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Theory of existence

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1. Abstract

The present work develops a simple unifying theory, titled Theory of Existence, which tries to explain the bases of functioning of the universe. It presents a new interpretation for the space-time, using the concepts of energy and dimensions. Is based on the conservation of energy, the principle of superposition, and the distribution of energy along dimensions.

Simulations of a universe fragment were made in a digital system, and the data obtained, as well as the concepts of existence theory, were used to explain the main topics of known physics.

2. Introduction

One of the major problems present in today's physics is the unification of the 4 known interactions. It is believed that such forces come together at high energies, but only success with electromagnetic force and weak force has been achieved (Young & Freedman, 2009).

To discover an interaction, one must use some element that has such interaction, so that it is measured. In this way, we can not know if there are more interactions in nature, unless we have a means to measure it.

Each of the interactions is described separately, for certain conditions and types of particles. Thus, there is no theory that can explain all phenomena in any situation. Some interactions have similarities in their formulas, and some are not yet fully understood.

One of the properties present in the interactions is the principle of superposition, which is present in many physical equations. This principle states that the result of a function is the sum of all partial contributions. The mass, or even the electric charge, are superimposed functions. In equations, the sum of these quantities is often used as if they were only one. The forces, or even the fields, are also functions that, when added together, provide the resulting module.

Scale is an important concept in the interpretation of physical results. Each of the interactions has a maximum range, that is, the interactions can occur up to a certain distance from the center of the agent that causes it.

In the known universe, there is a large discrepancy in the scope of interactions. While gravity reaches distances of the size order of galaxies, a strong interaction encompasses lengths of the order of the size of an atomic nucleus. (Young & Freedman, 2009).

Energy is a physical greatness present in all physical phenomena. It is known that energy is not destroyed, it is only transformed from one form to another. Such a phenomenon is known as the principle of energy conservation. Two fundamental forms of energy manifestation are known: kinetic energy and potential energy.

Kinetic energy is an energy associated with motion, that is, with the velocity of a particle. It depends on the square of its speed, and the mass of the particle. Potential energy is an energy associated with its position, and depends on an interaction. Such energies can be converted to one another in certain situations.

When a particle has velocity close to that of light, relative to a particle at rest, its time and space scales are altered according to the theory of special relativity. Such scales also change when a particle is in a gravitational field, as the theory of general relativity states. The concepts of space and time are dependent, and in this way it is understood that there is a space-time tissue, which is distorted by the presence of matter (Young & Freedman, 2009).

At reduced scales, quantum mechanics is applied. Such theory explains the wave behavior present in the particles, which can not be explained by classical theory. It describes a particle in terms of the probability of finding it, and the description of the phenomena is based on the Schödinger equation.

While the theory of relativity is applied at wide scales, it can not be applied on the scales of quantum mechanics. Such theories are incompatible, and one of the ways to solve is the theory of strings. Such a theory states that all particles are made up of energy with different frequencies, on a reduced scale. Its mathematical formulation is complex, and demands the use of 10 spatial and 1 temporal dimensions. Although it solves some of the problems of physics, this theory has not yet been proven experimentally.

In physics there are still many open questions that are difficult to explain in present physical theory: what is dark energy, or even dark matter? What were the interactions in the first intervals of the universe like? What causes the particles to become stable?

The standard model is a model that allows understanding the fundamental blocks of nature and their interactions. It includes three families of particles: leptons, quarks and interacting particles (Young & Freedman, 2009).

The theory of grand unification attempts to unite the electroweak force and the strong force. Already the theory of everything is an attempt to unite the 4 known interactions in only one (Halliday, Resnick & Walker, 1996).

There is still no general model for all things, much less a computer algorithm that can directly simulate a fragment of the universe, and have its behavior equal to the real.

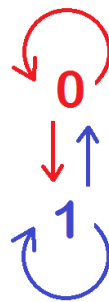
Thus, in attempting to answer some of the more complex questions of known physics, the theory of existence was elaborated, which is based on the simplest known principles of the behavior of nature.

3. Theory of Existence

The present theory is based on existence. A unit may exist depending on the reference adopted. Given a reference and a scale, the unit may exist and cause effects on other units. In this way, one existence can modify the states of other existences.

An existence can be represented by the logical state 1, and a non-existence by the logical state 0. An existence can remain an existence, or pass into the state of non-existence. A non-existence can continue in its state or become an existence, as shown in figure 3.1. Thus, for the development of the theory, it is assumed that existence will be in the logical state 1, and will continue in that state.

