Towards a General Theory of Scientific Communication

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Abstract

In this note, the authors examine optical induction in which visual information is discussed among participants. The authors suggest that an information theoretic model can be applied to this situation and provide an outline.

In optical induction [1], a set of experimental results which are visual in nature are being examined by three or more participants or scientists. As they examine the visual material, they make remarks to one another which help over iterations, to clarify the visual material for every participant. We suggest here that this optical induction phenomenon can be modeled as follows.

The examination of the visual material is an optical broadcast of information which every participant receives. The exchange of verbal messages is a multiple-access channel in which every participant partakes. Intermediate to these two stages is a two-way communication channel within each participant which carries optical (visual) information towards the verbal (speech) center and carries auditory (verbal) information towards higher visual cortex for processing.

If we model the situation in this manner, we note a parallel with the Berger-Levy model of a neuron as a multiple-access, partially degraded broadcast channel [2]. Their analysis of this reverse arrangement is relevant to the present situation. We say reverse because the optical induction system channel is the sequence: broadcast [3], two-way [4], multiple-access [5], with information flowing from left to right[1]. A detailed information theoretic analysis of this system could shed light on the capacity or maximum throughput of this day-to-day scientific communication setting in which visual evidence is examined, potentially leading to a general mathematical theory of scientific communication.

References

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[1] Note that there are as many two-way channels as participants.

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