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A Study on Some Direct and Inverse Problems Related to Utility and Risk Based on the Introduction of Higher Order Correlations between Sound and Electromagnetic Waves around ICT Environment

—Under a Viewpoint of Relationism First—

Yoshifumi FUJITA† and Mitsuo OHTA‡

† Faculty of Economics, Management & Information Science, Onomichi University 1600 Hisayamada-chou, Onomichi-shi, Hiroshima,722-8506 Japan

‡ Emeritus Prof. of Hiroshima University 1-7-10 Matoba-chou, Minami-ku, Horoshima-shi, Hiroshima, 732-0824 Japan

E-mail: † fujita@onomichi-u.ac.jp, ‡ ryxyj592@ybb.ne.jp

Abstract It seems that hi-tech pollution and many other difficult modern problems come up from slighting or reducing many kinds of complicated relationship among various environmental factors including even ethical or cultural faces to a secondary position and giving priority to only utility beyond trueness over any other everything. To solve these problems, we first pay attention to the criterion of "Relationism-First" that once after investigating at the first stage of study many environmental factors and the mutual correlations being latent among them as possible at the same time and in the same ring of study (for trueness), then our specified interesting cases for engineering application should be considered (for effectiveness). In the previous paper, by taking care of light and shade(that is, utility and risk) as a method for mutual intersubjective analysis, an extended correlation analysis for only two environmental factors has been applied on trial. In this paper, another extended correlation analysis available to more actual fluctuation limited within a finite amplitude interval is newly introduced. Furthermore, as a principle experiment for the proposed method, by applying it to the contrasted two environmental factors: magnetic field (related to risk) and sound (related to utility) around VDT and cellular phone before and after attachment of Tecno AO (active bio-controller as some magnetic oscillator, CE mark: ISO sanction), the proposed method is experimentally confirmed, too.

Keyword Relationism-First, ICT Environment, Higher-Order Order Correlation, Inverse Problem, Tecno AO

1. Introduction

In the present time, we are excessively persisting only our own interested part and/or the separated fragment by forgetting to recognize that anything is originally a part of the whole life style and cannot separate from this whole. Moreover, we very often believe that pursuing only its fragmentation leads to the truth. After all, it seems to us that environmental problems including hi-tech pollution and many other difficult problems come from this.

Even if our environmental problem is restricted within the wave-motion type environment, we can see many actual phenomena composed of extensive environmental factors in different fields with mutual relationship among them. For instance, these examples are given as follows[1]-[5]. The nervous system of mankind is so much affected by any field of sound, light and electromagnetic waves in the neighborhood of the specific frequency band from 15 Hz to 20 Hz (because calcium ions are occasionally lost out). This is particularly induced even by the signal modulated into high frequency band with the slow change of its amplitude. Furthermore, the generated order, generated time interval and each of their proper durations between sound and flash of lightning cannot be recognized as it is. There are the biological priority effect between the sense of sight and the sense of hearing that the sense of hearing is reflected by the sense of sight with more strong ability of evoking attention, the promotion effect between different senses, the synergistic effect between sense and stress, participation in VDT syndrome such as general malaise, relevance to circadian rhythm due to the reflection to the pineal body by the exposure of light and electromagnetic fields, the change of brain waves in the case when we have received sound and light at the same time, chromesthesia, the cooperation effect of music and picture and so on. Nowadays, as stated at some length in Appendix 1, since now these modern problems and high technology are double-faced sides of the same mirror (or the same coin), we can give many concrete examples, in various kinds of fields.

In fact, owing to the popularization of IT instruments such as cellular phone, cordless phone,

personal computer and so on, both in the inside of the room and in the inside of the car, we are surrounded more and more by electronic instruments and live always under the exposure of artificial electromagnetic radiation as if smog. So, the environmental problems (such as VDT syndrome, electromagnetic hypersensitivity and so on) in which the reflection of compound effect and accumulation effect induced by mixture of sound, light, electromagnetic wave, heat and so on, must be taken into consideration are arising even if we choose the problems in the only limited field of the wavy physical science and especially engineering technology as an example [6]-[10]. However, as the present situation that every knowledge branches artificially, it seems that each problem is decomposed owing to our human professional interest first to some parts in fragments belonging to different fields and each part is separately and professionally studied by reducing many kinds of complicated correlation with the other different fields to a secondary position. Accordingly, obviously there is an essential limit in any study on biological effect based on only many animal tests, as mentioned too in Appendix 2. Furthermore, not only in the acoustic environment but also in the electromagnetic environment, it can be said that almost all are mainly the studies in the frequency domain and few are studies in the time domain. Even in basic studies to solve the problems, it seems that any of quantitative studies related to compound effect and accumulation effect between different environmental factors such as sound, electromagnetic wave and so on in electrified indoor environment cannot be almost found even as a motive and a trial. If we recollect deeply and widely as possible the genesis of our existence, since, with the Universe began in a gigantic explosion- Hot Big Bang, we human being was born from some material nature first and become to have partly even subjective consciousness through the evolution and development based on the self-exercise of the material, it can be said that there are in principle no any phenomena not related to other different environmental factors including the one in our humanities and life style of the whole creation.

