

# HUMAN COMMUNICATION AS MEDIATING THE UNITS OF PARAMETERISED ENVIRONMENT

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## SUMMARY

Human communication is prevalently a mediated process. Mediators are units of environment, which are attributed functions within the local value set. They are utilised in such a way as to optimise the change of human states.

In this article, a mediator-centred interpretation of the human communication is given. The interpretation follows closely the concept of mediated interaction developed within physics. It is conjectured that collection of mediators, which the humans use, has a well-defined average. The averaged collection permits reliable interpretation as a human communication spectrum. Relation of the intensity of a spectral component with regard to different senses, and with regard to intensity of interaction is discussed.

## KEY WORDS

human interaction, environment excitations, mediators, communication spectrum

## CLASSIFICATIONS

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JEL: C0, D80

PACS: 89.70.+c

## **INTRODUCTION**

Humans interpret their actions and processes observed in environment using a value set. The value set is a complex convolution of socio-biological elements. The social part means interaction among humans, the significant part of which is communication. For the purpose of this article the communication is defined as a part of human interaction which primarily affects human interpretation of them and of environment. Frequent consequences of communication are other human actions. Human communication is a representative type of human interactions in the sense that it is rather structured, well-known, widely-adopted, constantly performed, dynamic and important for individual and collective well-being. Because of these facts, communication has been studied constantly. Generally, communication combines individual biological and psychological characteristics, social characteristics in the form of informal and formal rules as well as the characteristics of human environment in the form of available means of communication [1]. A sideways consequence is that it is rather interdisciplinary in origin. Recently, development of electronically founded means of communication (wireless communication and Internet based communication) enabled humans to carry out one step further – hence intensify – most of the processes the communication has contributed to. These processes include on the one hand human integration [2], information dissemination, transparent and traceable processing of actions and on the other hand human alienation and manipulation.

The communication is not clearly understood, as is seen from the fact that it has more than twenty different definitions [3]. The definition stated here is a human-centred definition, in the sense that the main causes and consequences of communication are seen on humans. In that sense, the essence of communication is projecting of human, internal dynamics. Other elements are solely means, utilisable parts of environment which contribute to efficient projecting. Because of that, the means – e.g., modes, duration, underlying norms and other characteristics of communication – are unimportant for the essence of communication. That accounts for the fact that in virtually every spontaneously formed human system communication has been possible. Therefore, realised communication modes are subset of all possible communication modes, the subset formed from the local techno-cultural basis as represented in the value set. However, the further fact is that a minute subset of possible communication modes is exploited. The existence of rules, which among other have restricting meaning in construction of speech, written text etc., point to that fact. The spontaneity in forming the communication modes reveals the existence of additional criteria applied, the criteria being the consequence of human characteristics. Because of that, analysis of the realised communication modes, In contrast with possible, yet non-realised modes, has a potential in making known human characteristics. To summarise, by focusing the research at the communication modes with human influence suppressed, one enhances probability to extract criteria which led to observed communication modes, which in turn enables better understanding of humans.

In particular, the quantitative interpretation of human communication enables us to better understand interplay among the different individual and collective human characteristics, as well as the possibility of their further purposeful modifications and design.

In this article human communication is interpreted as a mediated process. Details of mediators are given, and the combination of tied human and environment

characteristics elaborated. The article belongs to recent series of the articles in which the emphasis is put on mediator details.

The crucial starting point, that humans are substantial origin and source of communication is, because of the operability, developed further in the two premises:

- (i) for each assumed flow of human dynamics there is the optimal set of means of communication,
- (ii) the set of means of communication utilized by a human has a well-defined average

The set is optimal if it enables humans to realise dynamics which is the least different to the assumed one, the difference being appropriately introduced within the local value set. The main result of the article is the conjecture that ordering of the averaged set of means of communication using a scalar parameter is correct and reliable. By means of it the spectrum of human communication is formed.

