE could presumably account for this. The remaining two candidates both violate two constraints: **do:yum* has both vowel and consonant epenthesis, and **do:um* has vowel epenthesis and vowel hiatus.

Let us first examine **do:yum*, with vowel and consonant epenthesis. We might try to rule out this form by using separate DEP constraints for vowels and consonants. Individually, these constraints are both ranked below MPARSE. Their conjunction, which is violated when both vowel and consonant epenthesis are found, is ranked above MPARSE. The tableaus in (19) show how this accounts for epenthesis into clusters and failure of epenthesis to save subminimal forms:

(19)

	/it-m/	MPARSE	CODACOND	DEP-V	DEP-C
	itm		*!		
☞	itim			*	
	Null Parse	*!			

[9] Some borrowings have adopted initial epenthesis: *istim* ‘steam’, *uskur* ‘screw’.

/araba-a/	MPARSE	*V.V	DEP-V	DEP-C
araba.a		*!		
☞ arabaya				*
Null Parse	*!			

/do:-m/	FT-BIN	LEX≈PR	[DEP-V | DEP-C]	MPARSE
do:m	*!			
do:yum			*!	
☞ Null Parse				*

As we have seen, an MPARSE account with constraint conjunction can successfully rule out a candidate that has both vowel and consonant epenthesis. Epenthesis into clusters involves a single consonant or a single vowel, but never both. We have taken advantage of this fact in formulating an account based on constraint conjunction. Our constraint ranking allows candidates with vowel and consonant epenthesis, but not both.

We now turn to a more serious challenge, namely the fact that a single vowel epenthesis into the subminimal input [do:-m] would have been enough to bring the total size to two syllables. The relevant candidate is **do:um*, with vowel epenthesis and vowel hiatus. The obvious way to proceed for an MPARSE account is to conjoin DEP-V and *V.V, and rank the conjoined constraint above MPARSE. Note that *V.V itself has to be ranked below MPARSE, since vowel hiatus is allowed in forms such as *sa.at* 'hour' and *du.a:* 'prayer'. This ranking accounts for the data seen so far, as shown in the tableau in (20), where the minimality-enforcing constraints LEX≈PR and FTBIN have been abbreviated to MIN:[10]

(20)

/saat/	MIN	[*V.V|DEP-V]	MPARSE	MAX-V	*V.V	DEP-V
☞ sa.at					*	
sat				*!		
Null			*!			

/do:-m/	MIN	[*V.V|DEP-V]	MPARSE	MAX-V	*V.V	DEP-V
do:m	*!					
do:um		*!			*	*
☞ Null			*			

[10] We assume that some kind of contiguity constraint prevents glide epenthesis to break vowel hiatus in these forms.

/it-m/	MIN	[*V.V|DEP-V]	MPARSE	MAX-V	*V.V	DEP-V
☞ itim					*	
Null			*!			

The forms *sa.at* and **do:um* both violate *V.V. However, **do:um* also crucially violates DEP-V. This violation alone is not fatal, however, as *itim*, which also violates DEP-V, is grammatical. Of these three forms, **do:um* is the only one that violates *both* *V.V and DEP-V. None of the grammatical forms violates this precise combination of constraints. The constraint conjunction account is based on this observation. The conjoined constraint [*V.V|DEP-V] is violated just in case its component constraints are both violated. In general, a constraint conjunction solution to MPARSE paradoxes will be possible in the event there is a unique combination of constraints that ungrammatical forms violate, but no grammatical form violates. This combination of constraints can then be conjoined into one constraint and ranked above MPARSE.

