3D method of the analysis and prediction of driving of stock quotes in short-term perspective.

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Abstract

As a result of search of objective (settlement) methods of the analysis and forecasting of movement of the prices at a stock exchange, the fundamental role of parameter "the maximum deviation of the price from Open by the current moment sessions" (it is named "Base") has been found out.

Base use allows to present session in the form of object with the developed geometrical form-structure. Structure elements are accurately enough localised in space. Structure, as a whole, keep the configuration, at least, some months.

The object is a set of attractors to which the Price and "avoiding areas" for the Price is drawn.
The object, as a whole, has 4 measured character. It is represented in three "spatial" variables plus the coding by colour. Variables are: the transaction Price, Base, a session Present situation, Probability of the transaction to occur till the end of session. All variables have unequivocal numerical character and, thus, are strictly objective. Spatial variables set conditions of realisation of the transaction, the coding colour shows probability of the transaction.

In article the algorithm of construction of Object is given, the basic idea of practical use of Technology is described.

For today the Technology works in current session, i.e. is applicable, while, to day-trading. Use of Technology and supervision with its help behind the market, has shown high degree of conformity of a reality. It has allowed to offer qualitative model for movement of the prices.

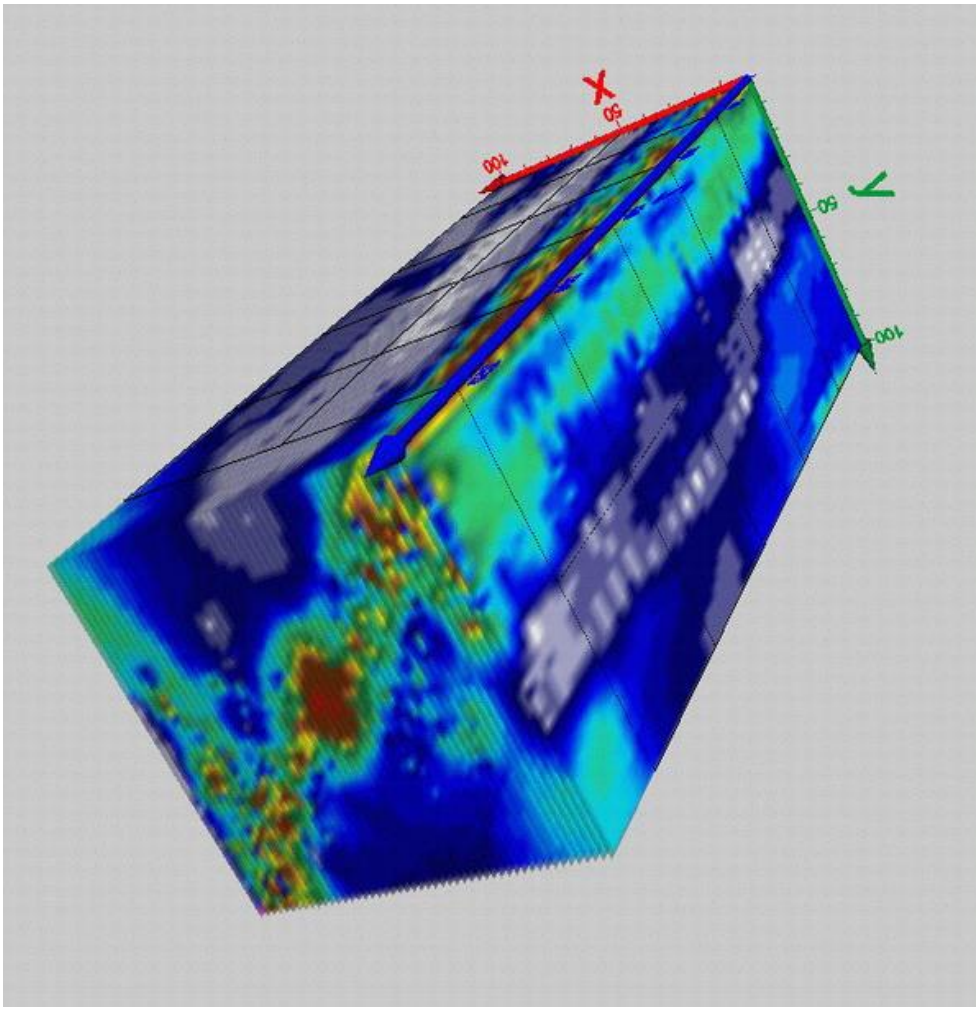
Drawings - 5.