The spectrum makes possible predicting the impact of a new communication mode onto the human communication in the following way: the averaged communication of a human with a given characteristics has some optimal form. All means of communication contributing to approaching of real communication to the optimal one are suitable and adoptable. On the contrary, all means which enlarge deviations are unsuitable.

The outline of the article is as follows. In the second section, because of a self-containedness, the notion of mediator is elaborated. In the third section the human senses and mind are analysed as the formal and the central element guiding communication, respectively. The concept of a human communication spectrum is elaborated in the fourth section, with the preliminary theoretical and experimental results presented. In the fifth section the summary of the results with the perspective for follow-up work are given.

## MEDIATORS

Each and any human value set provides one with a local interpretation of environment as a collection of units of a particular type. Within the value set, each of these units is (i) differentiated from the rest of surrounding, i.e. other units, (ii) attributed a function. Units exist naturally, or are prepared artificially. In both cases, their formation is traced to some other units, which were combined using an energy amount distributed in a specific way. Thus, the units are part of the environment – the environment excitations. Units are elementary in the sense that each unit has a specific function, and serves as the least part of environment making possible the function's realisation [4]. The units are therefore *elementary environment excitations* (EEEs). Because of the difference in their characteristic dynamics and characteristic human dynamics, some EEEs are considered as monolithic and opaque environment structures (e.g., house, road, river) implying static quality and some as easily manipulatable structures (e.g. paper, money [5], e-mail [6], sound) implying dynamism.

Let us illustrate with some detail the notion of EEE on the examples of a mobile phone and of a textual message from Short Message Service (SMS). The former is example of an EEE which is not a mediator (to be described later in the text), while the later is the example of the EEE which is a mediator. The mobile phone is made from raw materials existing in environment, after inclusion of energy and human knowledge and skills, hence is an environment excitation. Its recognised function is enabling distant people to communicate with marginal or irrelevant interference with

their momentary activities. Mobile phones couple humans and communication units in their environment. The mobile phones are considered as the least part of environment required for the corresponding function fulfilment. The mobile phone stated function is neither overpowered with their complex structure the users have knowledge of, nor with the fact that average user extracts occasionally, mentally or physically some of the mobile phone parts, e.g., battery, antenna, display, buttons or memory card. The mobile phones have sideways characteristics of contributing to the owner status presentation. Existing mobile phones differ in dimensions, capabilities and design. Their number changes, and their average contribution to communication is intensifying the possibility to connect and separate people. As a rule their form clearly differentiates them from the rest of EEEs, the exceptions being the toys and terrorist weapons. Overall, mobile phones are owned and represent EEEs bounded to individuals. They are not communication units, on the contrary to SMS. The SMS is a discrete communication unit, existing in a rather structured, artificial environment. Firstly that environment was the mobile phone network, which was subsequently broadened to fixed telephone network and Internet. SMS are excitations of that environment as they require some skills and efforts for their writing, some amount of energy for their transfer and some amount of money for the overall stabilisation of that structure. SMS function is indication of the auxiliary communication, prevalently as a precursor of other, more thorough communication types. SMS use spans rather broad time and space intervals (from duration of several seconds and range between humans of several meters to durations of several days and ranges of several thousands kilometre). SMS differ in their content.

The duration, extent and value are attributes of EEEs. The duration of an EEE is the average time the particular type of realised EEEs is considered as performing its function, i.e. as being in the excited state of the environment they were predicted. That has various components, like are physical, technological and social. Let us illustrate that on the example of mobile phone. Physical life-time is prevalently determined by the battery life-time. After battery empties, the mobile phone changes its predicted excited state with some other (which again is attributable the life-time). The battery refilling means re-establishing the mobile phone in the initial state. Some contribution to the life-time of the predicted state originates in the possibility of breaking and stealing the mobile phones. Technological life-time combines the duration of the technology used in transferring the signal between the mobile phone and the net operator (e.g., duration of a particular protocol). Social life-time is rather heterogeneous as it includes duration of the net card validity, fashion influences etc. E.g., some mobile phone may be in working order, but not used as being considered old-fashioned or technically insufficient by a majority of people. Substantially, duration of the EEEs shortens with intensifying interaction with other EEEs and humans. E.g., mobile phones are kept out of other people reach, protected from devastating atmospheric influence, etc.; SMS are coded in order not to interfere with other SMS during their transfer as electrical signals, and in order to suppress errors in the transfer.