In this paper, based on the primary criteria of "Relationism-First" [11],[12], as a special case of high-tech pollution, the intermediation between only each two factors chosen from environmental multiple factors of wave motion type (which are very often studied as different phenomena each other at least even in traditional engineering sides) in environment around VDT is taken into consideration as a trial (though this artificial restriction sometimes may neglect any type of the third and the forth *environmental* factors and so on). More concretely, first, under a viewpoint of "Relationism-First", the extended correlation analysis applicable to the actual environmental factors fluctuating within a finite range of amplitude is newly introduced based on hierarchical expression of Bayes' theorem. It is noteworthy that this Bayes' theorem can be considered too as the central principle for the inverse problem of stochastic phenomena. Next, the effectiveness of the proposed methodological trial is confirmed in principle through some basic experiment by first paying a special attention to mutual intermediation itself, especially as to its hierarchization not only in mutual relationship of only average and lower order type linear correlation but also in every higher order type nonlinear correlation of the fluctuation (even if the concrete meaning of high order type nonlinear correlation has not still been clarified).

2. Extended Correlation Analysis for Two Environmental Factors

In previous papers, we have proposed some extended correlation analyses for two environmental factors [6]-[13]. First, let us show the summary of these extended correlation analyses according to the fluctuating amplitude ranges of the environmental factors x, y. Generally, the joint probability density function (abbr., pdf) of x and y randomly in complicated distribution forms can be expressed in the following orthonormal series expansion form:

$$P(x,y) = P_0(x)P_0(y)\sum_{m=0}^{\infty}\sum_{n=0}^{\infty} A_{mn}\varphi_m^{(1)}(x)\varphi_n^{(2)}(y) \qquad (1)$$

with

$$A_{mn} = \left\langle \varphi_m^{(1)}(x)\varphi_n^{(2)}(y) \right\rangle, \qquad (2)$$

where $P_0(x)$ and $P_0(y)$ are dominant pdf of x and y, respectively and $\varphi_m^{(1)}(x)$ and $\varphi_n^{(2)}(y)$ are orthonormal polynomials corresponding to $P_0(x)$ and $P_0(y)$(weighting functions). Then, based on Bayes' theorem, the conditional pdf $P(y|x)$ of y conditioned by x can be expressed as follows:

$$P(y|x) = \frac{P_0(y)\sum_{n=0}^{\infty} A_{mn}\varphi_m^{(1)}(x)\varphi_n^{(2)}(y)}{\sum_{n=0}^{\infty} A_{m0}\varphi_m^{(1)}(x)}. \qquad (3)$$

From Eq. (3), by expressing y in the orthonormal series expansion:

$$y = c_0\varphi_0^{(2)}(y) + c_1\varphi_1^{(2)}(y) \ , \qquad (4)$$

the regression function of y is given as

$$\langle y|x \rangle = c_0 + c_1 \frac{\sum_{m=0}^{\infty} A_{m1}\varphi_m^{(1)}(x)}{\sum_{m=0}^{\infty} A_{m0}\varphi_m^{(1)}(x)} \ . \qquad (5)$$

By taking the expectation of Eq. (3) with respect to x,

the estimated pdf $P_s(y)$ of y from the sampled data of x is given as

$$P_s(y) = P_0(y)\sum_{n=0}^{\infty} E_n \varphi_n^{(2)}(y) \tag{6}$$

with

$$E_n = \left\langle \frac{\sum_{m=0}^{\infty} A_{mn}\varphi_m^{(1)}(x)}{\sum_{m=0}^{\infty} A_{m0}\varphi_m^{(1)}(x)} \right\rangle_x . \tag{7}$$

According to the fluctuating amplitude range of environmental factors due to physical laws and/or the restriction of the measurement instrument, we have given $P_0(x)$, $P_0(y)$, $\varphi_m^{(1)}(x)$ and $\varphi_n^{(2)}(y)$ for the fluctuating amplitude range of x and y in the following.