Keywords: 3D Technology of the analysis and forecasting of the prices in the exchange markets, movement of the prices in the markets, an attractor, avoiding area, pulse movement, casual wandering, «Relief DS», a day-trading, a stock exchange, the organised market.

I. As a result of searching objective methods of the analysis and forecast of prices development at stock exchange, the fundamental role of parameter: «the maximal deviation of a current price from Open to current moment at a session» was detected. This parameter has been named “Base”.

It has appeared, that then using that one can represent a session in the form of an Object with rather developed geometrical shape-structure with its elements precisely enough localized in space and, as a whole, they save their configuration during time intervals which can be measured as several months at least (Fig.1).

Figure 1



In its “physical sense" the Object can be easily apprehended as maps of structure of PROBABILITY for realization of transactions (for a wide range of prices) under certain conditions (in sense of "conditional probability"). These "conditions" have exclusively numerical character and immediately are equal to the values on coordinate axes.
The set of coordinates in which the object is being constructed, consists of 4 variables and include: the Price (axis X), the Base (" the maximal deviation" - axis Y), the current Time of session (axis T) and the Probability of transaction (axis Z, color). Obviously by virtue of the nature of these magnitudes, they easily and uniquely are digitized.

The object is being constructed on the basis of contemporary market records in relative magnitudes. Having applied it to current values of the prices (that can easily be done) and "imposing" the Marker mapping last, just occurred transaction to the Object, we have an opportunity in each present situation of a session to observe the level of probability of transactions which they occur on. Simultaneously we see enclosing structure of probability and, thus, we can make our forecast and namely: to take a local area of higher probability (one of those situated close by) as our aim for short-term driving of price.

By virtue of construction of the Object by means of the elementary, cleanly mechanical algorithm on the basis of historical data (transaction reports of the previous sessions), we have an opportunity for objective, historically justified analysis and forecast.

II. In general, the idea of this method can be described as follows.
Let's assume, that the Marker which represents current market, has appeared in the field of low probability, an area of high probability (area of "peak") which is precisely localized is situated nearby. It is obvious, that the most natural estimation of the situation and the most objective, historically justified forecast of its development

