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Connection of Subjective Entropy Maximum Principle to the Main Laws of Psych

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Abstract Herein it has been made an attempt to find some mathematical models of the main laws of psychology on the basis of the variational principle of the subjective entropy maximum. On the basis of the subjective entropy of an individual preferences extremization principle, using the necessary conditions for extremums of a functional to exist, we get the widely known main fundamental laws of psychophysics: the Bouguer-Weber, Weber-Fechner, Stevens, Zabrodin laws. It has been considered a few special cases of the models for the aggregating functions for sensations and perceptions, as well as cognitive functions for preferences and desires. Also it was obtained expressions for canonical distributions in the case of two-dimensional distribution of sensations and perceptions. The proposed approach, postulating the extremality of human's psych functioning, has the theoretically substantiated value for researches with the use of the principle for the general empirical laws in applied psychology.

Keywords: *psych functioning, sensation and perception, cognitive function, variational principle, subjective entropy, individual preferences, main fundamental laws of psychophysics*

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1. Introduction

Entropy concept is a popular theoretical tool for scientific explanations of different phenomena including the field of psychology. An attempt of one of such applications was made to behavioral finance [1].

Independently general idea was developed on human psychology and behavior in terms of subjective analysis in works [2,3,4].

In works [2,3,4] and later in works [5,6,7,8] it was discussed the principle of maximum of subjective entropy. Accordingly to that principle the human's psych is functioning in an optimal way. Each time it is postulated a certain criterion of the optimality, the main additive component of which is the entropy of an individual's preferences $\pi(\sigma_i)$ distribution determined upon the set S_a of alternatives σ_i. $\sigma_i \in S_a$.

From the formal mathematical point of view the mentioned principle repeats the principle of Jaynes-Gibbs [9,10], although in the given case the principle is not probabilistic. The principle of Jaynes-Gibbs is used herein just as a mathematical "wrap" for the other content.

In order to build a scheme for determination of the optimal (canonical) distribution, it is necessary to give, in addition to the functional, a function of effectiveness $E(\sigma_i)$, which in its turn depends upon a cognitive function.

Let us formulate a problem to discover at what conditions the principle of the subjective entropy maximum allows finding the main laws of psychophysics. Our convincing that this principle has a great generality allows us to make an assumption that the main laws of psychophysics might be encompassed in the mentioned principle in one way or the other.

The laws of Bouguer-Weber, Weber-Fechner, Stevens, Zabrodin [11,12] and some others that characterize in general the main interrelationships between sensations and perceptions pertain to the main laws of psychophysics.

The solution of the formulated problem would give us the possibility on one hand to determine the connection of these empirical laws with the variational principle, apriory "imposed" to the human psych, and that would serve as an additional substantiation of the variational principle application itself; on the other hand it would allow interpreting the empirical regularities from the other point of view. The chain of the psych manifestations, involved in the process of the "final product" – preferences formation, includes the following links:

$\Rightarrow$ initial stimuli $\Rightarrow$

$\Rightarrow$ sensations $s(\sigma_i)$ $\Rightarrow$

$\Rightarrow$ perceptions $p(\sigma_i)$ $\Rightarrow$

$\Rightarrow$ emotions, desires $\varepsilon(\sigma_i)$, $d(\sigma_i)$ $\Rightarrow$

$\Rightarrow$ preferences $\pi(\sigma_i)$.

The values of $s(\sigma_i)$, $p(\sigma_i)$, $\varepsilon(\sigma_i)$, $d(\sigma_i)$, $\pi(\sigma_i)$ are deemed to be normalized.

For each of these factors the experimental psychology establishes classification, "nomenclature", scale of measuring and comparison.

As it is we connect the preferences to the alternatives $\sigma_i \in S_a$. The power of S_a is N. Denoting the sets of the initial stimuli, sensations, perceptions, emotions, alternatives through S_I, S_s, S_p, S_ε, S_a respectively, we can state that the most "inhabited" one is the set of alternatives S_a, the number of the different kinds of emotions, in principle, is less than the number of possible alternatives, the number of different perceptions and sensations is much more less.

