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Olga Kosheleva

*The University of Texas at El Paso*, [olgak@utep.edu](mailto:olgak@utep.edu)

Vladik Kreinovich

*The University of Texas at El Paso*, [vladik@utep.edu](mailto:vladik@utep.edu)

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# Yes- and No-Gestures Explained by Symmetry

Olga Kosheleva and Vladik Kreinovich  
University of Texas at El Paso  
500 W. University  
El Paso, TX 79968, USA  
olgak@utep.edu, vladik@utep.edu

## Abstract

In most cultures, “yes” is indicated by a vertical head movement (nod), while “no” is indicated by a left-right movement (shake). In this paper, we show that basic symmetries can explain this cultural phenomenon.

## 1 Formulation of the Problem

In most cultures, “yes” is indicated by a vertical head movement (nod), while “no” is indicated by a left-right movement (shake); see, e.g., [1]. There are a few exceptions to this rule: e.g., in Bulgaria, the gestures are swapped, but in most cultures, “yes” and “no” are described by similar gestures. Why?

## 2 Our Explanation: General Idea

One of the main purposes of communications is to coordinate efforts between different people. From this viewpoint, “yes” means agreement; it means, in general, that we can safely continue what we have agreed on or what has been proposed. In contrast, “no” means disagreement, it means a change in plans.

In view of this, it is more crucial not to miss the “no” gesture; indeed:

- if we miss the “yes” gesture, we will either continue our previous action (as intended), or continue waiting for an agreement, which is probably also OK in situations where we have already been waiting for such agreement for some time;
- however, if we miss the “no” gesture, we will erroneously continue the action that needs to be stopped – and consequences may be serious: e.g., a primitive person during the ancient hunt may fall into a pit or not notice a wild animal attacking him.

So, we expect that between two possible gestures, the most easily detectable one will correspond to “no”, while the less easily detectable one will correspond to “yes”.

To describe this idea in precise terms, we need to describe how to tell which of the two gestures is more easily detectable.

### 3 Enter Symmetries

How do we make predictions and observations in general? A general idea is what is called *physical induction*: to find out what will happen in a given situation, we recall what happened in similar situations in the past, and we predict that a similar thing will happen now; see, e.g., [2].

Informally, similarity between two situations means that we can match objects from different situations, so that most important properties remain the same. For example, if in the past, a tiger attacked a person, and how this person sees a similar predator – e.g., a lion – the person will match the tiger to the lion and expects the same behavior.

In mathematical terms, this description means that we have a transformation that preserves important properties, i.e., we have what mathematicians call a *symmetry* [2].

From this viewpoint, a gesture is more easily detectable in comparison with no-gesture if they have different symmetries – and a gesture is less easily detectable if it has the same symmetries as the no-gesture situation.

Let us compare the vertical and the left-right motions from this viewpoint.

### 4 Symmetries Explain “Yes”- and “No”- Gestures

When two people talk, they usually face each other; this provides the best ability to communicate, we can clearly see all the gestures. A human being seen face-to-face has a natural left-right symmetry.

In a vertical gesture, this symmetry is retained at every moment of time, while for the left-right gesture, this symmetry is clearly violated. Thus, the left-right gesture is easier to detect.

In view of the above, this explains why the left-right gesture corresponds to “no”, while the vertical gesture corresponds to “yes”.

### 5 A Similar Argument Explains Verbal “Yes”- and “No”-Expressions

A similar idea can explain why in many languages (including English) “yes” is described by an “aha”-type expression, with stress on the second syllable of the two-syllable expression, while “no” is described by a similar two-part expression in which the stress is on the first syllable.

Indeed, we have mentioned that “no” should be more easily detectable. A syllable under stress is easier to detect, so, after hearing the first syllable, it is easier to detect the expression in which this first syllable is under stress.

This explains why the expression starting with an emphasized sound corresponds to “no”.

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