This solution to MPARSE paradoxes will not work if some grammatical form also violates the same constraints. However, there *are* grammatical forms in Turkish that violate both *V.V and DEP-V. These forms arise out of the opaque interaction between vowel epenthesis into coda clusters (which we have already seen in forms like *itim*) and intervocalic velar deletion. Some examples of velar deletion (Sezer 1981, Zimmer and Abbott 1978, Inkelas and Orgun 1995) are shown in (21):

(21)	yatak	'bed'	yata-a	'bed-dat'
	salak	'stupid'	sala-ɨm	'stupid-1sg'

The interaction between vowel epenthesis and velar deletion is opaque, of the type that would be characterized as counterbleeding in theories that use rule ordering. Examples illustrating this interaction are in (22):

(22)	/yatak-m/ → yata.ɨm	'bed-1sg.poss'
	/bilek-n/ → bile.in	'wrist-2sg.poss'

In these forms, epenthesis has applied even though its environment is not met in the surface representation. In a rule ordering account of this phenomenon, epenthesis would be ordered before velar deletion (23):

(23) UR bilekn
∅ → V / C__C# bilekin[11]
k → ∅ / V__V bilein
Surface bilein

(23) UR		bilekn
	∅ → V / C__C#	bilekin[11]
	k → ∅ / V__V	bilein
	Surface	bilein

Opaque rule interactions of this sort pose a challenge to Optimality Theory, which, in its purest form, claims that surface forms result from the interaction between faithfulness and wellformedness constraints. In the velar deletion example, we have what appears to be a gratuitous faithfulness violation. Solutions to this kind of problem have been proposed by McCarthy (1995) and by Sprouse (1997), who develops an analysis of Turkish velar deletion. The mechanism is quite involved, however, and we therefore refer the reader to Sprouse 1997.

For our purposes, it suffices to compare the constraints violated by the winning candidate *bilein* (input /bilek-n/ 'wrist-2sg.poss') with those violated by the ungrammatical form **do:un* (input /do:-n/ 'C-2sg.poss'):

(24)	Form	*bilein*	**do:um*
	DEP-V	*	*
	*V.V	*	*
	MAX-C	*	✓

Notice that the ungrammatical form **do:um* violates a subset of the constraints that the grammatical form *bilein* violates. This in itself is not a problem for OT, since candidate outputs only need to fare better with respect to other candidates for the same input. However, this situation does pose a fatal challenge to the MPARSE-constraint conjunction approach: for this approach to work, there must be a combination of constraints that only ungrammatical forms violate. In this case, such a combination of constraints does not exist.

We conclude that constraint conjunction is not a viable alternative to CONTROL.

4.1.5 CONTROL and the spirit of Optimality Theory

We have argued for a revision of the basic model assumed in Optimality Theory. In the original P&S model, there is one constraint component, EVAL, which evaluates an infinite set of candidate forms. The one candidate that fares best is the winner. Crucially, there is always a winner. If ungrammaticality is the desired result, a special candidate called the Null Parse must be the winning candidate.

In our model, being the best candidate with respect to EVAL is not sufficient. A candidate also needs to satisfy independent inviolable constraints in CONTROL. Otherwise, there is literally no output.

---

[11] For convenience, we ignore vowel harmony, which determines the quality of the epenthetic vowel. In addition, rule environments re simplified.

(25) Ungrammaticality in two versions of OT

	MPARSE model	CONTROL model
Grammatical output	input→ [EVAL] →output	input→ [[EVAL] → [CONTROL]] →output
No grammatical output	input→ [EVAL] → Null Parse	input→ [[EVAL] → [CONTROL]] → no output

The CONTROL model of ungrammaticality is more direct than the MPARSE model: we do not assume an ad-hoc, abstract entity, the Null Parse. Rather, we propose a direct model where the nonexistence of a grammatical output is modeled directly by the nonexistence of *any* output.

As any proposal for a broad architectural revision, our proposal must be approached with caution. In particular, we must ask ourselves whether this move is within the spirit of OT, or whether it amounts to a complete reworking of the OT model.

Before addressing this question, let us point out that whether or not our proposal amounts to a major change in the OT model, we submit that it must be accepted, since we amply demonstrate the empirical need for it in this paper.

We claim that our proposal, in addition to being empirically necessary, is in fact more in line with our understanding of the spirit of OT than MPARSE. Consider first a "pure OT" system, in which all constraints are ranked and violable in principle. In such a system, the only constraints that will be inviolable in practice are those that outrank all potentially conflicting constraints. Constraint ranking is never vacuous, except in cases of non-interaction.