(i) interval of x: $(-\infty,\infty)$, interval of y: $(-\infty,\infty)$

$$P_0(x) = \frac{1}{\sqrt{2\pi\sigma_x}} e^{-\frac{(x-\mu_x)^2}{2\sigma_x^2}}, P_0(y) = \frac{1}{\sqrt{2\pi\sigma_y}} e^{-\frac{(y-\mu_y)^2}{2\sigma_y^2}} \tag{8}$$

with

$$\varphi_m^{(1)}(x) = \frac{H_m\left(\frac{x-\mu_x}{\sigma_x}\right)}{\sqrt{m!}}, \quad \varphi_n^{(2)}(y) = \frac{H_n\left(\frac{y-\mu_y}{\sigma_y}\right)}{\sqrt{n!}} \tag{9}$$

and

$$c_0 = \mu_y, \; c_1 = \sigma_y \; , \tag{10}$$

where $H_m()$ denotes the m-th order Hermite polynomial, μ_x and μ_y are means of x and y, respectively, and σ_x and σ_y are standard deviations of x and y, respectively. We call Eq.(1) employing Eqs. (8), (9) statistical Hermite series expansion type joint pdf.

(ii) interval of x:$[0,\infty]$, interval of y:$[0,\infty]$

$$\left.\begin{aligned} P_0(x) &= \frac{1}{\Gamma(m_x)s_x}\left(\frac{x}{s_x}\right)^{m_x-1} e^{-\frac{x}{s_x}}, \\ P_0(y) &= \frac{1}{\Gamma(m_y)s_y}\left(\frac{y}{s_y}\right)^{m_y-1} e^{-\frac{y}{s_y}} \end{aligned}\right\} \tag{11}$$

with

$$\left.\begin{aligned} \varphi_m^{(1)}(x) &= \sqrt{\frac{\Gamma(m_x)m!}{\Gamma(m_x+m)}} L_m^{(m_x-1)}\left(\frac{x}{s_x}\right), \\ \varphi_n^{(2)}(y) &= \sqrt{\frac{\Gamma(m_y)n!}{\Gamma(m_y+n)}} L_n^{(m_y-1)}\left(\frac{y}{s_y}\right), \end{aligned}\right\} \tag{12}$$

$$m_x = \frac{\mu_x^2}{\sigma_x^2}, s_x = \frac{\sigma_x^2}{\mu_x}, m_y = \frac{\mu_y^2}{\sigma_y^2}, s_y = \frac{\sigma_y^2}{\mu_y} \tag{13}$$

and

$$c_0 = m_y s_y, \; c_1 = -\sqrt{m_y}s_y \; , \tag{14}$$

where $L_n^{(\alpha)}$ ( ) denotes the n-th order associated Laguerre polynomial, μ_x and μ_y are means of x and y, respectively, and σ_x and σ_y are standard deviations of x and y,respectively. We call Eq.(1) employing Eqs. (11), (12) the statistical Laguerre series expansion type joint pdf.

(iii) interval of x:[a, b], interval of y:[c, d]

$$\left.\begin{aligned} P_0(x) &= \frac{(x-a)^{\gamma_1-1}(b-x)^{\alpha_1-\gamma_1}}{(b-a)^{\alpha_1} B(\gamma_1, \alpha_1-\gamma_1+1)}, \\ P_0(y) &= \frac{(y-c)^{\gamma_2-1}(d-y)^{\alpha_2-\gamma_2}}{(d-c)^{\alpha_2} B(\gamma_2, \alpha_2-\gamma_2+1)} \end{aligned}\right\} \tag{15}$$

with

$$\left.\begin{aligned} \varphi_m^{(1)}(x) &= \sqrt{\frac{\Gamma(\alpha_1-\gamma_1+1)(\alpha_1+2m)\Gamma(\alpha_1+m)\Gamma(\gamma_1+m)}{\Gamma(\alpha_1+1)m!\Gamma(m+\alpha_1-\gamma_1+1)\Gamma(\gamma_1)}} \\ &\cdot G_m\left(\alpha_1, \gamma_1; \frac{x-a}{b-a}\right) \\ \varphi_n^{(2)}(y) &= \sqrt{\frac{\Gamma(\alpha_2-\gamma_2+1)(\alpha_2+2n)\Gamma(\alpha_2+n)\Gamma(\gamma_2+n)}{\Gamma(\alpha_2+1)n!\Gamma(n+\alpha_2-\gamma_2+1)\Gamma(\gamma_2)}} \\ &\cdot G_n\left(\alpha_2, \gamma_2; \frac{y-c}{d-c}\right) \end{aligned}\right\} \tag{16}$$

