Information Rooted in Properties of Natural Number

Karl Javorszky

Institut fuer angewandte Statistik, Loeblichgasse 13/16, 1090 Wien, Austria, karl.javorszky@gmail.com

We state: **Information = Expected whole–Observed part.** We refer to the instinctive faculty of humans, to create a mental picture of the whole, while actually seeing only a part of the whole. *Perception* shows that part *a* of the whole, which we observe, *cognition* creates a context, of a whole *c*, and of that part *b*, which is not there. Information has two variants: $a=c-b$, $b=c-a$. We conclude, based on a, $a \rightarrow (c,b)$, and we conclude, based on b, $b \rightarrow (c,a)$. The expectations do not match each other exactly. The proposition is, that there is a slack, deviation, tolerance which is the basic meaning of information. Information is the extent of being otherwise, the differences in $a \rightarrow (c_a,b_a)$, $b \rightarrow (c_b,a_b)$.

Tasks: (1) We have to show, that there exists an inbuilt slack in the numbering system, (2) we discuss tools to make the slack visible, allowing us to assign numeric values to the extent of information contained in a statement, (3) we suggest ways of categorizing, cataloguing and naming kinds of extents of numeric values, which describe deviations to the expected counterparts.

(1) Ordering and grouping are both pre-mathematical techniques of counting. By sequencing, we observe the diversity of the objects, contrasted against the background of the similarity of the places; by grouping, we observe the similarity of the objects against the background of their being diverse among each other. The similarity within the groups is the foreground, against the background of the groups being different and diverse against each other.

After a finite number of sentences about the members of any assembly of a limited size one will inevitably begin to repeat oneself. There are only so many different ways of creating groups within an assembly of *n* elements, if *n* is limited, and this will hold true also for the number of comparisons one can conduct on the same *n* elements. There is an upper limit to the number of logical relations possible on a collection of *n* elements, and this is of course $f(n)$. It is irrelevant, whether we state similarities against the background of diversities (by creating groups), or we state diversities against the background of similarity (by creating linear rankings): of a limited number of things, only a limited number of different sentences can be said.

In dependence of which of the backgrounds we use, we employ differing methods of counting. If we say “different visible on background similar”, we build sequences. If we say “similar visible on background different”, we build groups. It is well known, how one arrives at the maximal number of different sequences possible on *n* elements. The maximal number of different similarity inclusion relations possible on *n* elements is likewise dependent on *n* and is based on the number of partitions of *n*. Algorithm and figure in *www.oeis.org/A242615*.

Comparing the two upper limits, one finds a *Translation Key* between the number of objects*(n),*number of similarity-based sentences *(n!)* and number of diversity-based sentences *(n?).*

n!	**=**	**>**	**=**	**<**	**=**	**>**	**>>**	***n?***
for n	*1*	*12*	*32*	*66*	*97*	*136*	*140*	

(2) Our experimental objects are pairs of natural numbers $a,b;\ a,b \le d,\ a \le b,$ where *d* is the number of different *a,b.* These we order and reorder. There appear planes of which the axes are 2 sorting orders, and the objects have defined places on the plane, based on their two linear positions. We use *cycles* that appear as constituents of the procedure of reorder. Cycles definition: *www.oeis.org/A235647*. Cycles have at least two different properties: *run, carry.* Run is the length of the line connecting members of the corpus of a cycle during a reorder, carry is the summation of values *a,b* over the members of the cycle. The value *bd=carry/run* is descriptive of a cycle. **The simplest definition of information is: Inf Δ = *(carry_b – carry_a)/run.***

(3) In its elementary, dormant form, information is an entry in the property matrix of an element, reflecting the element's ability to take part in cycles during reorders. The whole of a cycle contains the information in the form of a summand. The reorder is in competition with other reorders, and which one shall prevail can well be determined by the information amount collected by the partaking cycles.

Cycles run concurrently. There is always 1 element of the cycle in the state [position, plane] *"now".* Which elements can be concurrently *now* depends on the reorders taking place. As the system undergoes periodic changes, the reorders, and with them the succession of concurrently appearing elements, become predictable. Information can be linked to the observation of specific elements appearing at specific places and times, as a differential diagnosis, that not reorder A but reorder B is currently taking place.

Reorders can run concurrently, as long as the constituent cycles do not raise incompatible demands on elements [e.g., to be at two different places at the same time]. If the demands are too much in contradiction, the system breaks down. The hypothesis is offered, that the electric bursts of the ganglia are each a sign of a local breakdown, and that Nature uses locality and frequency of planned and predictable breakdowns to enter feedback loops as signals, by this method steering processes.

References

Javorszky, K. :Natural Orders, De Ordinibus Naturalibus, ISBN 978-3-99057-139-2