Now consider a system that includes MPARSE. In such a system, the grammatical constraints are conceptually divided into two classes: those ranked above MPARSE, and those ranked below. The constraints above MPARSE are inviolable in principle, since the Null Parse is better than any candidate that violates one of those constraints. The constraints below MPARSE, on the other hand, behave exactly like the constraints of a pure OT system. They are all violable in principle.

(26) inviolable constraints » MPARSE » violable constraints

Thus, using MPARSE is nothing but a stipulation that a number of grammatical constraints are inviolable. Notice that it does not make any sense to talk about the relative ranking of the inviolable constraints. Thus, using MPARSE results in a hybrid system, with unranked, inviolable constraints as well as ranked, violable constraints pooled together in EVAL.

Let us now turn to a CONTROL model. In such a model, we also stipulate, just like in an MPARSE model, that a number of grammatical constraints are inviolable in principle. Those constraints are assigned to CONTROL. EVAL in this model is a pure OT system: constraints are totally ranked, and inviolability can only result from domination of all competing constraints.

Thus, a CONTROL model makes no stipulation that the MPARSE model does not make. It has the advantage of conceptual clarity over MPARSE. In the CONTROL model, those constraints that are inviolable in principle are not placed into the ranked-and-violable constraint component EVAL.

As we have demonstrated in earlier sections, conceptual clarity is not the only advantage of CONTROL. By putting all constraints in one component, the MPARSE model gives rise to the unwanted result that all inviolable constraints can interact with violable constraints. In the CONTROL model, constraints in CONTROL cannot cause repair; they can only cause ungrammaticality, as desired.

We conclude that our approach is superior to MPARSE in conceptual as well as empirical terms. The main conceptual advantage is that it makes a clear distinction between the inviolable constraints in CONTROL and the violable (subject to domination) ones in EVAL, a distinction that the MPARSE approach implicitly, albeit unsuccessfully, utilizes.

4.2 Tagalog -*um*- infixation

Infixation of the verbal marker -*um*- poses another challenge to an MPARSE analysis. Following M&P's (1993) analysis of Tagalog infixation, we assume that -*um*- aligns to the left edge of the word, but it infixes into consonant-initial roots in order to yield superior syllable structure (i.e., to avoid codas). In (27) -*um*- prefixes to a vowel-initial stem and infixes when the stem begins with a consonant or consonant cluster.

(27)	abot	um-abot	'to reach for'
	sulat	s-um-ulat	'to write'
	gradwet	gr-um-adwet	'to graduate' (French 1988)

(28)	ALIGN(L,*um*)	The morpheme -*um*- is located at the left edge; is a prefix. (This is EDGEMOST in M&P and P&S)
(29)	NOCODA	Syllables are open.

Although our analysis of -*um*- infixation is in the same spirit as M&P's, we will amend it slightly to deal with additional facts that we have elicited from our Tagalog consultants. For some speakers, NOCODA cannot be the constraint that drives infixation, as in M&P (1993).[12] For these speakers, infixation of -*um*- into CC-initial stems does not necessarily yield the smallest possible number of NoCoda violations. Instead, -*um*- infixation improves syllable structure by avoiding onsetless syllables whenever possible. Thus, -*um*- may be infixed after the first consonant in a CC-initial stem (30):

(30)	gradwet	grumadwet ~ gumradwet	'to graduate'
	plantsa	plumantsa ~ pumlantsa	'to iron'
	preno	pumreno ~ prumeno	'to brake'

Following Anttila 1995, we assume that variation results from crucial non-ranking of constraints with respect to one another. In Tagalog, we claim that NoCoda and Align are not crucially ranked with respect to each other. In (31), -*um*- is added to the CC-initial stem *plantsa*. If NoCoda is favored over Align, *plumantsa* emerges as the winner. If Align is favored over NoCoda, however, Onset forces infixation by only one segment, and *pumlantsa* is the winner.