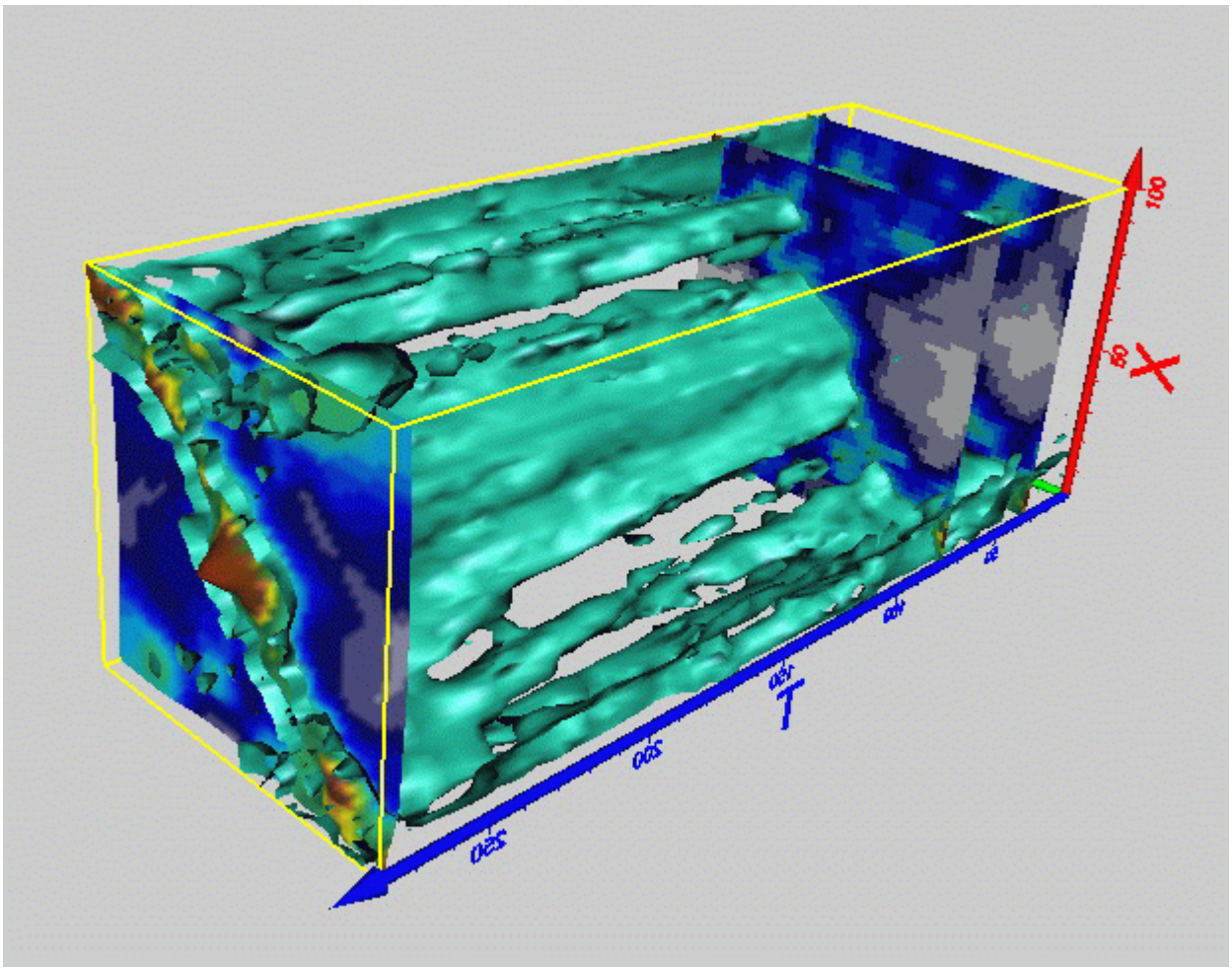
is the conjecture that the Marker, in the consent with existing distribution, will shift to the area of peak.
Coordinates of "peak" of the Purpose are read out directly from the coordinate axes: X (Price), Y (Base), T (Time). X the coordinate of peak is the FORECAST of those Prices (under condition of Yj) which are expected in one of the moments of the near future: from present moment Tj and till the moment of completion of session. Certainly, such forecast is not an instruction. For example, regular strong driving of "today" could be considered either as helping or as a stirring factor.

Practical embodiment of the specified approach will be, most likely, the following strategy: opening of a position during the moment "now" in a direction of Peak, with simultaneous statement of the inverse transaction at the price of Peak.

To the present time this procedure can to be applied to the analysis and forecast of prices development during a current session (i.e. to pure day-trading) and this application has obtained already prevalent though not absolutely exact title "3D Technique of the analysis and prediction of driving of the prices at a stock exchange in short-term perspective ".

III. Since dimension of the constructed object is equal to four (the Price, Base, Time of session, Probability of the transaction), it eliminates practical operation immediately with it.
Operation with 3-measured object also can call some difficulties, and therefore for real operation the set of conventional "flat" Maps, is used, for certain instant Tj each. The specified set of Maps, actually, is a set of sections of 4 Objects planes, perpendicular axes of time (Fig.2).