2. Methods

We will briefly consider a few applications of the postulated subjective entropy exptemization principle in order to get the empirically known relations.

2.1. Variational Principle for Perceptions

It is supposed that the perceptions are generated on the basis of a certain variational principle. Let the extremized functional have the view of:

$$\Phi_p = -\sum_{k=1}^{K} p_k \ln p_k + \beta_p \sum_{k=1}^{K} p_k G_k\left(s_1, s_2, \ldots, s_L\right) + \gamma\left(\sum_{k=1}^{K} p_k - 1\right), \tag{1}$$

where K – power of the set of the different perceptions; p_k – we emphasize they are not probabilities, but normalized measures of perceptions; β_p – endogenous parameter of psych; $G_k(\cdot)$ – function of sensations; L – power of the set of the different sensations; γ – Lagrange multiplier.

For further exposition we assume that all sensations can contribute to the perceptions p_k, i.e. there take place the aggregation of sensations. Let us consider the following functions as the models for the aggregating functions:

$$G_k^{(1)} = \sum_{j=1}^{L} \mu_{kj} s_j, \tag{2}$$

$$G_k^{(2)} = \ln \sum_{j=1}^{L} \mu_{kj} s_j, \tag{3}$$

$$G_k^{(3)} = \ln \ln\left(\sum_{j=1}^{L} \mu_{kj} s_j\right), \tag{4}$$

where μ_{kj} – weight coefficients at the aggregation formulas. They are introduced because of different physical sense and scale of s_j. There can be considered and other models for the aggregating functions. s_j – dimensionless normalized and scaled measures of sensations.

Dependently upon the view of the functions of G_k there can be obtained different forms of the psych response to the stimuli.

Let us suppose $G_k = G_k^{(1)}$. Then, in accordance with the principle of the subjective entropy maximum we find:

$$\frac{\partial \Phi_p}{\partial p_k} = -\ln p_k - 1 + \beta_p \sum_{j=1}^{L} \mu_{kj} s_j + \gamma = 0. \tag{5}$$

Replacing q for k we in an analogous way get:

$$-\ln p_q - 1 + \beta_p \sum_{j=1}^{L} \mu_{qj} s_j + \gamma = 0. \tag{6}$$

Since the members of $-1+\gamma$ mutually cancel at the equalizing of Eq. (5) to (6), then

$$-\ln p_k + \beta_p \sum_{j=1}^{L} \mu_{kj} s_j = -\ln p_q + \beta_p \sum_{j=1}^{L} \mu_{qj} s_j, \tag{7}$$

from where

$$\ln\left(\frac{p_k}{p_q}\right) = \beta_p\left(\sum_{j=1}^{L} \mu_{kj} s_j - \sum_{j=1}^{L} \mu_{qj} s_j\right). \tag{8}$$

Taking into account the normalizing conditions, we will find:

$$p_k = \frac{\exp\left[\beta_p \sum_{j=1}^{L} \mu_{kj} s_j\right]}{\sum_{q=1}^{K} \exp\left[\beta_p \sum_{j=1}^{L} \mu_{qj} s_j\right]}. \tag{9}$$

In a particular case, when

$$\mu_{kj} = \mu\delta(k-j); \tag{10}$$

where $\delta(\cdot)$ – δ – the Dirac delta function, we get from Eq. (8):

$$\ln \frac{p_k}{p_q} = \beta_p\left(s_k - s_q\right). \tag{11}$$

This relation describes even much more intense reaction to the change in a stimulus than it takes place in accordance to the Weber-Fechner law.

Let us assume that $G_k^{(2)} = \ln \sum_{j=1}^{L} \mu_{kj} s_j$, then instead of Eq. (8) we get:

$$\frac{p_k}{p_q} = \frac{\left(\sum_{j=1}^{L} \mu_{kj} s_j\right)^{\beta_p}}{\left(\sum_{j=1}^{L} \mu_{qj} s_j\right)^{\beta_p}}. \tag{12}$$

In the particular case of (10) we have

$$\frac{p_k}{p_q} = \left(\frac{s_k}{s_q}\right)^{\beta_p}. \tag{13}$$

This formula (13) represents by itself the Stevens' Law (Figure 1).