(31) Onset » NoCoda, Align ⇒ variable infixation

	/um + plantsa/	Onset	NoCoda	Align
☞	pumlantsa		**	p
☞	plumantsa		*	pl
	umplantsa	*!	**	

In any analysis using MParse, MParse must outrank Onset, Align, and NoCoda, as affixation of -*um*- results in grammatical forms violating all three of these constraints.

(32) MParse » Onset, Align, NoCoda ⇒ prefixation

	um + abot	MParse	Onset	NoCoda	Align
☞	umabot		*	*	
	Null Parse	*!			
	abumot		*	*	u!l

Having established that MParse outranks Align, we will now present cases of ungrammaticality that could have been prevented by additional alignment violations. These cases show that MParse is not a viable option for dealing with ungrammaticality in Tagalog infixation: Align is known to be violable (even multiply violable, as in ***gr***-*um-adwet*) in Tagalog. Given that, it must be ranked below MParse. As such, Align cannot cause ungrammaticality. The relevant

[12] Avery and Lamontagne 1995 also discuss variable infixation in Tagalog and conclude that Onset rather than NoCoda is the constraint that motivates infixation.

restriction is that -*um*- cannot attach to *w*- or *m*-initial stems, a fact that we attribute to an OCP-related constraint. OCP violations are not avoided by violating ALIGN as would be expected in an MPARSE analysis since MPARSE must outrank ALIGN; instead, they result in ungrammaticality. The fact that ALIGN is not violated to avoid ungrammaticality implies that it must outrank MPARSE. We therefore encounter a ranking paradox.

Three pieces of evidence illustrate the ungrammaticality of -*um*- with *m*- and *w*-initial stems:

1. Distribution:

   -*um*- never occurs with native words beginning with /m/ or /w/: "It may be noted that -*um*- does not occur with bases beginning with /m/ or /w/." (Schachter and Otanes 1972; p292)

2. Variable infixation of -*um*- is not possible with /Cw/-initial native stems:

gwapo	gumwapo ~ *gwumapo	'become handsome'
sweti	sumweti ~ *swumeti	'become sweaty'

3. *m*-initial loans cannot take -*um*-:[13]

foggy →	fumafagi na	'it's foggy now'
cloudy →	kumaklawdi na	'it's cloudy now'
misty →	*mumimisti na	'it's misty now'

In the next section, we show that MPARSE cannot deal with these data.

4.2.1 Failure of MPARSE

The OCP violations in Tagalog could in principle be avoided by hyper-infixation of -*um*- into the stem, but this never occurs, a fact that could not be captured with an MPARSE analysis.

(33) OCP-*um* **m-um, *w-um*

This OCP constraint must outrank MPARSE in order to cause ungrammaticality. This ranking alone is not sufficient to derive ungrammaticality, however. In order for MPARSE to cause ungrammaticality, it must be outranked by at least two constraints that potentially conflict with each other. When satisfying one of those constraints that outrank MPARSE entails violating another, the Null Parse will emerge as the winner. In Tagalog, it is obvious that the relevant constraint that conflicts with OCP is ALIGN, for violating ALIGN would have been a way to

[13] These examples involve reduplication in addition to infixation. *tawag* 'call' → *tumatawag* is a grammatical output of this particular morphological construction.

satisfy OCP. Accounting for ungrammaticality therefore requires ranking both OCP and ALIGN above MPARSE. Yet, MPARSE must outrank ALIGN since alignment violations *are* tolerated in *-um-* infixation. This ranking incorrectly predicts that further alignment violations should be allowed in order to prevent OCP violations (34):

(34) MPARSE cannot rule out ungrammatical candidate with hyper-infixation

	um + RED + misti	OCP	MPARSE	ONSET	NOCODA	ALIGN
	mumimisti	*!			*	m
	ummimisti			*!	**	
💣	mimistumi				*	mimist
	Null Parse		*!			

We have seen that an MPARSE analysis of Tagalog *-um-*infixation encounters a fatal ranking paradox. In the following section, we illustrate that a principled solution using CONTROL is readily available.