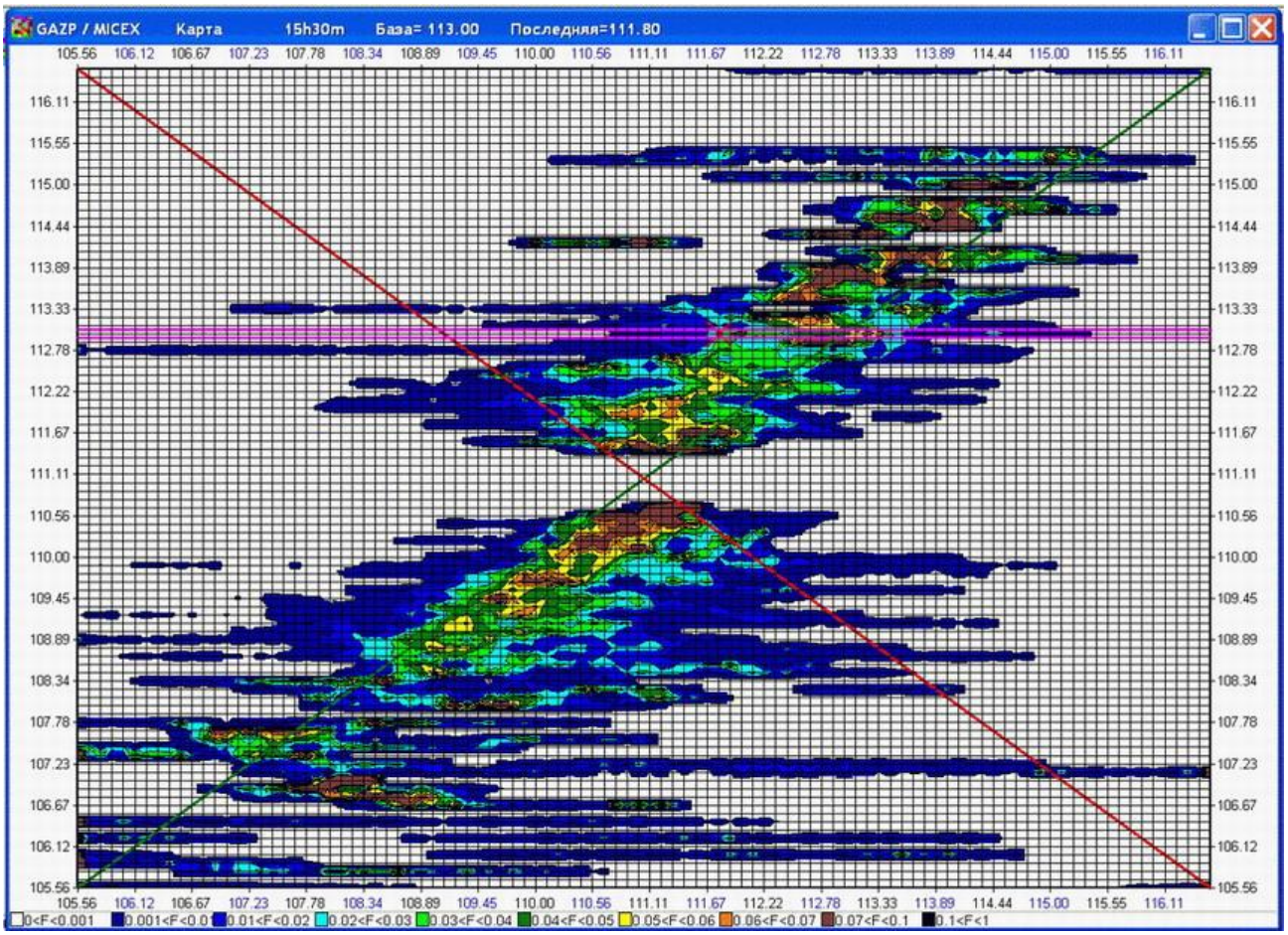
Figure 2



The set 3D Maps is constructed in a style of «maps of levels » for a specific instrument and for some selected instants in coordinates: the Price (axis X), the Base (axis Y), the Probability of the transaction (axis Z). The

