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## **LINEAR PSYCHOLOGY (CALCULATING HUMAN BEHAVIOUR)**

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**Abstract:** In this study, human behaviour, and events started by humans and effecting humans have been calculated with a determinist method. Model has been established with the help of matrix and determinant subjects of linear algebra. Events that are caused by humans and effect humans, and take a certain time, and human behaviour have been calculated as numeric values. With this mathematical model, human behaviour has become deterministically calculable to a certain level. Calculation of the reduced level of human emotion and behaviour may be perceived by robots. In this way the robots behave like human by understanding of human emotion and behaviour.

**Keywords:** Calculating human behaviour, linear psychology, mekara constant, robot behaviour

### **Introduction**

Social sciences and various disciplines had done many studies on human decision and judgement [1]. Understanding and modelling the decision process of humans is the main study point of human decision studies [2]. Studies on decision making can be grouped under two main titles; these are decision modelling studies and studies about monitoring decision making process [3,4]. Examples of findings from these studies include developing methods for a database and developing a new algorithm to build decision making models [5].

Many studies were made on decision making, primarily by psychologists. The purpose in these studies was to define decision making based on mimic, gesture and deciding instead of human beings [6]. Representing someone's decision with the help of a simple linear model is called bootstrapping. Many studies present evidence on bootstrapping applications, supported by linear models [7,8,9,10].

Linear psychology studies don't mean psychology is linear. This study tries to explain certain events originating from human actions, effecting humans and take place in a certain time in a numerical way with the help of subjects studied under linear algebra. The word psychology is used because this study analyses events originating from human activities. The necessity for linear psychology arose from lack of a real point of view for events, feelings and thought affecting humans.

### **The Extent of Linear Psychology**

Linear psychology can calculate all the events originating from human actions, taking place in a certain time and effecting humans, with the method developed. Calculable events include a variety of events from breathing to getting wed, from a murder to a birth, from an accident to a war, and even thought and feeling within ourselves, all of which can be calculated with the method developed. Also the size of the effect of human indulgence and colour preferences could be calculated. This means preferences and colours can be discussed and calculated with linear psychology. When calculating events, humans that are partly or fully cause of the event, amount of time affected by the event and number of people getting affected from the event are taken into consideration. Effect here means physical effects perceived by humans' five senses.

The calculated value shows the effect of these events over the world. For example, let's say there have been

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two traffic accidents, in USA and China. For someone in Turkey learning about these accidents, it would make sense that these two have more or less the same effect. We should take the world population as a big crowd at equal distance to everything. This person in Turkey learning about the event should be considered as part of this mentioned crowd distant to the event. Besides, when the parameters forming the events are equal, the effect of the events on world population is also equal. The proximity of the common sense result (the person in Turkey who learns about the news) and linear psychology results is obvious. This relevancy supports this study's appropriateness.

Another type of event we can calculate is the results. In all of the crimes worldwide, there's a criminal, effected people and a period of time while this crime happens. This tells us that all crime can be calculated with linear psychology. After the value of the calculated crime is determined, next step is the punishment. Punishment can be equalled to the crime. When calculating the crime, if criminal is one person, the person effected from punishment and starting the punishment is considered as one person. Because the criminal one gets punished and since the punishment originates from the crime of the criminal, the starter of the punishment is the criminal. The only unknown here is the amount of punishment. Also, the result willed to be found is the time. So we get an equation with one unknown. Solving the equation we can find the amount of punishment in days or years.

## Method

Linear psychology has this statement behind it: Even a day spent alone by one person has an importance and effect on the world. This word world used here can be defined as an objective evaluation centre independent of all the events, for this article. The actual problem linear psychology researches is this: How big is the effect and influence of these events, thoughts and feelings originating from humans and affecting humans for a certain period of time, for the world and those who experienced it? The scope of linear psychology can be described as all kinds of events that were started by humans and takes up a certain amount of time someone has experienced or ran into. The word effect reflects that it is assumed anything perceived by five senses of humans affect them. Only forgotten events can't be calculated. Even if only one person remembers an event, it has an importance, an effect, or left its mark on the world.

