THE DISC QUOTIENT:
A Post Detection Strategy

Dr John R Elliott
Creative Technology Research Group
Leeds Metropolitan University
Leeds, LS6 3QS, England, UK
J.Elliott@leedsmet.ac.uk

Dr Stephen Baxter
c/o Ralph Vicinanza,
303 W 18th St, New York,
NY 1001, USA;
sbaxter100@aol.com

ABSTRACT

D.I.S.C: Decipherment Impact of a Signal's Content.

The authors present a numerical method to characterise the significance of the receipt of a complex and potentially decipherable signal from extraterrestrial intelligence (ETI). This approach is modelled on the 'Rio Scale' (Almar, 2001), for characterising the discovery of an ETI, and the 'Torino Scale' (Binzel, 2000), for characterising asteroid impacts. The purpose of the scale is to facilitate the public communication of work on any such claimed signal as such work proceeds, and to assist in its discussion and interpretation.

Building on a 'position' paper rationale (Elliott, 2008), this paper looks at the DISC quotient proposed and develops the algorithmic steps and comprising measures that form this post detection strategy for information dissemination, based on prior work on message detection, decipherment. As argued, we require a robust and incremental strategy, to disseminate timely, accurate and meaningful information, to the scientific community and the general public, in the event we receive an 'alien' signal that displays decipherable information. This post-detection strategy is to serve as a stepwise algorithm for a logical approach to information extraction and a vehicle for sequential information dissemination, to manage societal impact.

In developing a strategy for message detection and decipherment, comparators from existing protocols for 'catastrophic' and globally significant events that have high societal impact are presented as supporting rationales. Nevertheless, a post detection scenario has very particular challenges that form its core metrics, dictating logical stages and subsequent information flow, which are significantly affected by the unknown aspects of its structure and content. To assist our capabilities in tackling such a complex task, prior research conducted on identifying structural 'universals' and decipherment strategies (Elliott, 2000; 2002; 2007), based on aspects of these computational phenomena identifiable in the constructs of language, provide essential insights into the difficulty factors each phase is likely to present.

The 'DISC Quotient', which is based on signal analysis processing stages, includes factors based on the signal's data quantity, structure, affinity to known human languages, and likely decipherment times. Comparisons with human and other phenomena are included as a guide to assessing likely societal impact.

The DISC quotient is (preliminarily) defined as follows:

$$DISC = (\delta + \omega + \alpha) * \lambda * \tau$$

with the parameters defined as follows.

λ is a difficulty weighting associated with a particular linguistic hierarchical level.

τ is an decipherment time delay /cost function.

α is a measure of affinity to known (human) languages. The key question answered is: how likely is it that this message can be translated? The more likely it is, the greater the cultural impact the message is likely to have. The measure therefore takes values from 0 to 10, with lower values indicating low affinity; 0 means the message is very unlikely to be translated, while a theoretical 10 means very like human language (with human sources previously excluded).

δ is a measure of data quantity: 'how big is the message?' This is assigned a value from 0 to 10 depending on the non-repeating length of the signal measured in bits (order of magnitude), as defined in the table, with comparative human and other data sets. The aim is to assess a message's likely impact due to its sheer size. One comparison is with the sum total of human knowledge, as represented by the data content of the Library of Congress. Of course a comparatively short work may have a disproportionate impact; the Koran is the length of a single short novel.

ω is a measure of data quality. This can be measured using Shannon entropy orders. Any given signal can be broken down into a distribution of entropic values, with human languages reaching a typical maximum order of 9. These maximum values for different species correlate closely with encephalisation quotients.

The measures in the DISC Quotient are not independent. It is impossible to compress complex quality into a small message size. It is estimated that a signal of complexity equivalent to human speech (max Shannon order 9) would require 20,000 words (~10exp6 bits) to enable a full analysis.

In conclusion, it is submitted that the development, refinement and implementation of DISC as an integral strategy, during the complex processes involved in post detection and decipherment, is essential if we wish to minimize disruption and optimize dissemination.

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