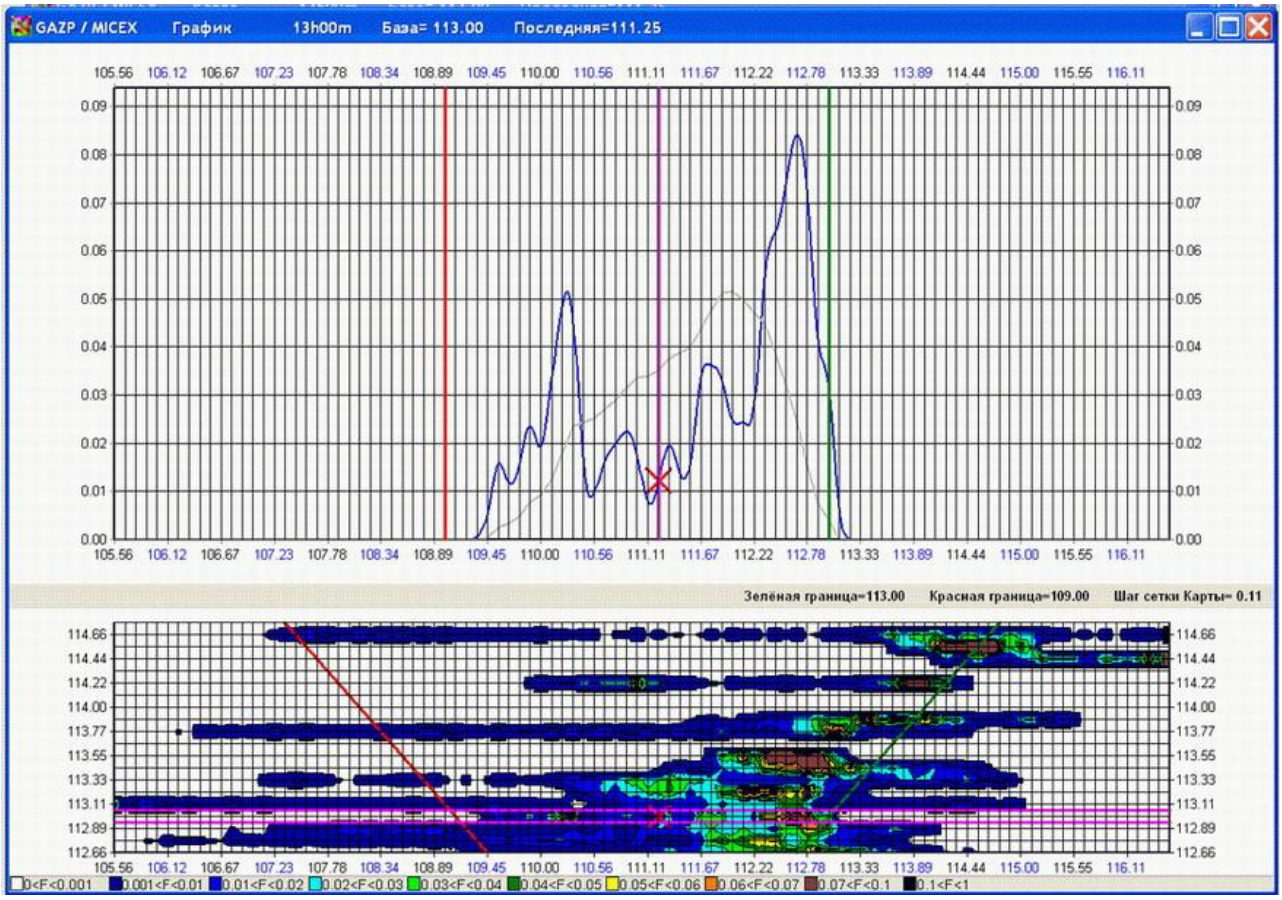
relief of Probability is coded by color in the style of conventional geographical maps (Fig.3). The increase in probability of realization of the Transaction is coded by color from dark blue, through green and yellow to black. Thus, value of probability Z in a point [X, Y] Maps «j» (i.e. for moment Tj) is read out through a color gamma.

Figure 3



In addition, for practical convenience, on current Base (Yi) the section of a relief of the Map of a vertical secant is made by a plane parallel to an axis of the Prices (X). The turned out section, i.e. the graph of a probability density of realization of transactions, is drawn in easily perceptible form (Fig.4). Near to this graph the Fragment of the nearest environ of the Map is drawn.