## Main Unit

The base of linear psychology is human life. It means, the basis of this study is "Even a day of living by one person has an importance". This main idea constitutes unit of the numeric value shown by linear psychology. This numeric value unit is determined as "Mekara", "MK" in short.

Mekara: is the amount of the effect of the events total that someone has lived to spend a day alone or only survive, on the world. According to this study the effect of the events on humans is a portion of the size. The phrase "effect of the size" tells about this.

## Calculating Human Behaviour or Events

Before calculating the events, event parameters should be generated. These are the number of people making the event happen, amount of time the event happens and the number of people affected by this event. All of these parameters are considered as axes. For each axis, the statements to be named unit vector on that axis has been determined. These statements have been named **i**, **j**, **k**. These statements represent x, y, and z axes respectively. Variables are used with statements representing change gaps on their own axes. Every variable is shown with **i**, **j**, or **k** vectors, whichever is their axis. This way of showing is similar to vectors'.

## Vectorial Expression of Events or Human Behaviour

Unit vectors have been used to determine event first vector, event last vector and location vector. Event vector has been defined as general name of these vectors. Matrixes have been used in events' calculation. Linear algebra subject matrix is a system where statements are placed side by side and one under the other. Matrix values are determined by determinant operation. When events are calculated, variables are shown in matrix form. With determinant we get event last vector. Do not confuse event vector with vector in physics. The phrase vector in event vector is used because of the method used for expressing the events. In this method, all vectors related to the event are shown as equations related to **i**, **j** and **k**. Because of this expressing method, the term vector is used. The reason behind designing events statements as related to **i**, **j**, and **k** is that all variables can be used in same statements. Also, in calculation of the importance or effect of the event, the last vector's force has

been used. This calculated force is similar to that of physics vector force. The first line of the matrix is defined as  $\mathbf{i}$ ,  $\mathbf{j}$ ,  $\mathbf{k}$ . Thus, the result acquired from determinant is an event vector related to  $\mathbf{i}$ ,  $\mathbf{j}$ ,  $\mathbf{k}$ . This vector is called event last vector. Calculated force of this event last vector multiplied by Mekara constant gives us the effect on the world, the importance for the world. This coefficient is the number that equals the Mekara event last vector, acquired from the matrix formed by Mekara definition variables, to one. This coefficient also has its place in the equation. This is called Mekara coefficient.

This study aims to get a real perspective on the events by calculating both the importance of events, feelings and thoughts and the value of the effect on those who experienced the event according to the world.

If successive events are parts of another event, these successive events can be summed up to calculate the importance of the event they are part of. The use of matrixes is that side by side and one under the other expressions only make sense when thought as a matrix. The primary finding of this study is that all events originating from human actions, affecting humans and take place in a certain amount of time will bear a value.

### ***Determining the Variables about the Event***

Three variables necessary and sufficient to calculate the events should be known. These variables are number of people making the events happen, the amount of time between the event happens and time required to get calculated, and number of people affected from the event. At all levels of operation, significant number of digits after the coma have been determined as three. These variables form the lower two lines of a 3\*3 matrix. The determined number of variables shown on the axis the unit vector represents is placed on the unit vector's column. Here x, y, and z axes are taken as the axes variables are shown on.

### ***The Meaning of the Axes Events or Human Behaviour are Shown on***

—x axis represents the number of people making the event happen. Unit vector is  $\mathbf{i}$ . Unit vectors represent the change gaps between variables. The position vector forms the second line of the matrix. Position vector has been designed to easily express the events affecting large groups of people or remaining in effect for long periods of time. Each person has been shown with a unit vector in location vector. When placing the elements into the matrix, numeric values of unit vectors for first vectors for location and event vectors are placed. Event first vector and event last vector mean the first vector created for the event and the last vector acquired from the event respectively. Event first vector is designed to express the event more clearly and detailed. In —x axis, each person making the event happen is represented with a unit vector.

