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A MULTILEVEL MODEL OF INTERSTELLAR COMMUNICATION

Abstract

This paper presents a model of interstellar communication that separates transmission, formatting, logical and intent-based aspects. The model permits independent exploration of different levels of communication, while retaining a framework for the overall endeavor. It admits categorization of terrestrial interspecies communication as well as anthropological investigations in the same model. Finally, the model serves as a basis for challenge problems, which can be useful in furthering public involvement in SETI.

A communicated message includes decisions at each level in the model. In general, to understand any level, the lower levels must be understood. The levels:

1. Physical. The transmission medium. Examples: Optical or radio transmission or physical artifact.
2. Encoding. How the medium is used to transmit data. Examples: Time, frequency or amplitude modulation, differential signaling, polarization.
3. Data. The basic encoding of information. Examples: Analog signals or digital bits.
4. Data Format. The structure of the encoding of information. Examples: Byte size, resolution, rasterization, pagination.
5. Message Format. The meaning of the units of data. Examples: Pixel, character, word, number, image, acoustic amplitude or frequency.
6. Structure. The intended syntactic message. Examples: Image content, expressed audio waveform.
7. Symbol. The encoding of the transmitted semantic content. Examples: Analogous representation, scale model, measurement, symbolic language.
8. Concept. The sender's semantic intent in the message. Examples: Sender's location or physical appearance, greeting.

The separation of the levels of the model encourages enumeration of the alternatives at each level independent of others, potentially exposing bias in the selection of alternatives due to human-centrism. The model also encompasses other forms of inter-species and cross-cultural communication, so songs of humpback whales as well as ancient written artifacts can be modeled in the same framework used for SETI. The paper includes example mapping of some well-known SETI messages into the model.

Another application of the model is in the construction of challenge problems to be used for experimentation in message decoding and to involve the public in SETI by offering challenge problems as puzzles. Sample challenge problems are included in the paper.

Although many researchers have examined different levels of this model, none has articulated the model itself.

This original work has not been published or presented publicly, though the concept has been circulated privately to a small group for critique. If accepted for presentation, the author has funding to attend IAC and present the material.