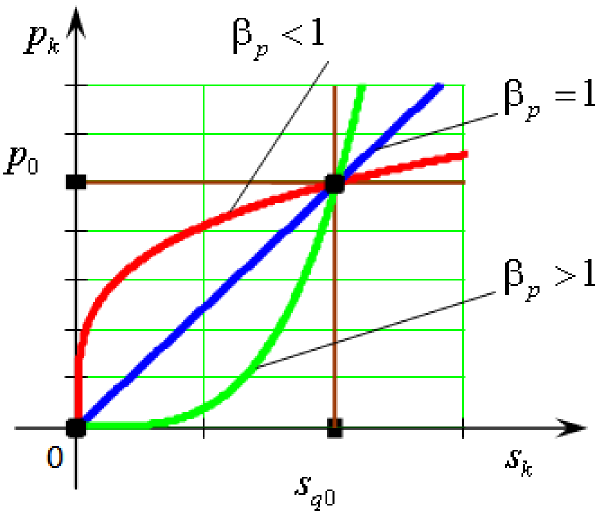

Figure 1. The law of Stevens

Let us rewrite formula (13) in the view:

$$p_k = p_0 \left(\frac{s_k}{s_{q0}} \right)^{\beta_p}, \tag{14}$$

where p_0 and s_{q0} – fixed level of the values of p_q and s_q before the new stimulus of s_k appears.

In the case if $G_k^{(3)} = \ln \ln \left(\sum_{j=1}^{L} \mu_{kj} s_j \right)$, the distribution gets the view of:

$$p_k = \frac{\left[\ln \left(\sum_{j=1}^{L} \mu_{kj} s_j \right) \right]^{\beta_p}}{\sum_{r=1}^{K} \left[\ln \left(\sum_{j=1}^{L} \mu_{rj} s_j \right) \right]^{\beta_p}}. \tag{15}$$

Physical meaning of the derived formulas, e.g. (15), as well as (9), is that they establish the hypothetical quantitative connection between sensations and perceptions. Sensations are more accessible to be measured by a psychology researcher in an experiment. Therefore, formulas (15) and (9) allow getting the quantitative estimate of the perceptions if there are results of the sensations measurements.

Practical value of the proposed interrelationships can also be in that they give a psychologist a certain logical and quantitative link which may be used at the experimental researches planning.

Let us consider, as an example, a case, when there are two sensations of a different type: taste and odor. They influence upon each other and this mutual influence is possibly being determined with the help of the formulae like (15). Since perceptions form preferences, the taste and odor are linked through the preferences. Both sensations taste and odor can be measured; the weight coefficients can be identified. In principle, perceptions also can be measured.

In the conditions of (10), we find the partial condition of connection:

$$\left(\frac{p_k}{p_q} \right)^{\frac{1}{\beta_p}} = \ln \frac{s_k}{s_q} \Rightarrow \left(\frac{p_k}{p_q} \right)^{T_p} = \ln \frac{s_k}{s_q}. \tag{16}$$

This formula (16) reflects the regularity which is normally called the Weber-Fechner Law. The difference is that in the left part of the equality (16) there is the index of raising to the power of $T_p = \beta_p^{-1}$, therefore this interrelationship opens up some additional possibilities for researching and gets itself closer to the law of Zabrodin.

2.2. Variational Principle for Preferences

The previous speculations pertain to the interrelationships between sensations and perceptions. Analogous speculations might be conducted to the pair of categories of "wishes(desires)"-"preferences". "Emotions" are in the connection with "desires". The place of the function of sensation (sensitive function) will be taken by the so called cognitive function. F_d — cognitive function, the subscript of "d" means "desire" – wish/willingness, the "desire" could be replaced with "utility" – usefulness/effectiveness.