A satisfactory mathematical model presents two contradicting situations: It has to be detailed enough to represent a mathematically accurate real world event, but simple enough to make a mathematical analysis. If the model is detailed enough to represent the real world event, it can be hard to make a mathematical analysis. If the model is too simple, the results are not accurate enough to use. Thus, there's an inevitable gap between the real world event and the mathematical probability. Establishing a model to unite reality and probability appropriately is a very important step [11].

To realise this step, location and event first vectors are designed. Location vector is designed to make mathematical analysis easier and event vector is designed to provide reality of the real world event.

j vector is represented in —y axis. It represents the time period between the time our event happening and the time we want to make calculations for. In location vector, each year (i.e. 365 days) has been defined as a unit vector. In event first vector, each day is represented as a unit vector. This way we form the second column of the matrix.

Third column is the —z axis. —z axis shows the number of people affected from the event in the time period mentioned in —y axis. In location vectors, each 1000 (thousand) people are recorded as a unit vector. When calculating historical events (it is assumed that 50 years after the event happened it becomes historical), if some people from the event who has experienced it are alive, the number of people affected from the event from the time it happened and the time we are calculating for will be used. But if no one who has experienced the event is alive, then the historical event is calculated indirectly. That means we cannot calculate the effect of the event itself, but the effect of knowledge of the event. For time, we use the time between when it happened and the time we are calculating for again. When we calculate this way, we say calculated events are handled indirectly. What's calculated is the importance of the event for the world, or the mark it has left. But since the effect of the event over the world and the effect of the knowledge of the event over the world are both originating from the event, we assume we indirectly calculate the effect of the event over the world. The statement written for axis —

z is what we have found starting from the number of people having the knowledge. In linear psychology, we use the number of the people affected by the effect we are calculating for. It means if we are studying the effect of the knowledge of an event we use the number of people who knows the event, but if we are studying the harms of an event then we use the number of people harmed by the event. If we want to calculate total effect of an event, all these effects are added up.

**Acquiring MekaraConstant, Mekara Eventand Mekara Matrix**

Let’s calculate the mentioned event using the data of Mekara term we formed starting from linear psychology logic. We said: the effects of the event(s) that happen to a person in a day in order for him/her to only survive over the world is 1 MK. Now we confirm it:

- x axis; There is one person doing the living/surviving action.
- y axis; the surviving action we want calculate lasted one day.
- z axis; the recipient (i.e. survivor) is one person.

Here, the people who know about this is not important. Because here the origin is human life. Besides, since this event is in Mekara definition, this is called the “Mekara Event”. Let’s form the first vector and location vector with this data.

Event first vector is shown as “V<sub>01</sub>”. We said: when forming the event first vector, each person on –x axis is shown as a unit vector and unit vector is **i**. Each day is a unit vector on –y axis and unit vector is **j**. And on –z axis, each person is shown as a unit vector for event first vector and unit vector is **k**. By adding these variables together vectors can be formed. It means  $V_{01} = 1i + 1j + 1k$ .

Location vector is shown by “K”. When forming location vector, each person on –x axis is shown as 1**i**. On –y axis a year is 1**j**. Since time in this occasion is one day, it will be shown as 1/365**j**. But we can’t use fractions in matrix, so we use approximate value of 1/365 as  $2,740 * 10^{-3}$ . On –z axis, every  $10^3$  people are shown as 1**k**. But since the number of affected people in this occasion is one, we write  $10^{-3}$ **k**. In terms of academic notation, if the values to be put in are smaller than 1, it is better to write them as multiples of  $10^{-3}$ . With this information we write  $K = 1i + 2,740 * 10^{-3}j + 10^{-3}k$ . If values are smaller than 1, first we write them as multiples of  $10^{-3}$  and then round them off to 3 significant digits after the coma. After location and event first vectors are formed we can form the matrix.

$$\begin{bmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 1 & 2,740 * 10^{-3} & 10^{-3} \\ 1 & 1 & 1 \end{bmatrix}$$

This matrix has been formed starting from the definition of Mekara. That’s why it is called “Mekara Matrix”. We can get the event last vector by getting the determinant of the matrix.