Humans have two types of interactions with EEEs: (i) screening and (ii) mediated interaction. The first group includes all the EEEs which are linked to an individual and which contribute to his or her status, role, appearance, capabilities and diverse impressions by others (e.g., mobile phone). The second group includes all the EEEs which are transferred from one human to at least another human (e.g., SMS). Generally, the transfer is causal and a direct consequence of individual interpretation

of his or her own state and state of environment. The EEEs which are regularly utilised in the mediated interaction are referred to as the *mediators*.

EEEs, hence mediators also, are attributed the *social mass*. It is the relative measure of resistance of a human system to a change of the EEE state. Let us concentrate on the case of mediators, as their predicted function includes transfer. The change in question is mediator transfer, and sources of resistance are e.g., legislative or economic sources. Mediator transfer starts with its emission from a sender and absorption by a receiver. E.g., consider a finite amount of money transferred between two humans. Initially money contributed to the initial state of a sender, hence money screens the sender, because of what is not separately treated. In that way, for the social environment that amount of money does not exist before it is introduced by the sender, i.e., separated from the sender, i.e., emitted into the social space. Similar interpretation goes with the receiver, who is screened with the money after its receiving, i.e., the absorption. Along with the money, the SMS, e-mails, voices, packages and other exchangeable EEEs may be emitted and absorbed.

Mediators which are transferable in a relatively short time interval bring about the synchronous communication. Conversely, if duration of a transfer is relatively long the corresponding communication is asynchronous. Relatively short (long) time intervals are those which are on average much shorter (longer) than the average duration of receiver and sender individual dynamics.

The causality of processes in which humans emit mediators and the regularity inferred from the observations, reveal the connection between the change of individual states and mediator characteristics. Mediators serve as part of the environment transcending some individuals, thus enabling them to perform the state change. The precise amount of change is determined within the local value set, with *local* prevalently meaning *within* the social system. The relatively long duration of a human system and invariance of the interpretation within the space region belonging to the system, bring about denoting the indicators using their value and extent (the dispersion relation which links value and extent is for collective EEEs analysed in the other paper by the same author in this issue. It can similarly be introduced for mediators).

The presented picture, in which there are separated humans, interacting with well-defined and mutually separated mediators is a simplification. Realistic situations include mutual multi-level interactions between all listed elements, e.g., separation of SMS and e-mails exists, but is not total as there is possibility to send SMS which will be received as an e-mail and vice versa.

## **HUMAN-MEDIATOR INTERACTION**

Human internal dynamics is the cause of emission of mediators. Their absorption is constant impetus for further change of states. While mediators are processed mentally, their absorption and emission are connected with human senses: gustative, tactile, olfactory, auditory and visual sense.

By influencing the senses the absorption of EEEs takes place. In communication the tactile, auditory and visual influences are prevalently utilized. The average range of communication is of the order of 1/2 m for tactile, 10 m for auditory and 100 meter for visual. Communication is direct or mediated. In particular, auditory and visual communications are strictly mediated: in auditory communication is realised through the disturbances called voices or sounds which propagate through physical

atmosphere or a combination of atmosphere and electric circuits, while in visual communication the sender reflects the light beams which the receiver uses for inference about the sender state (appearance, movements, gestures, etc.), again in atmosphere or a combination of atmosphere and electric circuits. In case of a noisy environment, darkness or opaque partition-walls these types of communication are not possible. Tactile communication can be direct (shaking hands, patting, etc.) or mediated [5]. The quiet atmosphere with naturally existing light and electric nets are two parts of environment making possible specific type of communication. The former is naturally existing, while the later is an artefact, thus they are again specific EEEs, which are slightly modified by senders. The subset of EEEs, which is modified during communication, is called a *medium*.