Figure 4



As mentioned above, to coordinate oneself in a current situation in a condition "on-line" a moving Marker is applied on the Map which constantly maps last transaction that just occurred, i.e. displays the current market condition.

Thus, visually we see something rather similar (visually as well as by its meaning) as on a GPS-sceen: "a geographical map" with a moving Marker.
The forecast of the Price is made on the above described algorithm and both the Graph, and the Fragment are used.

IV. The Algorithm of construction of Maps is purely mechanistic and can be described as it follows:

1. Instants of session are selected for which Maps are under construction, (for example 10:45... 13:15, 13:30, 13:45... 18:45). Actually, they are the coordinates of sections of the Object made perpendicularly of an axis of time T in these points (Fig.2).
2. The historical range of data is selected on the basis of which the Maps to be constructed (for example, from 01-01-2006 till). Data should be detailed, for example, we use archival transaction reports of sessions for a whole period selected.
3. The emitter is selected for which the set of Maps will be constructed (for example, LKOH).
4. In a cycle under archival Reports, for the next Map (i.e. for moment Tj, for example for 14:45), the Base, i.e. a relative maximal deviation from Open for a selected moment to be determined: Yj = ((maxTek/Op)-1)
5. For every each transaction AFTER THAT moment (i.e. in this case later 14:45) a relative coordinate is evaluated: Xk = ((Price (k)/Op)-1).
6. Number " 1 " meaning, that there was a transaction to the above-stated parameters (Xk, Yj), it is added to the number which is already the corresponding cell of an array [Xk, Yj].

As a result of handling one report we shall get one line of "television monolayer scanning" Maps Tj. Having treated large enough number of reports, we shall fill with lines all visible field and thus we shall get a full Map (Fig.3).

As it is obvious from algorithm of construction, in a method neither expert estimations, no opinions of analyzers are used. It is absolutely mechanistic and, therefore, its result can only be one of the two: either chaos, or the real FACT.

We detect **the FACT**.

This fact is that probability for the price to bear a defined value R (under certain conditions (Yj, Ti)) is not casual, and has strongly pronounced not Gaussian distribution. And this distribution is saved for historically long period of time, and its relief has some regular, non-analytic, multimodal shape (Fig.4).