Let $d = (d_1, d_1, \ldots, d_m)$ – a vector of the (normalized and scaled) desires. Reckoning that all d_s can influence the forming of the preferences, to one or the other degree, let us define

$$F_{di}^{(1)} = \sum_{s=1}^{M} \mu_{is} d_s, \tag{17}$$

$$F_{di}^{(2)} = \ln \left(\sum_{s=1}^{M} \mu_{is} d_s \right), \tag{18}$$

$$F_{di}^{(3)} = \ln \ln \left(\sum_{s=1}^{M} \mu_{is} d_s \right). \tag{19}$$

Let us write down the functional of the variational problem in the view of:

$$\Phi_\pi = -\sum_{i=1}^{N} \pi_i \ln \pi_i + \beta_\pi \sum_{i=1}^{N} \pi_i F_{di}^{(n)} + \gamma_\pi \left(\sum_{i=1}^{N} \pi_i - 1 \right). \tag{20}$$

From the functional (20) we find:

$$\pi_i = \frac{\exp\left[\beta_\pi F_{di}^{(n)} \right]}{\sum_{q=1}^{N} \left(\exp\left[\beta_\pi F_{dq}^{(n)} \right] \right)}, \; n = 1, \; 2, \; 3. \tag{21}$$

In the case of (17)

$$\pi_i = \frac{\exp\left[\beta_\pi \sum_{s=1}^{M} \mu_{is} d_s \right]}{\sum_{q=1}^{N} \left(\exp\left[\beta_\pi \sum_{r=1}^{M} \mu_{qr} d_r \right] \right)}. \tag{22}$$

From here it follows that for $\forall i, \; k$

$$\frac{\pi_i}{\pi_k} = \frac{\exp\left[\beta_\pi \sum_{s=1}^{M} \mu_{is} d_s\right]}{\exp\left[\beta_\pi \sum_{r=1}^{M} \mu_{kr} d_r\right]} = \exp\left[\beta_\pi\left(\sum_{s=1}^{M} \mu_{is} d_s - \sum_{r=1}^{M} \mu_{kr} d_r\right)\right]. \quad (23)$$

In the case of (18)

$$\frac{\pi_i}{\pi_k} = \frac{\sum_{s=1}^{M} \mu_{is} d_s}{\sum_{r=1}^{M} \mu_{kr} d_r}. \quad (24)$$

For the third case $\left(F_{di}^{(n)} = F_{di}^{(3)}\right)$ we get:

$$\left(\frac{\pi_i}{\pi_k}\right)^{\frac{1}{\beta_\pi}} = \frac{\ln\left(\sum_{s=1}^{M} \mu_{is} d_s\right)}{\ln\left(\sum_{s=1}^{M} \mu_{ks} d_s\right)} \quad (25)$$

which corresponds with the law of Zabrodin. (In the particular case of $\beta_\pi = 1$ – it corresponds to the Weber-Fechner law).

Really, for example,

$$\frac{\pi_i}{\pi_k} = \frac{\ln D_i}{\ln D_k}, \quad (25^*)$$

$$\frac{\pi_i / m}{\pi_k / m} = \frac{\ln D_i - \ln D_{i0}}{\ln D_k - \ln D_{k0}}, \quad (25^{**})$$

$$\pi_i = m \ln \frac{D_i}{D_{i0}}, \quad (25^{***})$$

where $\ln D_{i0}$, $\ln D_{k0}$ – additive components for the logarithmic functions of the desires $\ln D_i$ and $\ln D_k$ corresponding with the related coefficient of proportionality m for the given preferences functions of π_i and π_k.

Or, in the accordance with the functional of (20)

$$\Phi_\pi = -\sum_{i=1}^{N} \pi_i \ln \pi_i + \sum_{i=1}^{N} \pi_i \ln\left[k_i\left(\ln D_i - \ln D_i^*\right)\right] + \gamma_\pi\left(\sum_{i=1}^{N} \pi_i - 1\right). \quad (20^*)$$

From where

$$\pi_i = \frac{k_i\left(\ln D_i - \ln D_i^*\right)}{\sum_{q=1}^{N} k_q\left(\ln D_q - \ln D_q^*\right)}. \quad (20^{**})$$

Hence

$$\frac{\pi_i}{\pi_j} = \frac{k_i\left(\ln D_i - \ln D_i^*\right)}{k_j\left(\ln D_j - \ln D_j^*\right)}, \quad (20^{***})$$

$$\pi_i = k_i \ln \frac{D_i}{D_i^*}, \pi_j = k_j \ln \frac{D_j}{D_j^*}, \quad (20^{****})$$

where k_i, k_j, $\ln D_i^*$, and $\ln D_i^*$ – have the analogous sense as that for the procedure of (25*)-(25***).