$$\left.\begin{aligned} \alpha_1 &= \frac{(\mu_x-a)(b-\mu_x)}{\sigma_x^2} - 2, \gamma_1 = \frac{(\mu_x-a)(\alpha_1+1)}{b-a} \\ \alpha_2 &= \frac{(\mu_y-c)(d-\mu_y)}{\sigma_y^2} - 2, \gamma_2 = \frac{(\mu_y-c)(\alpha_2+1)}{d-c} \end{aligned}\right\} \tag{17}$$

and

$$c_0 = \frac{\gamma_2(d-c)}{\alpha_2+1} + c, \; c_1 = -\frac{d-c}{\alpha_2+1}\sqrt{\frac{(\alpha_2-\gamma_2+1)\gamma_2}{\alpha_2+2}}, \tag{18}$$

where $G_n(\alpha,\gamma;z)$ denotes the n-th order Jacobi's polynomial, μ_x and μ_y are means of x and y, respectively, and σ_x and σ_y are standard deviation of x and y, respectively. We call Eq.(1) employing Eqs. (15), (16) the statistical Jacobi series expansion type joint pdf.

As a special case, the statistical Hermite series expansion type joint pdf and the statistical Laguerre series expansion type joint pdf can be included in the statistical Jacobi series expansion type joint pdf. That is, the statistical Hermite series expansion type joint pdf can be derived by setting such that

$$\left.\begin{aligned} &\alpha_1 = 2\gamma_1 - 1, \alpha_2 = 2\gamma_2 - 1, \\ &\nu_1 = \gamma_1 - \frac{1}{2}, \nu_2 = \gamma_2 - \frac{1}{2}, \nu_1 \to \infty, \nu_2 \to \infty. \end{aligned}\right\} \tag{19}$$

The statistical Laguerre series expansion type joint pdf can be derived by setting such that

$$\left.\begin{aligned} &\gamma_1 = m_x,\ \gamma_2 = m_y,\ a = 0,\ c = 0, \\ &b = \alpha_1 s_x, d = \alpha_2 s_y, \alpha_1 \to \infty,\ \alpha_2 \to \infty. \end{aligned}\right\} \quad (20)$$

3. Applications to Electrified Environment

3.1. Magnetic and Acoustic Fields around VDT

When a shooting game (DOOM LEGACY) was playing on a personal computer, the sound level and the magnetic field strength were measured each 5 seconds and 101 sets of sampled values were obtained. The setup of this experiment is shown in Fig. 1. In this experiment, the sound level meter was set at the location of 30 cm distant from the personal computer and the EM strength meter was set at the location of d (15cm, 30cm and 45cm) distant from.

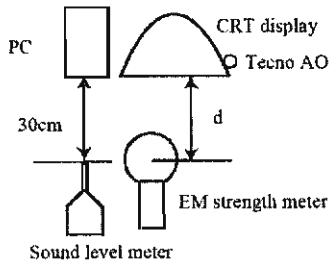

Fig 1. Experimental setup for the CRT display.

In this experiment, the measurement was done before and after the attachment of the active bio-controller as some magnetic oscillator (Tecno AO) to the CRT display. Then, it could be clearly seen that the magnetic field strength is reduced by the attachment of Tecno AO although the mean of the sound pressure level doesn't change so much.

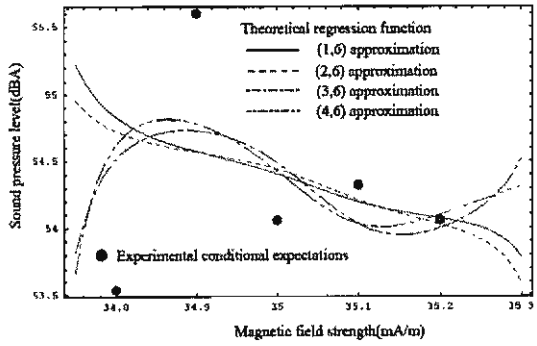

Fig. 2. A comparison between experimental conditional expectations and theoretical regression functions of the sound pressure level to the magnetic field strength without attachment of Tecno AO.

First, when Tecno AO was not attached to VDT, the sound level and the magnetic field strength were measured. The proposed method has been applied to these data and the result for the case when the EM strength meter was set at the location of 30cm distant from VDT is shown in Figs. 2 to 4. Then, we calculated as a=34mA/m, b=36mA/m, c=50dBA, d=70dBA.