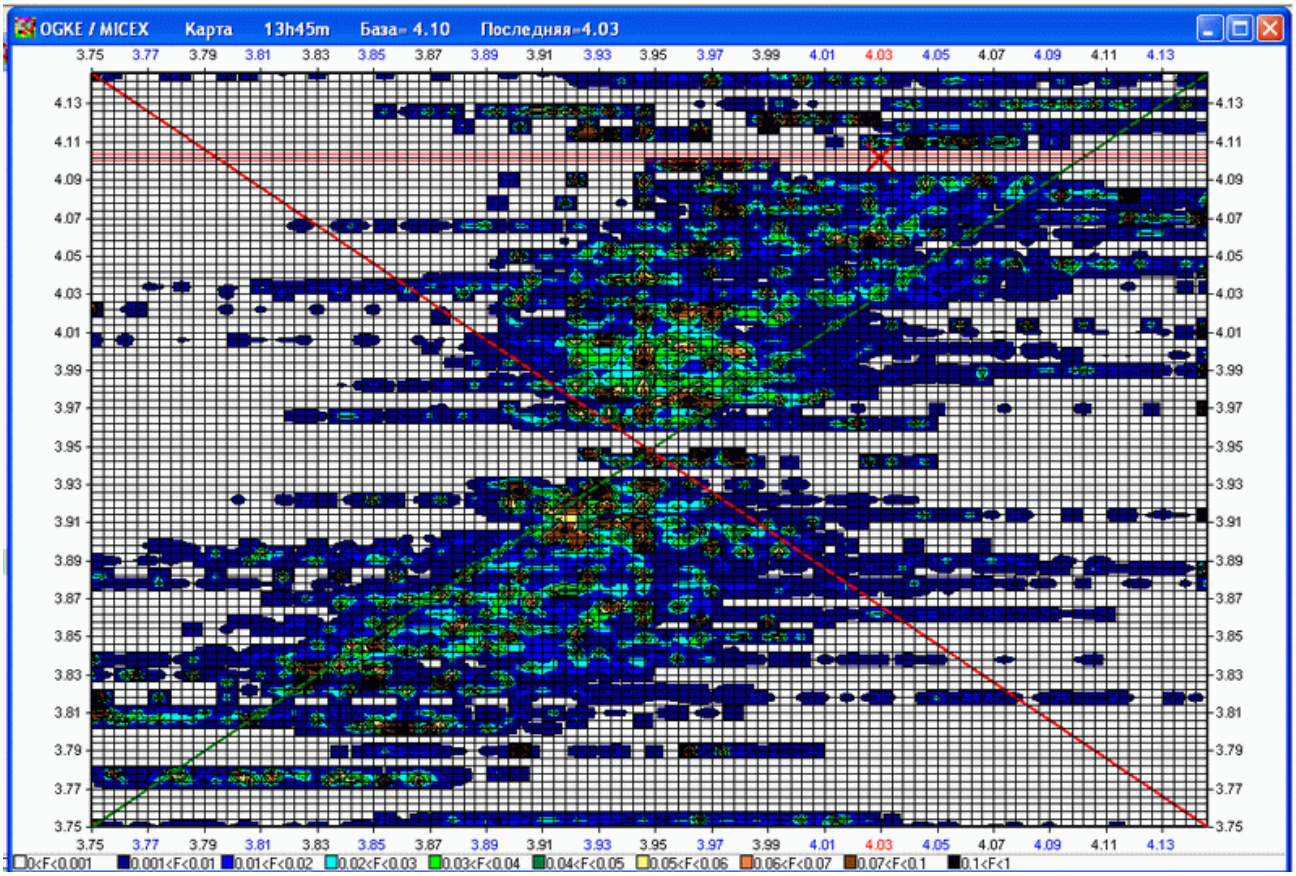
V. The areas of higher probability of realization of transactions naturally are named as “the attractors", i.e. points of attraction for the price. "The Peaks" correspond to them on section of the Map, i.e. on the Graph.
The attractors are constantly observed on standard graphs (X= Time, Y= Price) and can be identified as «levels of support and resistance» which usually try to explain different "round" values of the price. The relativity of coordinates in which Maps are being constructed, clearly shows inaccuracy of this opinion and of more deep reasons of their origin.

The relief of probability ("figure" of Maps) is rather static in historical periods (at least some months). It is obvious, that internal regularities of the market which shape this relief also remain steady and are obviously of not-random character. Thus, these regularities do not vary instantly.
From this follows, that "today" the market should behave, as a whole, is similar to how it behaved during the previous period. In particular, the Price should be attracted to existing attractors and avoid areas of the reduced probability.

Thus, after binding to the current real prices, we not just receive a picture with interesting information on historical behavior of the market. But we receive the Map-forecast of distribution of probability of realization of transactions for a current session. And this forecast is digitized in real magnitudes and given for wide ranges, both the prices, and conditions.
The binding is carried out easily. For this purpose "today's" Open becomes attached to the central point of the Map and the scale on axes is recalculated in appropriate way.

Maps are being constructed on the basis of rather good statistics. The number of "references" in peaks of a relief regularly reaches tens and hundreds thousand "references" whereas the grey basis of the Map is the ”O” level. It is obvious that using such statistics the "mountain" relief of the Map is not a casual picture of fluctuations, and real distribution of probability.
On Fig.5 the Map with small statistics is displayed. It is clearly visible that though it is extremely fragmentary and not informative, but still has rudiments of structure. The "noise" field, a type of picture on TV screen which was not set up has absolutely different character.