$$V_{os} = 1,7 * 10^{-3}i - 0,999j + 997,3 * 10^{-3}k \quad (1)$$

The force of the last event vector is the square root of the sum of squares of the coefficients of unit vector. The force of the last event vector is:

$$VOS = 1,413 \text{ units.} \quad (2)$$

Both by definition and linear psychology logic, the effect of this Mekara event should be 1MK. The constant to achieve this is called Mekara Constant and it is shown with  $\mu$  (mu). Its size is  $[\mu] = \text{Mekara}$ . Its value is  $1/1,413 = 0,708$ . We have found the effect of Mekara event over the world. The model has been designed to also give us the effect of the event over who has experienced it over the world. The meaning of constant  $\mu$  is this: It can leave an impact on people as big as 0,708 of the size of the events size. This explains the effect of the size expression. This value’s also very surprisingly close to  $\sin(45^\circ)$  value. The model this study gives us is like below.

$$MK = \mu * V_{os} * (\text{world population} / \alpha) \quad (3)$$

If we're researching the effect on world population, we take  $\alpha$  (alpha) equal to world population. If we're studying the effect on those who experienced the event in comparison to the world, instead of  $\alpha$  we put any of the event or location vectors from column i. This means the bigger the world population and fewer the number of experiencing people, the event is more effective for those who experienced it. If we adjust this to Mekara Event; the larger the world population, one person's daily life gets more and more important to that person compared to the world.

### Expression of the Model with a Real World Event

Let's show the model with an example.

A company owner decides to rent a billboard sign. Calculate the effect of the place;

- a) The effect of the size of the advertisement over the world (or the effect in short) if it's a 30 day rental of a 100.000 daily visitor spot,
- b) The effect of the advertisement over the world if it's a 45 day rental of a 200.000/3 daily visitor spot
- c) The effect of the advertisement over the world if it's a 20 day rental of a 150.000 daily visitor spot.

Interpret the results after you find all of the effects above.

### Solution:

First, we form all the general matrixes as told in linear psychology article.

a) i	j	k	b) i	j	k	c) i	j	k
1	30	3.000.000	1	45	3.000.000	1	20	3.000.000
1	0,082	3000	1	0,123	3000	1	0,055	3.000

Determinants of these matrixes give us event last vector. Multiplying the event last vector with Mekara coefficient, we find the advertisement effect in Mekara units.

$$a) \mathbf{Vos} = -156.000\mathbf{i} + 2.997.000\mathbf{j} - 29,918\mathbf{k} \quad \left| \mathbf{Vos} \right| = 3.001.057,314 \text{ unit}$$

$$MK = 0,708 * 3.001.057,314 = 2.124.748,578 \mathbf{Mekara}$$

$$b) \mathbf{Vos} = -234.000\mathbf{i} + 2.997.000\mathbf{j} - 44,877\mathbf{k} \quad \left| \mathbf{Vos} \right| = 3.006.456,21 \text{ unit}$$

$$MK = 0,708 * 3.006.456,21 = 2.128.570,997 \mathbf{Mekara}$$

$$c) \mathbf{Vos} = -105.000\mathbf{i} + 299700\mathbf{j} - 19,945\mathbf{k} \quad \left| \mathbf{Vos} \right| = 2.998.838,775 \text{ unit}$$

$$MK = 0,708 * 2.998.838,775 = 2.123.177,853 \mathbf{Mekara}$$

## Dicussion

### Interpreting the Example Results

Table 1. Increasing the effect with wider time gap for an event

ExampleCode	Number of Event Starters	Number of Effected People	The Time the Event Happened	Size Order of the Events According to Linear Psychology
A	1	3.000.000	30 days	2 (Medium)
B	1	3.000.000	45 days	1 (Largest effect)
C	1	3.000.000	20 days	3 (Smallest effect)

The number of effected people is the same on each question. But this equal number is the total number of effected people at the end of the rental period. Since the total number of people is equal, the effect of a billboard rented for a longer period has a larger effect than shorter rentals. This means that; if we'll reach the

same number of people at the end of the advertisement period, the longest advertisement application can be chosen. In other words, a  $2t$  time advertisement on a television channel with  $m$  viewers is more effective than a  $t$  time advertisement on a channel with  $2m$  viewers. This means if the channel with  $2m$  viewers demand a lira for  $t$  period of time and the channel with  $m$  viewers demand a lira or less for  $2t$  period of time, the channel with  $m$  viewers should be chosen. Or, after the advertisement sizes are calculated, the one with lower ad price per Mekkara unit should be chosen over the other. In this latter scenario, a price for one Mekkara effect is determined and thus it is easier to choose.