4.2.2 Solution using CONTROL

Since OCP-*um* causes ungrammaticality rather than repair, it must be in CONTROL, not EVAL. The correct result is then obtained as shown in (35):

(35) The winning candidate from EVAL is ruled out by OCP-*um* in CONTROL

um + RED + misti		ONSET	NOCODA	ALIGN
☞	mumimisti		*	m
	ummimisti	*	**	
	mimistumi		*	mimist

CONTROL		OCP-*um*
✂	mumimisti	*!

Our CONTROL account succeeds where MPARSE failed, thanks to its proper separation of inviolable constraints that interact with the rest of the system to cause repair from those that do not interact with the grammar.

Notice also that Tagalog poses problems to a constraint conjunction account. One might try to conjoin alignment with itself to rule out multiple violations (hyperinfixation). However, in *gr-um-adwet*, two segments (gr) violate alignment. Conjoining alignment with itself to rule out multiple violations is therefore not an option. One would need to resort to a triple conjunction: two alignment violations are allowed, but three or more are not. Such an approach not only goes against the basic assumption that natural language grammars do no counting, but it also misses the point entirely: the point is that hyperinfixation is not an option to resort to in Tagalog in the face of OCP problems. A counting (multiple conjunction) approach suggests that one could just as easily have a language in which infixation by up to 47 segments is allowed, but not by 48 or more segments. This clearly cannot be the right approach.

4.3 Tiene

Our next example comes from Tiene. In Tiene, deletion is required in order to avoid violating a constraint on stem shape that prohibits CVCVC stems with coronal consonants in the onsets of both the final and penultimate, which we refer to as STEMSHAPE. However, a constraint on stem size that rules out stems containing more than three syllable leads to ungrammaticality rather than repair by deletion.

Deletion triggered by STEMSHAPE is illustrated in (36). The data come from Ellington 1977. Our analysis closely follows that of Hyman (1996).

(36) Deletion:

mata	'go away'	maasa	'cause to go away'
bóta	'give birth'	bóosɛ	'deliver (child)'
kɔlɔ	'become tired'	kɔɔsɔ	'tire' (tr.)
pala	'arrive'	paasa	'cause to arrive'
pî̂ina	'be black'	pî̂isɛ	'blacken'
banya	'be judged'	baasa	'cause to be judged'

In these forms, the causative suffix (Proto Bantu *-ɪs) is added to stems whose last consonant is a coronal. STEMSHAPE violation is avoided by deleting the coronal stem consonant (see Hyman 1996 and Hyman and Inkelas 1997 for details).

Having established that deletion is allowed by the grammar of Tiene, we show that a constraint violation that could have been avoided by deleting a consonant instead leads to ungrammaticality. The construction of interest is definitive aspect formation.

For a disyllabic stem, reduplicating the last stem syllable (37) forms the definitive aspect:[14]

[14] The fact that STEMSHAPE is violated in these forms shows that it must be outranked by constraints on base-reduplicant identity. Since STEMSHAPE in turn outranks constraints against deletion, the situation is hopeless for MPARSE, which would need constraints barring deletion to be inviolable in order to cause ungrammaticality.

(37)	yɔbɔ	‘bathe’	yɔbɔbɔ	‘bathe thoroughly’
	mata	‘go away’	matata	‘go away once and for all’
	yaka	‘believe’	yakaka	‘believe once and for all’
	lɔŋɔ	‘load’	lɔŋɔŋɔ	‘load once and for all’

For stems containing more than two syllables, no morphologically expressed definitive form is possible. A periphrastic form must be used instead.[15]

(38)	kótoba	‘chase’	°kótobaba	°kóobaba
	vútekɛ	‘come back’	°vútekɛkɛ	°véekɛkɛ
	binema	‘sleep’	°binemama	°beemama
	panama	‘frighten’	°panamama	°paaamama

The constraint responsible for ungrammaticality is STEMSIZE, which restricts stems to a maximum size of three syllables.[16] The fact that deletion cannot salvage STEMSIZE violations implies that, in an MPARSE account, DEPRT outranks MPARSE. However, this incorrectly rules out deletion in the causative forms in (36). This is an irresolvable ranking paradox.