To get the theoretical regression functions of Fig. 2, in Eq. (5), as the denominator, initial term and the terms from the 1st to 6th order were used, and as the numerator, initial term and term of the 1st order, initial term and terms from 1st to 2nd order, initial term and terms from 1st to 3rd order and initial term and terms from 1st to 4th order were used. We call them (1,6) approximation, (2,6) approximation, (3,6) approximation and (4,6) approximation curves, respectively.

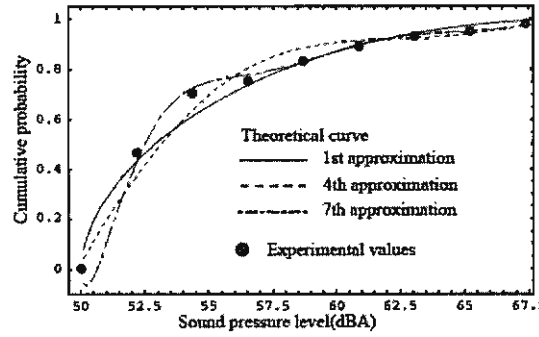

Fig. 3. A comparison between the theoretically estimated cumulative probability distributions of the sound pressure level based on the magnetic field strength fluctuation and experimentally sampled values without attachment of Tecno AO.

To get the theoretical cumulative probability distribution of Fig. 3, both in the numerator and in the denominator of Eq. (7), terms from initial to 3rd order were used and in Eq. (6), initial term, initial term and terms from the 1st term to the 3rd order, and initial term and terms from the 1st to the 6th order were used. We call them the 1st approximation, the 4th approximation and the 7th approximation, respectively. To get the theoretical cumulative probability distribution of Fig. 4, both in the numerator and in the denominator of Eq. (7), terms from initial to 4th order were used.

In Figs. 3, 4, 6 and 7, it can be clearly seen that the difference between theoretical cumulative probability distribution and experimental values becomes smaller as the degree of approximation increases. This means that it is necessary to make use of not only lower order correlation but also higher order correlations for the correlation analysis between environmental factors. Furthermore, this result shows that we can make use of the proposed

method based on the primary criterion of "Relationism-First" for investigating the magnetic field only by measuring the acoustic field and investigating the acoustic field only by measuring the magnetic field.

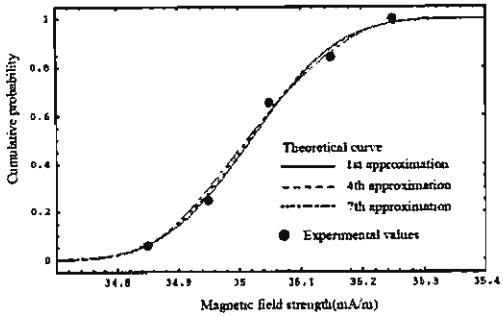

Fig. 4. A comparison between the theoretically estimated cumulative probability distributions of the magnetic field strength based on the sound pressure level fluctuation and experimentally sampled values without attachment of Tecno AO.

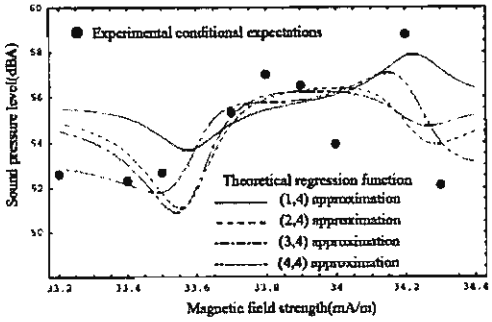

Fig. 5 A comparison between experimental conditional expectations and theoretical regression functions of the sound pressure level to the magnetic field strength with attachment of Tecno AO.

The result for the case with attachment of Tecno AO and d=30cm is shown in Figs. 5 to 7. Then, the calculation was executed as a=32.2mA/m, b=35.4mA/m, c=48dBA, d=73dBA.

To get the theoretical cumulative probability distribution of Fig. 6, both in the numerator and in the denominator of Eq. (7), terms from initial to 3rd order were used and in Eq. (6). To get the theoretical cumulative probability distribution of Fig. 7, both in the numerator and in the denominator of Eq. (7), terms from initial to 4th order were used. Then, the optimal number of truncated terms should be considered based on the previously reported methods[15],[16]. However, it is omitted owing to page limitation.