These examples are just one applied field of linear psychology. Linear psychology can calculate any human originated event that lasts for a certain period of time and effects people. In the previous example, the number of starters for the event was taken as one, because the advertisement decision came from the owner of the company. If this decision came from a board of directors, then that board would be the starters and number of members of the board would be used for calculations. If daily effect of the advertisement was asked, the numbers given in the question would be in use. But it is the total effect that's asked and the numbers are multiplied with number of days rented.

### Calculating Events and Pre-Requirements for This

With time, the effect of events over the world automatically grows. Events have to be remembered in order for them to grow and be calculated. Because forgotten events can't be calculated and events matter only as much as the mass of people that remembers them. The larger the number of people that know about an event, the larger the news. Thus, the power of press and media now has a real point of view. This means, media can increase/grow the news of the event by keeping it in coverage and increasing the number of people who knows about it. The effect of the news growing actually doesn't change the effect of the event. The increase is in the news' effect. But we can assume the effect of the event indirectly grew. The effect of the news overtook the effect of the event. For example let's take an event performed by a certain number of people for 10 hours and effected a certain number of people within these 10 hours. Actually, the event had come to an end within 10 hours. And the effect on the world can only grow with time. But if the number of the people who knows about the event is grown to very high values and the event is kept in agenda for days after days, the event can reach to very high numbers in comparison to our first calculated values for the event. But the news of the event is so very big we assume the effect of the event has also grown. Because it is the event that originates the news. So if any effect of the event increases, it means the event grows in that direction. If people are sad about the event, the saddening effect of the news can be calculated also. This applies to all feelings and thoughts originating from the event. This means, the effect of thought and feelings can be calculated when we know the number of people in that thought or feeling. The number of people performing/causing the event is fixed after the event is finished. Later on, the event grows with time and people under effect. This growth continues until everyone forgets about the event. These events can be originating from thoughts or feelings. That is, if the people making the event happen made it because of certain known thoughts or feelings, calculated values are expressed as the effect, importance or mark of those thoughts or feelings over the world. In this study we tried to calculate the effect over the people of the world under certain assumptions, not event thought and feelings. We can consider the effect of your spouse's love (for those married) for you as an example for thought or feeling originated event effects. How big is this effect? Or how important is your marriage for your spouse? This kind of thought or feeling events can be considered as main events which are sum of some other events. The parts of the main event are your priorities for this event. Let's take the love of a spouse for the other. When we are working on an event we take as a total of other events, we always assume the monger of the event as one person. Because we are not studying the effect of love of these spouses for each other over the world, but the love of one for the other. Define your priority events. For example if you think your spouse spending time with you is a way of showing their love for you, calculate the time from when you started living together until the time you want to do the operation for. People with an organised life can do this easier than the others. If you spend 8 hours at work, 8 hours sleeping and half of the rest with your spouse, that means you spend around a quarter of the time (or years) together. So, if you've been together for 30 years, you have only been together with your spouse for five years. The number of people affected from all events – only in this main event – is two. That is you and your wife. Define your priorities and approximate time you spent on them. Then, calculate these events as described above and add them up. The value you find is the importance of your spouse's love for you to the world. If you wonder the importance of this love for you over the world, multiply this number with the population of the world. This value you find is the importance of it for you, over the world. The value of that love in your heart can not be calculated so far, but for spouses with same priorities, this method creates a comparison. And this can create a real grading or a point of view to thoughts and feelings. For example the event of proposal. If your spouse had proposed at the biggest derby game of the country with numerous spectators and an even bigger audience (millions) on television, the impact over the world for this, is much bigger than a proposal at a romantic diner. Because all the parameters are vastly more compared to the dinner. But for your spouse, the effect in your heart is always more important than the effect of his/her love or the proposal over the world. The values we find in thought and feeling calculations are values for the world.