CONTROL circumvents this problem entirely: STEMSIZE is in CONTROL, as are all constraints that cause ungrammaticality rather than repair. Therefore, nothing motivates deletion in the definitive aspect forms in (38). The winning candidate from EVAL contains four syllables, and is ruled ungrammatical by the STEMSIZE constraint in CONTROL.

(39)	/mata + RED/	MAX	RED=σ
	☞ matata		
	maata	*!	

	/panama + RED/	MAX	RED=σ
	☞ panamama		
	paamama	*!	

[15] The periphrastic definitive aspect is formed by adding *nkó mɔ́to* to the conjugated verb in the neutral aspect (Ellington 1977:93)

[16] The three syllable maximum could be stated as Ft + σ to avoid counting. Alternatively, as Inkelas and Hyman suggest, a maximal size constraint of two syllables (one foot) could be imposed on the *core stem*, that is, the verb root plus all tense/aspect suffixes, excluding the final vowel morpheme.

	CONTROL		Stem Size
	✓	matata	
	✂	panamama	*!

Our Tiene analysis yields a significant insight into the failure of MPARSE. In a rule-based account, environments, targets, and repairs are bundled into a single package. This, one does not expect a rule to apply outside its intended environment. As pointed out by Prince and Smolensky and McCarthy and Prince, this packaging prevents rule-based accounts from capturing interesting generalizations, as there are cases within and across languages where a single target may be reached by various paths depending on the input form. Optimality Theory provides a more satisfactory approach by decoupling wellformedness targets from the operations that allow a language to reach them. The actual way in which the wellformedness targets are reached (or fail to be reached) emerges from the interaction of grammatical wellformedness and faithfulness constraints.

While this architecture gives rise to aesthetically pleasing accounts, it gives rise to an interesting potential problem: a given repair is sometimes available in a particular environment, but not in others. For example, in Tiene, a consonant may be deleted under pressure from the OCP, but not under pressure from the maximal size condition. In a rule-based account, this situation could be handled by building the OCP into the deletion rule's environment. In Optimality Theory, the process must be decoupled from the target. This makes it possible for the process to apply in unexpected environments.

Our approach using CONTROL allows us to once again decouple certain constraints from possible repair procedures. This is empirically required, since there are cases where repairs used to avoid violating some constraints are not resorted to when other constraints are violated, giving rise to ungrammaticality instead of repair. However, our approach is still more restrictive than a rule-based one, since we predict that an inviolable constraint that fails to interact with one grammatical constraint must in fact fail to interact with *any* grammatical constraint.

5. Conclusion

We have considered the treatment of ungrammaticality in OT and shown that MPARSE, Prince and Smolensky's proposal, is unable to account for the full range of data. We have proposed an alternative mechanism for ruling out ungrammatical forms. By assigning constraints that cause ungrammaticality to a separate constraint component (CONTROL), we ensure that those constraints will not cause repair, thereby avoiding the spurious prediction of ungrammatical outputs.

In the three languages we have discussed, Turkish, Tagalog, and Tiene, MPARSE fails to rule out some ungrammatical forms. In particular, it fails when the following conditions obtain:

- a constraint C_1 is independently known to be violable in some grammatical output forms;
- a different constraint C_2 is never violated;
- violation of C_2 can be avoided by violating C_1.

When these conditions hold, MPARSE predicts the existence of a grammatical output that violates C_1 and satisfies C_2. However, we have shown that there are cases in Turkish, Tagalog, and Tiene in which precisely these conditions obtain, yet there is no grammatical output.

MPARSE incorrectly predicts ungrammatical outputs because it fails to distinguish two types of inviolable constraints: those that cause ungrammaticality and those that cause repair. Our proposal offers a principled distinction between these two types of inviolable constraints. Those that cause ungrammaticality are in CONTROL. Those that cause repair or block alternations are in EVAL, and outrank all conflicting constraints.