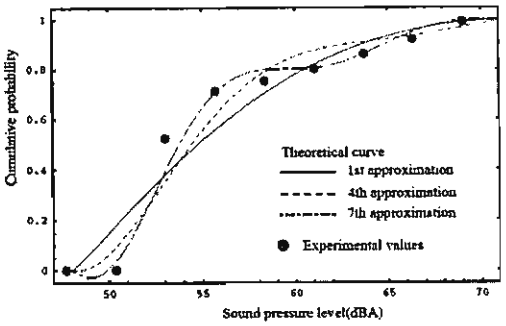

Fig. 6. A comparison between the theoretically estimated cumulative probability distributions of the sound pressure level based on the magnetic field strength fluctuation and experimentally sampled values with attachment of Tecno AO.

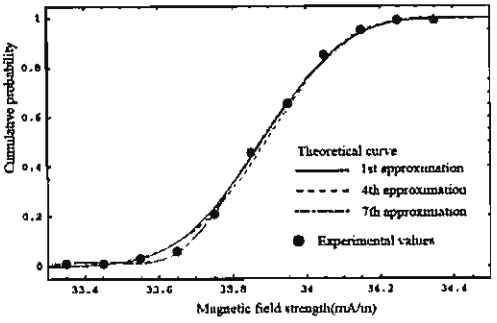

Fig. 7. A comparison between the theoretically estimated cumulative probability distributions of the magnetic field strength based on the sound pressure level fluctuation and experimentally sampled values with attachment of Tecno AO.

3.2. Magnetic and Acoustic Fields around Cellular Phone

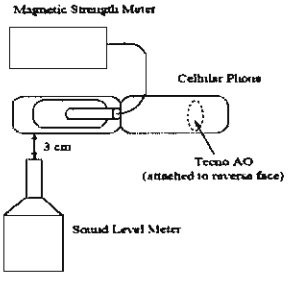

Fig. 8 Experimental setup for the cellular phone 1.

When the cellular phone 1(N900is, NTT Docomo) was connecting with the cellular phone 2 and was simultaneously receiving the sound of the regenerated movie from cellular phone 2, the magnetic field strength and sound level around the cellular phone 1 were observed. The sound level and

the magnetic field strength were measured each 10 seconds and 100 sets of sampled values were obtained. The setup of this experiment is shown in Fig. 8.

Here, as the magnetic strength meter, Model 8532 Precision ELF/VLF Gauss Meter (Narda) was used. In this measurement, the frequency range of 12Hz to 50kHz and the observed range of 20mG were chosen.

The measurement was done before and after the attachment of Tecno AO to the cellular phone. Then, it could be clearly seen that the magnetic field strength is reduced by the attachment of Tecno AO although the mean of the sound pressure level doesn't change so much.

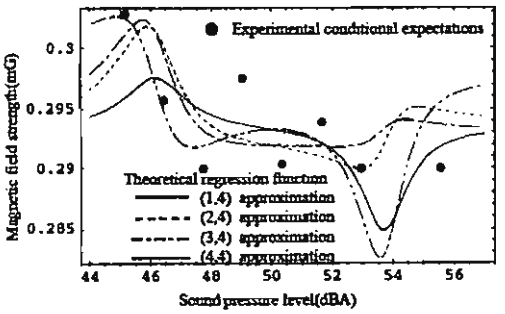

Fig. 9 A comparison between experimental conditional expectations and theoretical regression functions of the magnetic field strength to the sound pressure level without attachment of Tecno AO.

First, let us show the result without attachment of Tecno AO. We calculated as a=0.22mG, b=0.38mG, c=43.7dBA, d=57.4dBA. The comparison of the theoretical regression curves and experimental conditional expectation is shown in Fig. 9. In Fig. 10, the comparison of theoretical cumulative probability distribution and experimental values is shown. In Fig. 9, as the denominator, initial term and the terms from the 1st to 4th order were used, and as the numerator, initial term and term of the 1st order, initial term and terms from 1st to 2nd order, initial term and terms from 1st to 3rd order and initial term and terms from 1st to 4th order were used. We call them (1,4) approximation, (2,4) approximation, (3,4) approximation and (4,4) approximation curves, respectively. In Fig. 10, both in the numerator and in the denominator of Eq. (7), terms from initial to 4th order were used.

Next, let us show the result with attachment of Tecno AO. We calculated as a=0.2mG, b=0.28mG, c=42dBA, d=56dBA. The comparison of the theoretical regression curves and experimental conditional expectation is shown in Fig. 11. Then, in Fig. 12, the comparison of theoretical cumulative probability distribution and experimental values is shown. Then, both in the numerator and in the denominator of Eq. (7), terms from initial to 4th order were used.

