Adapting referring expressions to the task environment

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Abstract
In referring to objects people mention properties which help the listener to identify the intended referent. We show that selection of properties depends on the task environment and changes over time. While speakers use features of high utility consistently over time, they gradually abandon salient colour terms when their utility is artificially constrained. Speakers who have experienced the limited utility of colour terms as listeners use these terms least.

Background
• Generating referring expressions with Dale & Reiter’s incremental algorithm is psychologically plausible in principle: linear complexity and non-minimal expressions
• Algorithm selects referent features until referring expression is uniquely identifying
• However, it only tests features in a fixed preference order – the order does not change over time
• We look at:
  1. Influences of utility on the choice of features
  2. Audience design: Does Instruction Giver adjust to the listener’s problems?
  3. Specificity: Does this apply to all features?

Method
• Modified Map Task, a restricted-domain route-communication task
• Instruction Giver (IG) and Follower (IF) collaborate to reproduce on IF’s map a route preprinted on IG's map (neither sees the other’s map)
• 32 Memphis U dyads with 8 map pairs each; roles exchanged after map 4
• Map pairs differ with respect to homogeneity and orderliness (Fig. 1)
• Orderliness: ‘ink damage’ hides colours of some landmarks on IF’s map
  [i] Colour should be used more often for orderly maps
  [ii] Colour use should fall as problems accumulate
  [iii] If firsthand experience is important, original IF should use colours less than original IG
• Homogeneity of landmarks (just birds vs birds mixed with fish, aliens …)
  [iv] Consistently useful terms should appear at consistent rate
  [v] Colour should be used more often in homogeneous maps

Behavioural results
• 7995 introductory mentions of landmarks by IG (83%)
• 2055 colour terms used in introductions (1901 by IG)
• No effect of orderliness on colour terms [i]

Figure 1: Homogeneity (on Instruction Giver and Instruction Follower maps) and orderliness (only on Instruction Follower maps)

Figure 2: Use of colour terms decreases (1) after the first quartile (2) within dialogues [iii] (3) after speakers exchange roles [iii]. The use of useful features (1) rises within dialogues (2) does not change between dialogues [iv].

Figure 3: Useful features (other than colour) are used where they are relevant. Colour terms are used more in homogeneous maps [v].

Discussion
• Utility controls attribute mention over successive acts of reference (but reduction of colour terms not a general change: useful features are used more within dialogues)
• Experience as listener more effective than experience as describer
• Describers who are sensitive to lower utility of colour terms are insensitive to fine details of listener’s knowledge (orderliness of ink damage)
• Model of aggregate data
• Future research: comprehensive ACT-R model for (1) tracking individual dyads (2) accounting for changes between dialogues

Model
• Simple model using utility mechanism of ACT-R
• Two productions: use-colour and don’t-use-colour
• In task environment colour is useful in 40% of cases (useful feature in 92%)
• Reward if colour was used correctly
• Change of utility of production (and thereby likelihood of firing) over time
• Model of three cases: map 1 (Fig. 4), maps 2–4, maps 5–8

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