The specific constraints that we have argued belong in CONTROL all refer to morphological information. Turkish does not augment subminimal forms, even though its grammar allows epenthesis to satisfy syllable structure constraints. The minimal size constraint applies only to morphologically derived forms. In Tagalog hyper-infixation is not used in order to prevent unwanted *m-um-* and *w-um-* sequences even though multiple alignment violations are allowed in regular infixation. The OCP constraint responsible for ungrammaticality refers specifically to the morpheme *–um-*. In Tiene, deletion is not possible to avoid violations of STEMSIZE, even though deletion *is* available to avoid violations of STEMSHAPE. The constraint in CONTROL, STEMSIZE, refers to a morphologically defined string, the verb stem. We leave for further research the question of what types of constraints can be in CONTROL.

References

Anttila, Arto. 1995. Deriving variation from grammar: a study of Finnish genitives. Manuscript, Stanford University. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-63.

Avery, Peter and Greg Lamontagne. 1995. Infixation <and metathesis> in Tagalog. Handout from the annual meeting of the Canadian Linguistic Association.

Ellington, John Ernest. 1977. *Aspects of the Tiene language.* Doctoral dissertation, University of Wisconsin-Madison.

Hyman, Larry. 1996. Prosodic constraints on morphology: the strange case of Tiene. Linguistics department colloquium, University of California, Berkeley.

Inkelas, Sharon and Larry Hyman. 1997. Emergent templates: the unusual case of Tiene. Presented at the Hopkins Optimality Theory workshop/Maryland

Mayfest. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-214.
Inkelas, Sharon and Cemil Orhan Orgun. 1995. Level ordering and economy in the lexical phonology of Turkish. *Language* **71**(4): 763-793.
Itô, Junko and Armin Mester. 1996. Rendaku I: constraint conjunction and the OCP. Handout, Kobe phonology forum. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-144.
Itô, Junko and Armin Mester. 1997. Sympathy theory and German truncations. In Viola Miglio and Bruce Morén (eds.), *Proceedings of the Hopkins Optimality workshop/Maryland Mayfest*. University of Maryland working papers in linguistics 5, 117-138. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-211.
Itô, Junko and Jorge Hankamer. 1989. Notes on monosyllabism in Turkish. In Junko Itô and Jeff Runner (eds.), *Phonology at Santa Cruz*. Santa Cruz: Linguistics research center, University of California. 61-69.
McCarthy, John. 1997. Sympathy and phonological opacity. Presented at the Hopkins Optimality Theory workshop/Maryland Mayfest.
McCarthy, John and Alan Prince. 1994. An overview of prosodic morphology, part 2: template satisfaction. Workshop on prosodic morphology, Utrecht University. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-59.
McCarthy, John and Alan Prince. 1995. Faithfulness and reduplicative identity. In Jill Beckman, Laura Walsh Dickey and Suzanne Urbanczyk (eds.), *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory*. Amherst, MA: Graduate Linguistic Student Association. 249-384. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-60.
Prince, Alan and Paul Smolensky. 1993. Optimality Theory: constraint interaction in generative grammar. Manuscript, Rutgers University and the University of Colorado at Boulder.
Raffelsiefen, Renate. 1996. Gaps in word formation. In Ursula Kleinhenz (ed.), *Interfaces in phonology*. Berlin: Akademie Verlag. 194-209.
Schachter, Paul and F. T. Otanes. 1972. *Tagalog reference grammar*. Berkeley: University of California Press.
Sezer, Engin. 1981. The k/0 alternation in Turkish. In George N. Clements (ed.), *Harvard studies in phonology*. Bloomington: Indiana University Linguistics Club.
Smolensky, Paul. 1995. On the internal structure of the constraint component CON of UG. Manuscript, Johns Hopkins University. Available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-86.
Sprouse, Ronald. 1997. A case for enriched inputs. Presented at the Trilateral phonology weekend, University of California, Santa Cruz. Available from

the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html) as ROA-193.

Zimmer, Karl and Barbara Abbott. 1978. The k/0 alternation in Turkish: some experimental evidence for its productivity. *Journal of Psycholinguistic Research* 7: 35-46.

Orhan Orgun: orgun@cogsci.berkeley.edu
Ronald Sprouse: ronald@uclink.berkeley.edu