In some particular cases instead of "desires" d_s it can be used utilities u_s or scaled intensities of emotions (affects).

We note that here the same making allowance for the "folding up" of the desires (utilities), intensities of emotions is used at the previous stages of the preferences forming: from "stimuli" up to "sensations", from "sensations" to "perceptions" and so on.

At "moving" by this chain from top down to bottom to the preferences, the variational principle keeps its own form, although the evolution of the sense of the distributions, participating in the main functional, takes place.

The applied technique of folding up, which in this given occasion is expressed through the formulae (17-19), or it might be done by the others similar to them, of course, corresponds with some certain additional hypothesis; the used practice requires experimental tests, checks, and proofs, and the coefficients of μ_{is} – experimental identifications. The conducted discussion has the goal to demonstrate, in principle, the possibility of building the similar models of equalization of the measurements of the diverse distributions.

Apparently, that, if to look at the genesis of the psychological factors (stimuli → sensations → perceptions → emotions → desires → preferences) in the timey-wise retrospective, then the perceptions, for instance, follow the sensations, and, strictly speaking, cannot appear or arise before the sensations.

However, let us presume that there is a back link ("perceptions" → "sensations") $p \to s$. Supposedly, we put ourselves a question: How, having the information about the perceptions, to try to restore what sensations (or might be even stimuli) were the reasons for the perception.

The similar possibility is authorized in the monograph by Rubinstein [13]. Application of the variational principle of the type of the Jaynes principle in case of the backward retrospection, comparatively to the considered above, also leads to the complex of some regularities from the area of psychophysics. In particular, that yields the analogies of the laws mentioned above. Following this one can come to the conclusion about non-unique interpretation of laws of psychophysics from the point of view of the postulated variational principles.

This backward problem has not only one solution in the framework of the postulated variational principle.

2.3. Variational Principle for Two-dimensional Distribution $\rho(S_i, P_n)$

Let us show, how it can be obtained the analogies of the main laws of psychophysics, basing upon "two-dimensional" functions of distributions.

As before, we indicate normalized and scaled intensities of sensations through S_i, and related intensities of perceptions – through P_k. It is considered the retrospection of $S_i \to P_k$.

Let us introduce a distribution

$$\rho(S_i, P_k),$$

where S_i and P_k are normalized values.

In addition, let us presume, in an analogous way to the probability theory, that there is the expression that takes place:

$$\rho(S_i, P_k) = \rho(S_i)\cdot \rho(P_k|S_i), \qquad (26)$$

where $\rho(P_k|S_i)$ – conditional distribution of perceptions P_k (subject to sensation of S_i has taken place). The values of S_i and P_k are reckoned to be scaled, and their common distribution is normalized with the condition:

$$\sum_{i=1}^{N}\sum_{k=1}^{M}\rho(S_i, P_k) = 1. \qquad (27)$$

Since in the retrospection the perceptions follow the sensations, then Eq. (26) can have sense. In addition to Eq. (26) it is fulfilled the conditions of:

$$\sum_{i=1}^{N}\rho(S_i) = 1, \sum_{k=1}^{M}\rho(P_k|S_i) = 1. \qquad (28)$$

Let us introduce the entropy of the two-dimensional distribution:

$$H_{S,P} = -\sum_{i=1}^{N}\sum_{k=1}^{M}\rho(S_i, P_k)\ln\rho(S_i, P_k). \qquad (29)$$

With respect to the interrelationship of (26) we find:

$$\begin{aligned} H_{S,P} &= -\sum_{i=1}^{N}\rho(S_i)\ln\rho(S_i) \\ &\quad -\sum_{i=1}^{N}\rho(S_i)\sum_{k=1}^{M}\rho(P_k|S_i)\ln\rho(P_k|S_i) \\ &= H_S + \sum_{i=1}^{N}\rho(S_i)H_{P|S}^{(i)}. \end{aligned} \qquad (30)$$

where $H_{P|S}^{(i)}$ – conditional entropy.