Figure 3.1 - Logical states of existence.



Source: Prepared by the author.

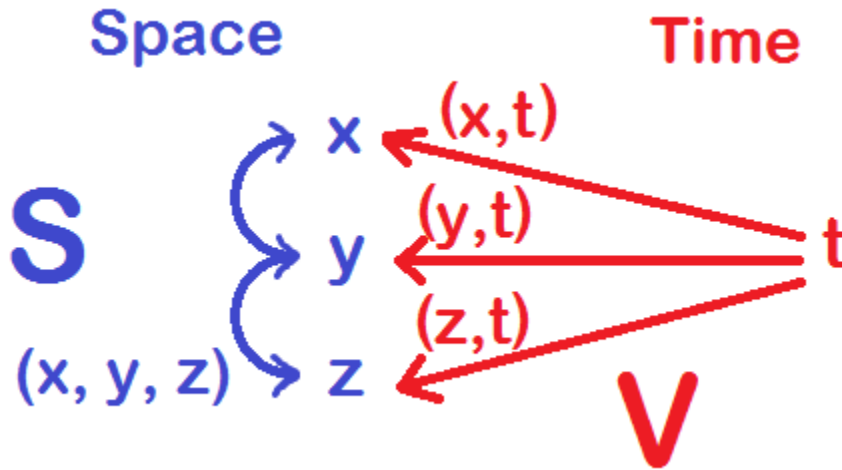
3.1. Energy and dimensions

Existence is formed by energy. For an energy to be defined, it is necessary to establish a basic unit, which has a numerical value, as well as an association of dimensions that this basic unit occupies. Thus, if an existence exists and maintains its state of existence, then its energy is considered and the principle of energy conservation is used, which states that energy converts but can not be created or destroyed.

Dimensions can be divided into groups. By associating the elements of the groups, the regions in which the energies can occupy are obtained. A dimension can be divided into equal intervals, which are enumerated by indices, and will be described by the variable n .

For the development of theory, the space and time groups are used. 3 dimensions are defined for space (x , y , and z) and 1 for time (t). The variable S for energy is attributed to the associations between the dimensions of space, which forms the set (x, y, z) . It is given the variable V for the associations of energy over time and space (x, t) , (y, t) , (z, t) . With these groups, we have the associations shown in figure 3.2.

Figure 3.2 - Associations between the dimensions of the space and time groups.



Source: Prepared by the author.

3.2.Base existence

Existence needs a basic unit to be defined, in terms of that unit. The base existence name was given to this entity, which is defined in S and V.

The variable E represents the indices of the regions that each base existence of index b occupies in S. The reference energy of the base existence for S is called e, which consists of an arbitrary amount of energy. Thus, we have associated base existence with an energy on S, which is given by the sum of the energies of all base existence that have the same index n in space. This sum is based on the principle of superposition.

$$S_n = \Sigma e_n \quad (1)$$

Using energy conservation, the following equation is obtained.

$$V_1 + S_1 = V_2 + S_2 + e$$

The index 1 of S represents the energy over the current S of the base existence, and the index 2 represents the energy of the next region that the base existence would occupy in the sense of V. The indices of V represent the state of the energy over the time of base existence, in the time dimension, at the current time 1, and at the later time 2. Since the presence of the energy of the base existence in the value of S_1 is considered, it has to be considered in the term on the right.

Thus, we have the general equation of V, for the next index in the time dimension:

$$V_2 = V_1 + S_1 - S_2 - e \quad (2)$$

If V_1 is negative, its signal is inverted, it is applied in the equation, the indices of S are adapted to the direction of V. The result of the term on the right must be inverted before assigning the result to V_2 , to conserve the value.

