

## Harmonic agreement

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**Claim:** I provide an argument for the use of weights à la Harmonic Grammar (HG) in morphosyntax. It is based on multidimensional scale effects in agreement where several prominence scales interact in determining (i) the agreement controller or (ii) the order of agreement affixes. I present one example for each (i) and (ii) in which the individual *scales are ranked*, i.e. scale  $S_1$  outranks scale(s)  $S_2$  ( $S_1 > S_2$ ) in case of conflicting preferences. I show that such interactions are unexpected under the standard separate probing account of scale effects in agreement. Furthermore, the data seem to require the reverse scale ranking ( $S_2 > S_1$ ) in certain contexts. An implementation of scale rankings in Optimality Theory (OT) leads to a ranking paradox; possible solutions require (a) stipulated exceptions for particular contexts (for (i)) or (b) local conjunction (for (ii)); neither of them derives the exceptions. I show that the exceptions fall out as cumulative (or “gang”) effects once the individual scales (and their members) are weighted according to their prominence, and scale interactions are modelled by adding the weights of individual scales. The agreement / ordering rules can refer to the harmony score resulting from the added weights; the rules are then very simple and exceptionless.

**Hierarchical agreement in Hayu** (Kiranti, Michailovsky 1974, 1981, 2003): A transitive verb in Hayu agrees with *one* of its arguments. The agreeing argument isn't determined by grammatical function but rather by the prominence scales for person and number in (1) and (2):

(1) person scale: 1 > 2 > 3

(2) number scale: plural > dual > singular

In general, agreement is with the argument that is more prominent on these scales. If both arguments have the same person value (e.g. in a 3pl ↔ 3du scenario, where ‘↔’ means that each can be the subject or the object), the number scale determines agreement, i.e. agreement is with the argument that is higher on the number scale (here: 3pl). If both arguments have the same number value (e.g. in scenario 2pl ↔ 3pl), the person scale determines the agreement controller (here: 2pl). If both scales pick out the same argument (e.g. in scenario 1pl ↔ 3sg), this argument agrees (here: 1pl). In *hierarchy-crossing* contexts (HC, Trommer 2006), where one argument is higher on the person scale and the other is higher on the number scale (e.g. in scenario 1du ↔ 3pl), agreement (in person & number) is with the argument that is more prominent on the person scale (here: 1du). Thus, the person scale outranks the number scale (*person > number*). However, there is an exception: in the HC scenario 2sg ↔ 3pl, agreement is with the 3pl argument, i.e. it seems that here the ranking is reversed to *number > person*.

**Challenges:** (i) It has been argued in the formal literature on hierarchical agreement that person and number probe separately (see Béjar 2003, Coon & Bale + references cited there); each probe targets the most prominent argument on the relevant scale. This predicts mixed agreement in HC contexts (the person value is taken from one and the number value from the other argument), but cannot derive scale interactions as in Hayu, where person and number values must come from the same argument (see also Coon & Bale 2014, Bhatia, Kusmer & Vostrikova 2016). (ii) That person outranks number in case of conflict can be handled in OT by ranking the scales PERSON ≫ NUMBER. However, the exception in 2sg ↔ 3pl scenarios requires the reverse ranking. This paradox can be solved by adding a high-ranked context-sensitive number scale constraint for this scenario (cf. Trommer 2006 for a proposal along these lines for Dumi), cf. (3). However, this merely restates the observation that 2sg ↔ 3pl scenarios are different.