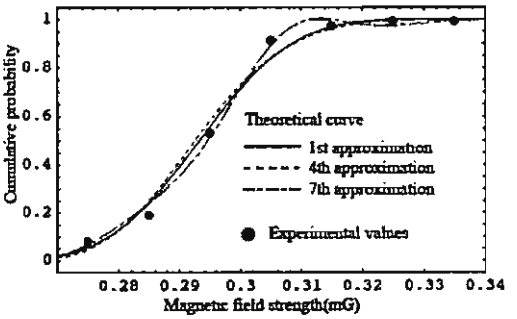

Fig. 10 A comparison between the theoretically estimated cumulative probability distributions of the magnetic field strength based on the sound pressure level fluctuation and experimentally sampled values without attachment of Tecno AO.

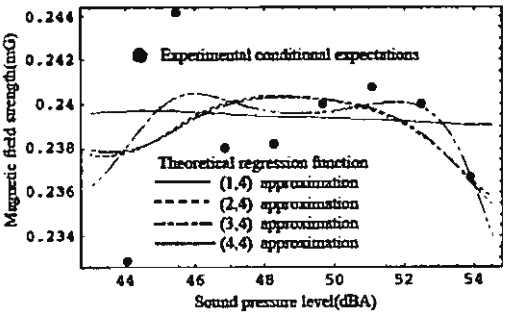

Fig. 11 A comparison between experimental conditional expectations and theoretical regression functions of the magnetic field strength to the sound pressure level with attachment of Tecno AO.

In Figs. 10 and 12, it can be clearly seen that the difference between theoretical cumulative probability distribution and experimental values becomes smaller as the degree of approximation increases. Furthermore, this result shows that we can make use of the proposed method for investigating the magnetic field only by measuring the acoustic field and investigating the acoustic field only by measuring the magnetic field.

Hereupon, in spite of the idealized expectation in the theoretical side, we have to emphasize the following essential point of study in the actual experimental side. Originally, the information on higher order type nonlinear correlations is supported experimentally only by a few samples (near peak values) within a restricted narrow limit of experiment, and moreover by conditional average operation its tendency becomes remarkable more and more. Accordingly, the effect of averaged operation

cannot be fully exhibited especially in the higher correlative moment.

It seems to be natural that in the comparison between experimental conditional expectation and theoretical regression functions the tendency of agreement can not be exhibited.

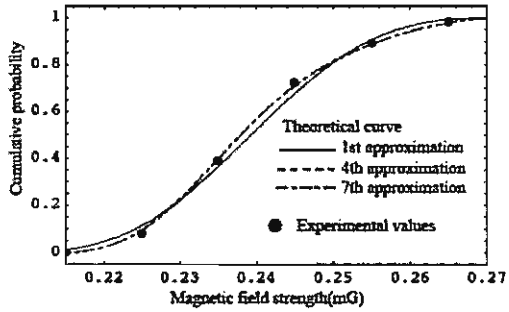

Fig. 12 A comparison between the theoretically estimated cumulative probability distributions of the magnetic field strength based on the sound pressure level fluctuation and experimentally sampled values with attachment of Tecno AO.

4. Conclusions

We have already reported that the criterion of "Relationism-First" is the key to solve every type serious environmental problems that confront us in the modern times. In this paper, following the previous paper, we first have dared to take a standpoint based on this essential principle "Relationism-First" on the existence of all things in the universe, differing from a standpoint of "Separatism-First". That is, every linear and nonlinear type multi-correlation analysis among all kinds of different environmental factors (including even social, ethical and human factors) should be deeply and diversely considered at the first stage of a study (as a quest for truth). After that, by decomposing the compound correlation effects into each factors, our specific interesting factor should be separately studied (as a quest for effectiveness) according to the main purpose of our investigation.

As a trial based on this criterion, in the previous paper, we have proposed a methodology introducing an extended correlation analysis reflecting not only linear but also nonlinear correlation information for two environmental factors, under a viewpoint of "Relationism-First". But it is available for only some ideal case when the environmental factors fluctuate within $(-\infty, \infty)$. In this paper, we have proposed the method available for the actual case when the environmental factors fluctuate within any finite amplitude interval $[a, b]$. Of course, this includes the already proposed method as a special limit case with $a \rightarrow -\infty$ and $b \rightarrow \infty$. Finally, by applying it to principle experiments on the environment around VDT under playing a game and the environment around cellular phone under calling, a part of effectiveness on this proposed method has been experimentally confirmed. Furthermore, the following characteristic point had better to be noticed too in common to two different cases with use of VDT and cellular phone. With attachment of Tecno AO, first as a passive style of "Relationism-First", some slight change of sound field can be found. Secondly, as an active style of "Relationism-First", a whole form of cumulative probability distribution on sound field can be predicted only through the change of magnetic field. That is, if we keep strictly an essential viewpoint of "Relationism-First", we will make an attempt and be able to predict successfully some remarkable reduction effect on magnetic field strength(related to risk) based on only measurement of just a slight change on sound pressure level(related to utility) of a different kind with attachment of Tecno AO(even if almost no effect of Tecno AO on sound field can be predicted in advance), especially in the form of inverse problem.