The fact that the medium is one EEE, within which other EEEs are transferred, should be addresses in more detail. It is connected with the introduction of EEEs as units attributed function within the local value set. In that sense, the medium is the least part of environment which makes possible a particular communication channel. However, it is a complex structure, consisting of subunits, which – within the very same value set, are however again units with a different function attributed, e.g., conveying of a particular information content.

Nowadays, a variety of different EEEs are utilised in communications: telephone, SMS, e-mails, VOIP, video-conferencing, ... As an illustration, SMS and e-mails were introduced as a sideway consequence of technology, and their proliferation has come as a rather large surprise [6]. On the other hand, the unsuccessful attempts to introduce video-telephony were also surprises [7]. The constancy of the trends of use of different mediators reveals the underlying close connection of mediators and human internal dynamics.

Communication mode depends on communicating agent needs and capabilities for communication, communicating agent formal and informal set of rules, available communication equipment, and on characteristics of transferred information. Most of these characteristics are nowadays subjected to rapid change. While precise way of further communication development may be reliably predicted only in short-term, it seems opportune to analyse the limiting or saturated state, in which material prerequisites for communication reached the saturation states. In other words, it is assumed that then communication equipment is freely and widely available and that all communicating agents adopted a unique set of communication guiding rules. In the limiting state, therefore, communication characteristics are set by the intrinsic characteristics of transferred information and of individual agents. Operationally, characteristics of ideal communication state may serve as additional criteria for precise setting of future communication mode development.

All communications are collective in origin, e.g., interpretation of voices requires adopted language, a part of a collective structure, the value set. The existence of a particular medium requires underlying energy content with a particular history of formation. That is clearly seen in the media for electronically transmitted communication, which consists of a firm infrastructure.

## **HUMAN COMMUNICATION SPECTRUM**

The underlying assumption in this article is that humans are origin of communication, which is conveyed in accordance with their needs. Humans, who adopted the value

sets which are mutually similar enough, share the level of change in interpretation of environment the particular EEE during communication causes.

Different EEEs after interpretation provides one with some quantity of information. The each piece of information content of an EEE is attributed a specific number denoting its quantitative measure. The scale thereby spanned is called its dimension.

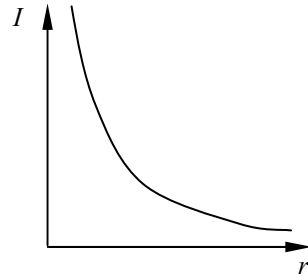
As crucial characteristics of EEEs in this article the set of their dimensions is used. For face to face communication the estimated number of dimensions spanned is considerably larger than for other communication modes, hence is considered as effectively infinite. The face to face communication is considered as at least visual and auditory communication with negligible level of obstructing influences (noise, inadequate lighting, non- or weakly-transparent compartments, etc.). It includes speech semantic dimensions, sound dimensions, movements, gaze, etc.). For auditory communication without accompanied visual communication, the number of dimensions is reduced, yet relatively large – it consists of the number of different dimensions in speech as information flow and sound flow. For the communication through text (which includes visual elements) the number of dimensions is further reduced and lowers as lowers the possibility to form the text. Text is particularly structured and prepared part of environment, which includes a medium (like a paper or a display), interpreting code (alphabet and grammar) and which reflects additional norms and customs (different expressions, slang, emoticons, ... ). The development of SMS and e-mail mediated communication reveals the interplay between the human needs and environment capabilities for exciting particular EEEs.

The average set of EEEs, utilized in relatively long time interval thus in relatively large number of different situations and individual states, in relatively stationary human states is conjectured to have a regularity of determining moments, like are mean value and variance. Such a set is called a spectrum. It is further analysed using the scale of an average information content transferred between two humans. The average of their relative distance is known. That distance is a consequence of a number of different factors, e.g. habits, local environment, daily dynamics, etc. The distance serves as a representative of these factors. It is assumed that average distance and job intensity, number of mutual activities etc. on average are related.