(3) NUMBER<sub>[2sg↔3pl]</sub> ≫ PERSON ≫ NUMBER

**Analysis:** The entire agreement system of Hayu can be described in a simple way if we quantify how prominent an argument is on the person and on the number scale. This can be done by calculating its *harmony score*. To this end, we assign a numerical value (NV) to arguments that reflects the argument's prominence on each of the two scales: the more salient an

argument's person/number value on a scale, the higher its harmony score. The overall harmony score of an argument = its NV for the person scale + its NV for the number scale. The basic idea is that as in Harmonic Grammar, we give rewards to an argument for its location on the scales: the scales are ternary, so they have three levels; being on the top level (level 3 with the highest prominence) means the weight of the feature (person or number) is tripled; being of middle prominence (level 2 of the scale) means the weight is doubled and for the lowest prominence (level 1) the simple weight is counted. The scores for the values (boxed) are given in (4). Note that the simple weight for person  $\boxed{1.5}$  (multiplied by the level of the scale) is higher than the basic weight for number  $\boxed{1}$  (also multiplied by the level of the scale); this implements the observation that person is generally more important than number in case of conflicting requirements. The harmony scores for person-number-combinations are given in (4). The derived hierarchy (by descending harmony scores) is shown in (6).

(4) Numerical values for the person and number features according to their prominence:

scale	1	>	2	>	3	pl	>	du	>	sg
NV	4.5		3		1.5	3		2		1

(5) Overall harmony scores for person-number-combinations (NV person + NV number):

1pl =	7.5	(4.5 + 3)	2pl =	6	(3 + 3)	3pl =	4.5	(1.5 + 3)
1du =	6.5	(4.5 + 2)	2du =	5	(3 + 2)	3du =	3.5	(1.5 + 2)
1sg =	5.5	(4.5 + 1)	2sg =	4	(3 + 1)	3sg =	2.5	(1.5 + 1)

(6) Derived hierarchy: 1pl > 1du > 2pl > 1sg > 2du > 3pl > 2sg > 3du > 3sg

The agreement rule for Hayu can now be stated in simple terms: The verb agrees with the argument that has the highest harmony score. This correctly determines the agreement controller for all scenarios including the HC-contexts: we get 1du-agreement in a 1du ↔ 3pl scenario because 1du has a higher score (6.5:4.5). Even the “exceptional” 3pl-agreement in 2sg ↔ 3pl scenarios (encircled in (6)) is predicted because 3pl has a higher harmony score (4:4.5), no reversal of the person/number ranking or contextualized constraints are necessary.

**Prefix ordering in Haya** (Bantu, Duranti 1979). In Haya, a ditransitive verb agrees with both objects in person/number expressed by prefixes. Their order is determined by three scales:

(7) person scale: 1 > 2 > 3 (8) number scale: sg > pl (9) GF scale: G(oal) > P(atient)

In general, the prefix which is more prominent on the scales is closer to the verb stem. Duranti (1976) describes three interactions in HC-contexts. (i) person outranks GF and person outranks number in case of conflicting requirements; (ii) in case of equal person values, GF equals number (both prefix orders are possible); (iii) person = GF+number (both orders are possible if an argument has high person prominence but its coargument has a higher prominence on both the number and the GF-scale). Hence, GF and number team up to level up with person. Implementing these scale interactions in OT would require local conjunction of the constraints standing for the GF- and the number scale as in (10). However, local conjunction undermines the main assumption of OT, namely strict dominance between constraints (see Smolensky & Legendre 2006: ch.20). I show that weighting the scales as described above for Hayu can derive this gang effect: the weight (harmony score) of the person scale simply needs to be equal to the sum of the GF- and the number scale. The ordering rule is that the prefix expressing the feature combination with the highest harmony score is closest to the stem.

(10) NUMBER & GF, PERSON ≫ NUMBER, GF

**Conclusion:** (i) Ranked scales in agreement speak against separate probing of person and number. (ii) Stipulative mechanisms required in an OT implementation of ranked scales are unnecessary once a HG logic is applied: the prominence of the feature values is quantified/weighted; ‘exceptions’ in the data are just cumulative effects (known mainly from phonology).

**Selected references:** A. Duranti (1979): Object clitic pronouns in Bantu and the topicality hierarchy. *Studies in African Linguistics* 10.1. • Michailovsky, B. (1981): *Grammaire de la langue hayu*. PhD thesis, Univ. of California.