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Appendix 1: Technology and Ethics (Technology with no ethics is blind)

The time has come when science and technology should contribute to the very recovery of the whole view for human and nature in this highly information-oriented technology society, especially by introducing positively human science sense of value.

What will come, if both sides of natural science (especially by connecting with our artificial technology) and human science will not make any efforts to find some unification "on the same ring at the same time", and what will come if they continue to be buried in their own specially professional field independently with each other? In the end, there is a risk that one of them will drive the other out of concerns as the problem on the other bank. What will come, if each will continue to accumulate a great stock of knowledge and experience, isolated with each other? The craftsmanship-like self conceit of natural scientist (especially technology) and moralistic self conceit of human scientist are gradually formed up. Each peculiar self-conceit of these types based on big ignorance lost the spirit of "Relationism-First" in wide sense becomes, after all, self-centered and begins to find out any fault only in the other side ("The himself is his greatest enemy") Nowadays, "A narrow stream is noisy"

It is not permitted today to approve it as the necessary evil under the name of human nature and original sin, sitting by only as a spectator. It is rather a problem on how to select our daily life and our problem toward to the future. Does high technological innovation increase the methodological gap between natural science (especially technology) and human science? Does it dream "age of computer for science" or "technology-based nation", where not only politics and economics but also human serves in our modern society only to science and technology by distorting any ethics? The development of science and technology have been accelerated, diversified, and refined amazingly by the progress of computer. Does it surely work in order to lead in the direction of the recovery of that gap so that the science, especially technology will be a real servant to society of mankind? This is a serious and very important problem which we have to solve now at this time and on this ring. – "The future will come hesitatingly, the present flies like an arrow, and the past is standing still forever." ... "The best prophet is the past." -

After all, it cannot help thinking it is our human ethics what provides the ultimate goal of environmental control technics and provides its valuable mean. But, this mean should follow harmonically the original natural evolutional rhythm. – "Rome was not built in a day".

Appendix 2 An Essential Limit of (Human) Biological Effect Study Based on Only Any Animal Test

As long ago F. Engels referred to biology in a book "Dialektik der Natur" (translated 1901 in Japanese by Tanabe), especially from a bottom up way viewpoint, every life can be defined as an existence style of protein and show some dynamical balance of never-failing material metabolism with surrounding outside nature. As its existence style, all sorts of movement from physically dynamic displacement of the lower order to very complicated types of human thinking can be considered. For example, even in a struggle for existence as one of its existence style of life (originally, though Engels suggested severely Darwin theory is only narrow minded and one sided view of emphasizing a mutual struggle by neglecting any cooperation), every type means of development in our cultural, economical, pleasure-seeking and happiness desires in our society are included, and when such means are produced socially every kinds of criterion related to animal is impossible to apply as it is to our human side in development toward self-consciousness.

As is well-known, WHO gives a fairly clear definition of human healthy condition as bodily, mentally and socially sound state, not as only the nature of no disease. Also, electrical hypersensitivity (abbr. EHS) named by Dr. W.J.Rea is indicated as one of no peculiar disease consisting of many of medically unexplainable inharmonious factors. One of researchers related to this EHS insists any necessity of introducing some evaluation and regulation on the total amount of our bodily load.

On the other hand, from a top-down way viewpoint as one of an existence style of life on all things in the Universe, a pure lively motion of our human life (like a farmer's rural life creating everyday the path of life) was named as God, goodness in a book "O Jizni" written by a pure (fundamental truth) Christian: Lev Tolstoi (translated 1961 in Japanese by Nakamura), since it originally leads to our deep reason, philanthropy and conscience as the mirror of God, without depositing ourselves with any pawnshop like the objective system on religion or animal test(that is, Tolstoi's God exists in our heart of hearts and in no outside of our flesh and blood).

Accordingly, essentially and substantially there are many points at which they meet on common ground in both theories of Engels and Tolstoi except a problem on naming of God. From a viewpoint of "Relationism-First", we couldn't help thinking it had better sublate these both viewpoints by examining richly some unsettled points about some higher order human theory for the former and some self-exercise of material for the latter.