Each value of V is associated with a base existence. The reference energy of the base existence for V is called v_r . Furthermore, the energy on V stipulates that the base existences will move in the positive sense of space if V is greater than v_r , and will move in the negative direction of space if V less than v_r , and that will not move if V equals v_r , for each advance of an index t. In this way, we have:

$$E_{b2} = E_{b1} + 1 \text{ if } V_b > v_r$$

$$E_{b2} = E_{b1} \text{ if } V_b = v_r$$

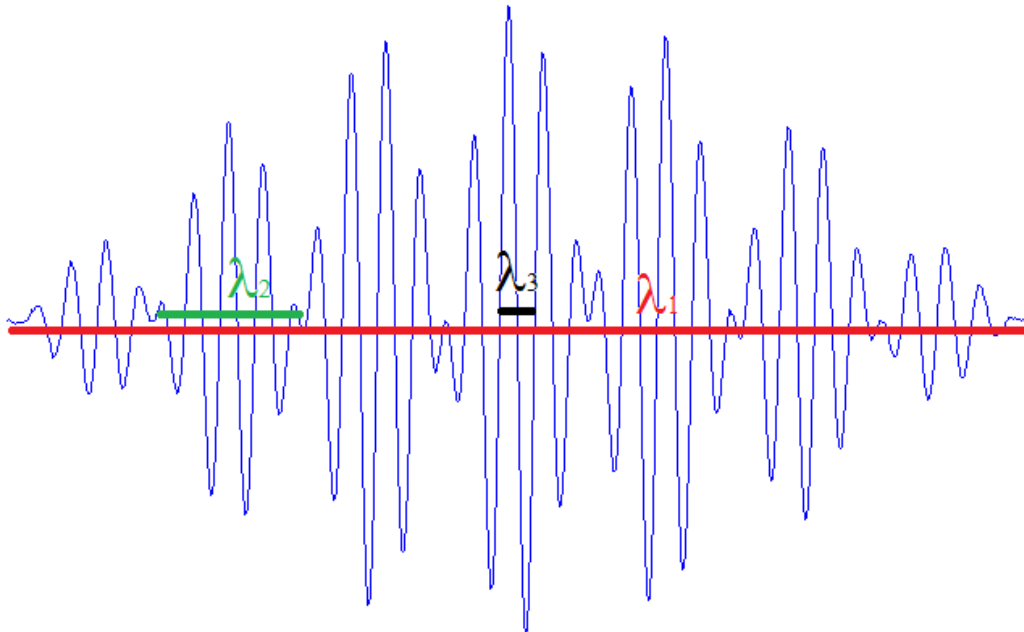
$$E_{b2} = E_{b1} - 1 \text{ if } V_b < v_r \quad (3)$$

3.3.Periodic non-existence and compound existence

The model proposed for space is an energetic model, so that the energy contained in space has a periodic format, defined in S and V. For such an energy is called periodic nonexistence.

Energy over space can have a format that has maximum and minimum in certain regions, as well as have components of varying lengths. This behavior can be visualized by analyzing the beat, which is a superposition of waves with slightly different frequencies and wave numbers. Figure 3.3 shows a 3-wave beat in one dimension. It can be seen that such a beat has waves with three different wavelengths: $\lambda_1, \lambda_2, \lambda_3$.

Figure 3.3 - Associations between the dimensions of the space and time groups.



Source: Prepared by the author.

Such an energy format creates energetic barriers with different wavelengths. These energy barriers can shape a region that has an energy density on S. This fact occurs when S is converted to V, and the density decreases. If there is a barrier in S in specific regions and this barrier is greater than V of base existence, they are reflected and return to the initial region of S. This effect prevents the base existence from totally dispersing, forming a structure stable. For this structure, the compound existence name is given.

The compound existence is a set of base existences, or even of other compound existences, which have S and V that repeat along the dimensions. In the same way, a base existence is a compound existence, which has a scope in space, and a length in time, according to its internal structure.

The compound existence must relate to the energy format of space. In three dimensions, a compound existence, as it spreads, has its density reduced, that is, the concentration of S on the indices of the dimension becomes smaller. When a certain concentration of S is placed on space, it

tends to dilute, converting the energy to V. However, for a periodic space, which has periodic peaks in time and space, part of that energy is reflected back to the region of concentration, due to the barrier in S. That way, over time, there will be a flow of energy going towards the center and there will be a flow out of center.

Such concentration on S has a maximum value, which after a time interval is fully spread. Thus, depending on the lengths of the periodic nonexistence, as well as the amplitudes, and the initial amount of concentration of S, it may or may not form a compound existence.

In this way, a space S that forms several lengths of barriers in S, can give rise to existences composed of different lengths, occupying the same region.

