Exam page 2

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Statistical Information Theory 277

Information is related to uncertainty, namely, it is possible to interpret information entropy (quantity of information) as the measure of eliminated uncertainty. Thus, it would be natural to use possibility measures instead of probability defining possibilistic entropy. As a generalization of the Hartley measure of information (3.2.2), Higashi and Klir (1983) introduced the U-uncertainty measure of information

$$U(r) = \int_0^1 (r_i - r_{i+1}) \log_2 I \tag{3.2.9}$$

Here a possibility distribution r is expressed in the form of a normalized fuzzy set A and $|A_\alpha|$ is the cardinality of the α–cut of the fuzzy set A.

$$U(r) = \sum_{i=1}^{n} (r_i - r_{i+1}) \log_2 i \tag{3.2.10}$$

Patni and Jain (1977) introduced and studied a non-additive measures of information associated with a pair of finite probability distributions defined on sets with the same number of elements.

Lerner (1999; 2003) constructed a very different generalization of the Shannon's approach to information measurement. One of the main ideas of his approach is to use the entropy functional called *information path integral* as an integral measure of information processes instead of the Shannon's entropy.

To conclude, it is necessary to comment that the Hartley-Shannon direction has become very popular and dominates the field of information studies to such an extent that many people are not aware that this approach was not the first mathematical direction in information theory and it is not generally the best to use. Many other information theories exist and are extensively used to solve real-life problems. One of such theories was developed by Ronald Aylmer Fisher (1890–1962) who was an English statistician, evolutionary biologist, and geneticist. Based on mathematical statistics, he introduced (1922) an original information measure now called Fisher information and used it to build the classical measurement theory (Fisher, 1950).

In a particular case, which is important for physics (Frieden, 1998), Fisher information is defined by the following formula

$$\mathbf{I} = \int p'^2(x) / p(x)\, dx$$

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\usepackage{times}
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\author{Jnis Hodorjonoks}
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\begin{verbatim}
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