Figure 5



VI. The Determined regularities have allowed to offer following model of driving of the prices in the exchange market.

1. The process of price driving at stock exchange market has two components: casual and more or less determined ("impulse"). Each component determines a character of driving with different, constantly varying weight. A Brownian motion, in general, is relapsing, i.e. it does not change the Price crucially. The impulse component is crucial for essential change of prices (and trends).
2. There are areas of the higher and lower probability of realization of transactions. Their origin is not known. In coordinates the Price - Base they are visualized as “scattered” attractors in space and «areas of avoiding» for the Price of different intensity.
3. The price (Marker) attracts to the attractors and pushes out from «the areas of avoiding»
4. Coordinates of attractors are historically steady enough and their interposition is static though is not regular.
5. Intensity of an attraction of the Marker to attractors historically slowly varies. It looks, as slow change of height and outlines of details of a relief. It is supposed, that the repulsive potential of "areas of avoiding» varies also.
6. Intensity of a specific attractor during session also varies. These changes have oscillating character for some attractors and are of «amplification - weakening» type.
7. The Price spends most part of time (70-90 %) by the next attractor, fluctuating in the area of peak. Significant, regular change of the price does not happen.
Attractor to attractor hopping take insignificant time (10-30 %), but the basic changes of Prices happen during these moments.
8. As a result of external influence to stock exchange, the Marker acquires an impulse to grow or fall. The influence can have one-time or durable effect. The magnitude of impulse apprehended can stay in a wide range of values.
9. As a whole, driving of the Price (Marker) can be described as the following endless loop:

(The moment k). The price "is captured" by an attractor (Xi, Yj) and fluctuates for some time dT (k) in the field

of "peak" making basically a Brownian motion (it is possible with small drift). As a whole, driving is relapsing.

(The moment k+1). In result of unpredictable outer influence which is not described by this given model, the Price acquires "impulse". As a result the Marker moves in one of directions (the Price either grows, or drops) determinably enough.

(The moment k+2). The marker moves along relief passing though series of attractors. Depending on a ratio of received "impulse" and "force of an attraction" these attractors, "impulse" driving is exhausted. There is "capture" of the Price (Marker) by one of the attractors (not necessarily the nearest to the first).

(k+3). Transition to point (k).

Working with the program for visualization 3D Techniques «Relief DS», shows a good degree of conformity of such a model to reality.

VII. The use of Technique shows impressive results. In particular, there was a steady impression that even today at the initial stage of development of Technique, its application allows to ensure profitableness (on volumes of day-trading) in area of 0.5 % during a session (the Moscow Interbank Stock Exchange, the Russian Federation).

It became simultaneously clear, that to get a steady result on historical intervals one must have at least a common prediction of a situation for the nearest days. Particularly, in case of strong driving of "today", one should have some understanding whether this driving will be compensated within the next few days, or is this the beginning of a noticeable trend?
Still it is not clearly for the time being if solving of this problem is possible within the limits of 3D Techniques.

The future of Technique as a method looks quite clearly. Most likely, perspectives of practical application are rather favorable by virtue of obviousness, objectivity and extensiveness of the accumulated information. Also it is not necessary to overlook, that Techniques is one of only two existing ways of observation of the market.
Generally speaking, the problem of the analysis and prediction of stock quotes has received the objective and powerful instrument which henceforth allows to speak about the market in language of mathematics and to research it with standard scientific methods.

As «a reserve for the future» it would be desirable to state a general impression, consisting that many ideas and methods of spectroscopy, physics of a hard body, statistical physics and other sections of physics, can appear useful, or it is direct applicable for the further operations in the given direction.

And in summary it is necessary to mention the following:
The author clearly understands, that «a price attraction», «price driving», «force of an attractor» and so forth, is simply convenient exposition of collective behaviour of players, and Maps of attractors are, as a matter of fact, fear and greed maps.
However it appeared rather productively to consider the given question abstractly. In this case it is appropriate to draw analogy to physics when results of simple mechanical movements of molecules in gas on a practical level more conveniently and easier to describe by means of fictitious magnitudes, type "pressure", or "temperature".

The patent of Russian Federation N 2295156 with a priority from 19-04-2005 was issued for the Technique of the analysis and prediction.

The «Relief DS» (RDS) program was created for visualization 3D Techniques (Figures 3 - 5). For the time being (the 2014) the program works only with the Moscow Interbank Stock Exchange, Moscow, Russia.

Figures 1 and 2 were executed in a demo of the version of program Voxler of Golden Software corporation**.** The author expresses the sincere gratitude to its developers for this, practically unique, a yield.