Personal values are incalculable so far. But a grading of effect or importance can be made for people known to have same priorities.

### **Some Unclear Calculation Events**

There are events to change nations' or states' destiny. Origins of these events can be secret services. Events as big as changing nations' or states' destiny can be calculated starting from different sources. Because this event's origin, when it's secret services, can be perceived as something else. When you take a different source for an event, you calculate the event different than the reality. So if the origin/source is wrong, the calculated result would also be wrong. Linear psychology can only calculate the visible and known effects of an event. This applies to other variables. So if there are various evaluations for variables, events would come out different depending on various evaluations. This creates relative results. This can be a minus part of linear psychology.

Since this study calculates events originating from humans and effecting humans for a certain period of time, natural disasters or ecosystem events that happen without human intervention cannot be calculated directly. But the effect of the news of the event can be calculated. As performer of the news event, the number of the news squad making the news is taken. As time passed, the preparation and publishing of the news is taken. As number of people affected, the number of people who get the news is taken. So starting from ratings for news channels or broadcast vicinity population, the number of affected people can be found. This is a hard way to get data, and it is very probable to get relatively false data. This can be a minus part of linear psychology.

### **The Effect of Linear Psychology in Courts and Legal Events**

All events originating from humans and affecting humans for a period of time can be calculated. One of the successful implementations of this model is matters for the courts. These are mostly human originated events. The originating number of people can be taken as the number of defendants. Time passed is the time from the beginning of the event till the it's over. If the defendant party is on the run, this adds to the time. That means if the defendant party runs away the event grows. If found guilty, that adds to the crime. Time must be calculated from the moment the defendant party attempted on the event. The number of people affected should be considered as the claimant party. The higher the number of defendants, the bigger the effect of events is. If the event had been planned for long, the effect is expected go up. The more people performing the event, the bigger the effect of the event. These expectations are there because the value of the matrix elements get higher. The punishment for the crimes could be equalled to the crime. The crimes of the criminals can be separately calculated. Defining axis is time here. The crime level for one who was there from the very beginning and one who joins later is not the same. When calculating crimes, time factor is calculated for each criminal separately. The number of people affected according to this timeline can also be determined separately. But the number of people committing the crime (event) is taken as total number of criminals. Each criminals rime is calculated separately this way, and all are punished according to their own crimes. The number of people making the punishment is one. Because punishments are calculated separately for each criminal. The number of people affected from the punishment is also one, the criminal. Here, only the number of days for punishment is unknown. So, calculating this unknown gives us the number of punishment days equal to the criminal's crime. These are calculated as effects of the event over the world. So,  $\alpha$  value is taken as the world population at the time of calculation. This study may help build a fairer world.

### **The Effect of Linear Psychology on Robot Programming**

With linear psychology, it is possible to calculate human behaviour in a determinist approach. This calculable behaviour could be transformed into an algorithm via a definition set defining human specific feelings. This way, the size of the events is calculated and they are given a meaning with pre-defined feelings. Robot will be put into a feeling of a known size and definition, acquired in a determinist fashion. If which feeling moment calls for which action is also determined in a linear fashion before, it will perform that designated behaviour. The size of the reactional behaviour will equal to that of the one he is exposed to. This way the robot will have a linear psychology. For instance, when a robot get sad because he is insulted, he will get sad proportional to the size of the insult. Same way, when respected, he can calculate how much respecthe will show. Also robots can make a size order for events they've faced and determine which event is bigger in which way with this developed method.

## Conclusion

As a conclusion, linear psychology tries to provide a real perspective to events caused by humans, effecting humans and taking place in a certain period of time. This perspective it has been working on could be achieved both by giving numerical values to events and being able to compare these values. We can define it as the effect, importance or the mark of the events, thoughts and feelings we are trying to calculate. Future studies aim to develop non-linear models to calculate human behaviour. This way, more complicated behaviour models will be designed especially for robots.

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