The significant dynamics of communication innovations is observed as constant and rapid development of communication devices, protocols etc. It brought about the myriad of possibilities utilizable in communication. Because of that, in more and more occasions it is not the environment but the human characteristics which determine the realized communication means. Therefore, the utilized set of communication means is projection of human characteristics, as a socio-biological construct, onto the environment. The elements of the utilized set are exploited in accordance with their capability to transfer the characteristics of human states with certain rate. In principle, the average information transfer is calculable, making possible the ranking of means of communication. Let us illustrate these points continuing with the SMS; it is documented that the form of SMS is suitable in initiating communication. If stimulating, the SMS-based communication rapidly, i.e. after at most few messages, transforms into other types of communication that enable the persons involved to enhance the rate of information transfer, e.g. use of telephone or face to face communication [2]. Contrary to that, the SMS-based communication may cease sooner or later, depending on whether the quantity of information to be transferred is marginal or irrelevant.

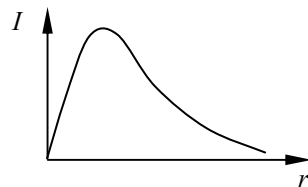
The averages of utilized means of communication of a human are, overall, relatively stable, thus making possible correct and meaningful definition. The set of utilised communication units, which are represented in some average, when ranked according to the rate of information transfer is a *human communication spectrum*.

The hypothetical shape of a human communication spectrum, presently, is delineated in Fig. 1. In it, the assumed distance-dependent average intensity  $I(r)$  of transferred quantity of information is shown. The transfer may bring about attractive or repulsive interaction.



**Fig. 1.** Presently assumed form of average human communication spectrum.

In Fig. 1 the assumed, idealisation is sketched. It is formed from all existing communication means, each of which generally contributes like is shown in Fig. 2.



**Fig. 2.** General contribution of a communication mode to the human communication spectrum.

The distance for which the maximum of  $I$  in Fig. 2 is achieved depends on the mode. E.g., it is the least for gustative, then tactile, olfactory, auditory and visual communication. This list is subject to gradual change as underlying technological basis (presumably electronic in origin) broadens the list of artificially formed media, which besides existing audio-visual, shows tendency to include the olfactory and tactile channels. Such a media have more pronounced collective character in comparison with the non-electronic ones.

## CONCLUSIONS AND PROJECTIONS

Relating the origin of communication with the individual human dynamics induces the need for different interpretation of environment, which becomes the collection of functionally determined units – elementary environment excitations (EEEs). In this article the EEEs related to the communication are analysed. They are related to the human characteristics and operationalised in the form of human communication spectrum. It is the ordered average of communication means. The ordering is performed by the average contribution to the overall information transfer between the communicating humans.

In order to deepen that interpretation in further work the data about the communicating habits need to be collected and analysed. Suitable part of the available communication means is the electronically based communication, as it is recorded and consists of discrete and well-separated units.



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## KOMUNIKACIJA IZMEĐU LJUDI KAO IZMJENA JEDINICA PARAMETRIZIRANE OKOLINE

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### SAŽETAK

Komunikacija između ljudi većinom je ostvarena putem medijatora. Medijatori su jedinice okoline kojima je u lokalnom skupu vrijednosti pridružena funkcija. Upotrebljava ih se tako da je odgovarajuća promjena stanja ljudi optimirana.

U ovom radu izložen je pristup ljudskoj komunikaciji s naglaskom na medijatorima. Interpretacija slijedi koncept međudjelovanja putem medijatora razvijen u okviru fizike. Razmatra se tvrdnja da je skup medijatora, koje ljudi upotrebljavaju, dobro definiranog prosjeka. Uprosječen skup omogućuje pouzdanu interpretaciju spektra komunikacije ljudi. Razmotrena je relacija između intenziteta spektralne komponente i osjetila te intenziteta međudjelovanja.

### KLJUČNE RIJEČI

ljudska komunikacija, pobuđenja okoline, medijatori, spektar komunikacije