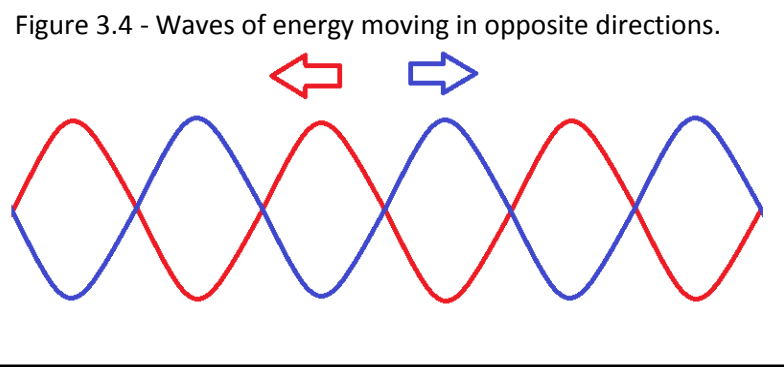
In a particular region of compound existence, the energy flow away from its center must be equal to the flow of energy that approaches the center, so that it can maintain its stability. Thus, in a compound existence, there is a constant flow of energy in any region. As a consequence, the closer to the center, the greater the energy density.

Two hypotheses will be presented on how energy in space-time can behave, which supports compound existence: The first consists of beats of energy with great V in relation to S. The second consists of energy waves that have similar V to S.

In the first, there exist base existence with V on several dimensions, which spread over space. Peaks in the quantity of existence are at certain distances, have a length and form periodic beats at certain positions.

When the peaks or valleys meet, they form interferences, which overlap. These interferences create barriers or wells on S. Since V is much larger than S, only part of V is used for this overlap.

Figure 3.4 shows two waves of energy that move in opposite directions, and which overlap, giving rise to an oscillatory space.



Source: Prepared by the author.

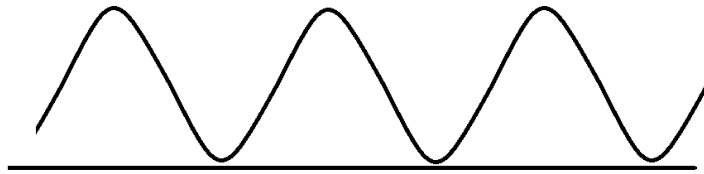
The second hypothesis consists of values for S, which are converted to V, and again to S, forming an oscillatory space. In a one-dimensional space, the maximum and minimum regions occur in the same indexes of S.

Such a conception is complex when analyzed in 3 dimensions, because when S spreads it forms spheres which, when encountered, form regions of higher density, and the conversion from V to S is partial.

Figure 3.5 shows an energy wave converting S to V and then V to S, in one dimension.

Figure 3.5 - Conversion of energies between S and V.

Energy on S



Energy on S passing to the energy on V



Energy over S converted to energy over V



Energy on V passing to the energy on S



Source: Prepared by the author.

4. Simulation of the theory of existence in a computer

It is possible to simulate the theory of existence in a digital environment, which processes the behavior of all base existence sequentially.

In doing the simulation of the base existences, the passage from the state of nonexistence to the existence occurs, and in this way, they are maintained in that state through the memory of the computer.

According to the theory of existence, base existences can be formed from other base existences, on a smaller scale. Therefore, in making the creation of a digital base existence, on a given scale, it is considered all the base existences that form the base existence of reference, as just a single existence.

It is therefore necessary to adapt the theory of existence so that it can be simulated in a digital system.

4.1. Matrices of dimensions and size of dimensions

It is possible to simulate the theory of existence in as many dimensions as necessary. A convention was chosen to fill a one-dimensional matrix, and mathematical rules were defined to create the other dimensions. In this way, the necessary memory was dynamically allocated.

The mathematical rule for accessing the elements of S was:

$$t * (X_TAMANHO * Y_TAMANHO * Z_TAMANHO) + z * (X_TAMANHO * Y_TAMANHO) + y * X_TAMANHO + x$$

Where X_TAMANHO represents a variable for the size of x, Y_TAMANHO represents a variable for the size of y, and Z_TAMANHO represents a variable for the size of z. The size of the dimensions were: 100 units for the dimensions x, y, and z, and 500 units for the dimension t. The maximum value of 50 million units of basic existence was defined. The states of the energies of S were saved for all values of x, y, z and t, occupying a memory space of approximately 1 GB.