Let us take the value of:

$$\begin{aligned} \Phi_{S,P} &= H_{S,P} + \beta\sum_{i=1}^{N}\sum_{k=1}^{M}\rho(S_i)\cdot\rho(P_k|S_i)\cdot G_S(S_i|k) \\ &\quad + \gamma_1\sum_{i=1}^{N}\rho(S_i) + \sum_{i=1}^{N}\rho(S_i)\gamma_{2i}\cdot\sum_{k=1}^{M}\rho(P_k|S_i). \end{aligned} \qquad (31)$$

Here, in the expression (31), $\rho(P_k|S_i)$ has a sense of the distribution of the possibility of the perception P_k emergence as a response to the sensation of S_i. $G_S(S_i|k)$ – corresponding cognitive function; γ_1 and γ_{2i} – related Lagrange multipliers.

Let us rewrite down the formula (31) in the view of:

$$\Phi_{S,P} = H_S + \sum_{i=1}^{N}\rho(S_i)\cdot\Phi_{P|S}^{(i)} + \gamma_1\sum_{i=1}^{N}\rho(S_i), \qquad (32)$$

where

$$\begin{aligned} \Phi_{P|S}^{(i)} &= -\sum_{k=1}^{M}\rho(P_k|S_i)\ln\rho(P_k|S_i) \\ &\quad + \beta\sum_{k=1}^{M}\rho(P_k|S_i)G_S(S_i|k) + \gamma_{2i}\sum_{k=1}^{M}\rho(P_k|S_i). \end{aligned}$$

Let us calculate the derivative:

$$\frac{\partial\Phi_{S,P}}{\partial\rho(S_i)} = -\ln\rho(S_i) - 1 + \Phi_{P|S}^{(i)} + \gamma_1 = 0; \left(\forall i \in \overline{1, N}\right). \qquad (33)$$

Calculating the second derivative, we will find:

$$\begin{aligned} &\frac{\partial^2\Phi_{S,P}}{\partial\rho(S_i)\partial\rho(P_k|S_i)} = -\ln\rho(P_k|S_i) - 1 \\ &+\beta G_k(S_i|k) + \gamma_{2i}\frac{\partial^2\Phi_{S,P}}{\partial\rho(S_i)\partial\rho(P_k|S_i)} = 0. \end{aligned} \qquad (34)$$

It is obvious that

$$\frac{\partial^2\Phi_{S,P}}{\partial\rho(S_i)\partial\rho(P_k|S_i)} = \frac{\partial\Phi_{S,P}^{(i)}}{\partial\rho(P_k|S_i)} = 0. \qquad (35)$$

In order to determine γ_{2i}, we will use the normalizing conditions:

$$\sum_{k=1}^{M}\rho(P_k|S_i) = 1.$$

where

$$\sum_{k=1}^{M}\rho(P_k|S_i) = \exp[-1+\gamma_{2i}]\times\sum_{k=1}^{M}\exp[\beta G_s(S_i|k)] = 1. \qquad (36)$$

The dependence of $G_s(S_i|k)$ upon k implies that for $\left(\forall i \in \overline{1, N}\right)$ the "function of perception" depends not only upon the intensity of the sensation but also on that "perception", which is being born by the given sensation. Indicating

$$c_i = \exp[-1+\gamma_{2i}],$$

we find that

$$c_i = \frac{1}{\sum_{k=1}^{M}\exp\left[\beta G_s(S_i|k)\right]}. \qquad (37)$$

Let us choose the expressions of (2), (3), and (4); namely

$$G_S(S_i|k) = \begin{cases} \sum_{i=1}^{N}\mu_{ki}S_i; \\ \ln\sum_{i=1}^{N}\mu_{ki}S_i; \\ \ln\ln\sum_{i=1}^{N}\mu_{ki}S_i; \end{cases} \qquad (38)$$

as the models for the function of $G_S(S_i|k)$.