It was defined that the values of S would have 2 bytes of size and that such energy could only be positive, and thus it could have the values of 0 to 65535. Already for the values of V were defined 2 bytes for each interval and that V could be positive or negative, and thus the possible values for V were -32768 to 32767. For the value of E, for each base existence, it was defined that it would have 8 unsigned bytes, ranging from 0 to 255, since the possible values for the base existence position are from 0 to 100.

In making the basic existence-processing algorithm, the theory of existence was adapted so that V could have both positive and negative values. In this way, the velocity reference was set to 0, in order to simplify processing.

4.2. Formation of S

The first step in creating S was to define a geometry, and a value for each index.

For each base existence of index n, the matrix E was used to store the indexes that it occupies over the dimensions of space and over time.

It was arbitrated that the energy of each base existence has the value of 1, that is, $e = 1$. For the value that each index of S possesses, the same number of base existence was placed, occupying that index. Then, the values of all indices of S were set to 0. To perform tests in the simulation, values were placed in certain S indices, without having base existence occupying that region, that is, barriers were placed in S . Finally, S was reconstructed using equation 1 of the theory of existence.

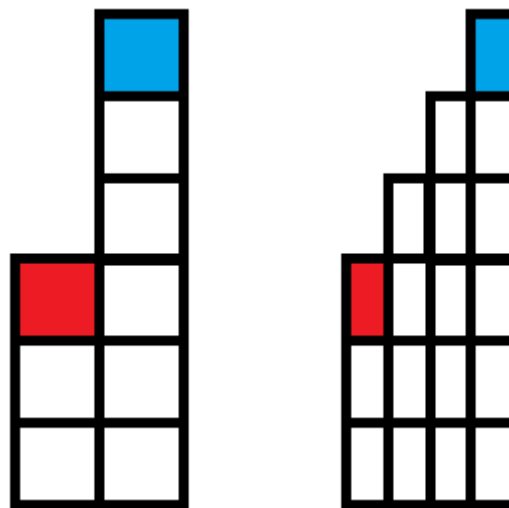
4.3. Processing of base existence

The first step in processing the base existence behavior is to calculate the current index of S , based on the information of the base existence position, defined in E . Then, it is verified in which dimension x , y or z associated with V will be processed. Then the condition of V is tested: if it is greater than the reference, if it is smaller than the reference, or if it is equal to the reference, and according to the value of V is made certain algorithm.

The next index of S is calculated, which will depend on the conditions of the energy on V . Finally, it is verified if the sum of the energy on S and on the current V of existence are sufficient to move the base existence to the next index of S . If it is, existence is shifted to the next position, otherwise its velocity is reversed.

In the case of an analog environment, where theoretically there are always intermediate values, the equation of existence theory works normally, but in a digital environment a problem arises, which is illustrated in figure 4.1. Using the theory, the velocity of the base existence on the right is reversed, but generates a conservation problem of energy in the case of the left, when applied in a digital environment, depending on the lengths of the chosen dimensions.

Figure 4.1 - Energy conservation problem in a digital environment.



Source: Prepared by the author.

Thus, when converting the equation from the theory of existence to digital processing, it is necessary to verify if existence has the amount of energy needed to overcome the barrier. That is, the energy over V plus the energy over S current has to be greater than the next energy over S . If it is not, the value of V is reversed.

One of the properties of V is that the higher its value, the higher the rate at which the base existence are processed. Thus, an algorithm was made that the base existence will be executed in proportion to its speed. In this way, the closer V is to a variable that defines the maximum velocity, the more the base existence will be processed. If it is greater than this velocity, the base existence is always processed.

4.4. Symmetry Considerations

Two forms of distribution of the base existence were made: one aiming at its uniform distribution, which takes longer to process, since for each complete S-scan only one base existence is attributed to each index, if that value is greater than zero. The other distribution consists of assigning all base existences to a given index of S, and therefore S is only traversed once, and thus execution is faster. The first form was used in the simulation of 3 dimensions for the space, and the second form in the simulation of 1 dimension for the space, since for 1 dimension there is no need for symmetry in the distribution of the base existence.