The function of $\rho(P_k|S_i)$ is

$$\rho(P_k|S_i) = \frac{\exp\left[\beta G_S(S_i|k)\right]}{\sum_{m=1}^{M} \exp\left[\beta G_S(S_i|m)\right]}. \quad (39)$$

In a particular case, if γ_{2i} does not depend on i, we get that

$$\ln\left(\frac{\rho(P_k|S_i)}{\rho(P_q|S_i)}\right) = \beta\left[G_S(S_i|k) - G_S(S_i|q)\right] \quad (40)$$

from the equation (34).

From the equation (33), we find:

$$\ln\left(\frac{\rho(S_i)}{\rho(S_j)}\right) = \Phi_{P|S}^{(i)} - \Phi_{P|S}^{(j)}. \quad (41)$$

In regards to the equation of (41), also to the other formulae of the given subsection 2.3, we emphasize that they realize, similarly to the formulae of (15) and (9), the same idea for the two-dimensional distribution at the additional assumption which is introduced with formula (26).

For instance, flight safety issues urge the pilot in the aircraft cockpit to form his preferences on the basis of the available visual and audio information. Or in other flight situations it may be on the basis of some information from different sources.

3. Results

It is proposed the three variants of the cognitive functions, which enter the formulation of the variational principle of the subjective entropy maximum. In each case, it was found the canonical distributions connecting sensations and perceptions; preferences and desires. It was shown that after some transformations it leads to the relationships, which reflect the well-known main laws of psych, such as laws of Weber-Fechner, Stevens, and Zabrodin.

The main feature of the derived in this paper interrelationships, as that was shown, is that they follow a certain principle of optimality, to which, accordingly to the initial assumption, the functioning of a subject's psych is subordinated. Thus, the obtained relations are followings of the subjective entropy maximum principle.

4. Discussion

The authors consider this work as an attempt to lay down the subjective entropy maximum principle as a basement of empirical main laws of psych and to give them theoretical explanation. The authors are convinced that this approach is not only one possible. At the same time, if our suppositions are true, then we foresee the further development of some similar investigations in the area of entropy methods application to the Behavioral Psychology, Cognitive Psychology, Community Psychology, Contemporary Issues and Trends in Psychology, Human and Social Psychology, Measurement and Evaluation in Psychology, Psychology and Social Behavior, Psychology, Conflict and Social Transformation, Research methods in Psychology, Social Psychology, Social Behavior and Interaction and others.

There is a wide area of the presented theory application: theory of conflicts, theory of active systems safety, in economic problems, theory of education, some issues of sociology and so on (interested readers and experts are invited to visit our website: http://kasianovv.wix.com/entropia).

The authors and their colleagues have already developed some of the specified directions in a certain way. For example, a conflict is considered as an interaction of the preferences distributions. The conditions for a conflict genesis, dynamics, and solving are established.

5. Conclusions

In the presented paper it is marked out the way of obtaining mathematical models of the main laws of psychophysics on the basis of the variational principle of the maximum of subjective entropy. The latter gets the specific view depending upon which psychic reactions manifestation is being compared. In addition to what has been done in [2-8] for a distribution of preferences, it is introduced the entropy of perceptions. It is considered special cases of giving the function of perception and cognitive function. In particular, it is proposed the functions of perception in the view of the simple and doubled logarithm of the intensity of perception, which gives the connection of sensations and perceptions. It is possible to show that simple transformations lead to the law coinciding, in fact, with the law of Weber-Fechner. In the case of the simple logarithm model, the same takes place for the Stevens law.

In the text of the article, it is mentioned the opinion uttered in the work [13] about possible existence of the backward retrospection and respectively some laws of psychophysics being in inversion of the variational principle.

Statement of Competing Interests

The authors have no competing interests.

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