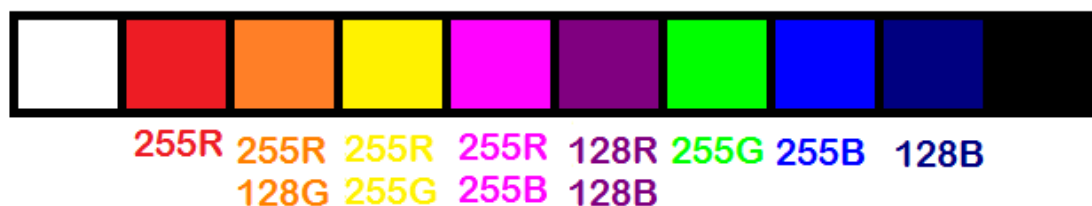
Since three energies on V are defined for each base space existence, the order in which they are processed influences the behavior of the base existence. Thus, an algorithm that alternates the first V to be processed was made.

When V is equal to 0, the processing is switched between $V > 0$ and $V < 0$, in order to have greater symmetry in the processing of the base existences.

4.5. Convention of scale in 3 spatial dimensions and representation of energy

Figure 4.2 shows the color conventions adopted to represent the amount of energy on S for each of its indices. White represents values above 90% of a scale reference value. Red from 80 to 90%, and so on. Underneath the colors the ratio of red (R), green (G), and blue (B) was adopted, on a scale from 0 to 255.

Figure 4.2 - Color convention for simulation in 3 spatial dimensions.



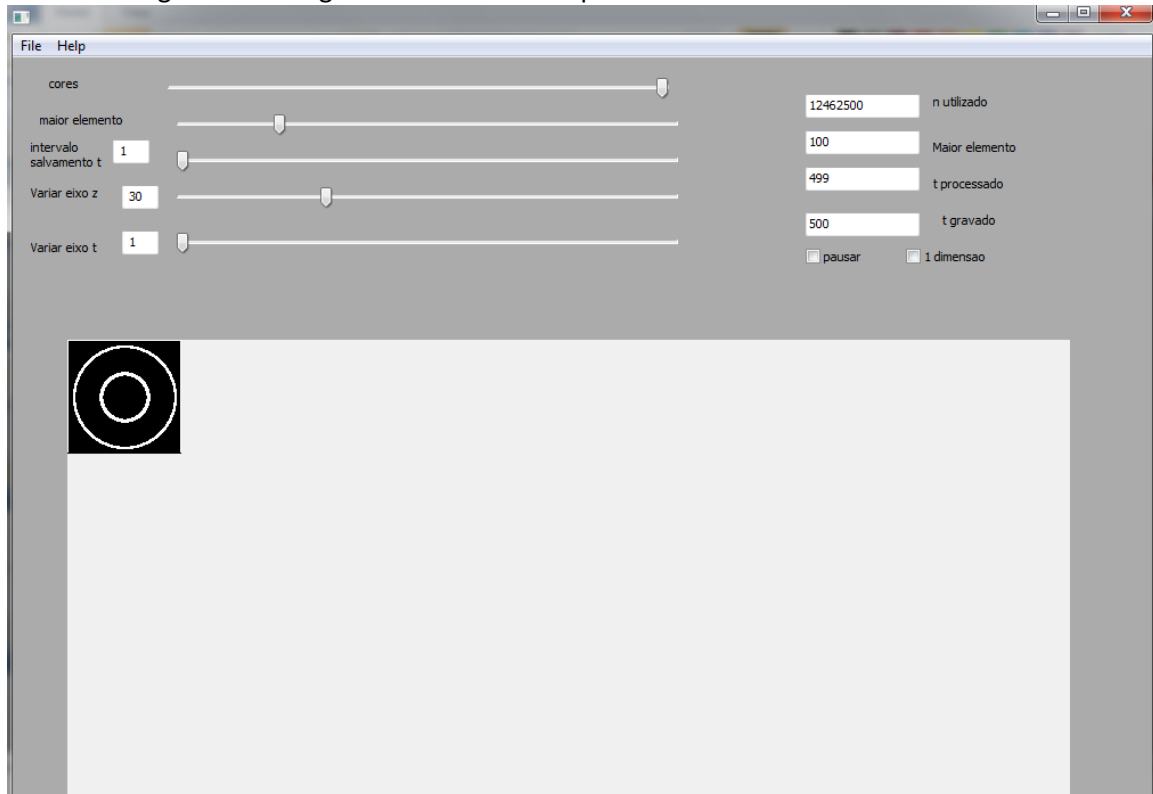
Source: Prepared by the author.

Each pixel on the screen represents a position of index x and y of S. The values of z and t are traversed through a slash. The pixel is a representation of the length in the space of the base existence, which is an arbitrary scale for the visualization of a space in the memory of the computer, which represents the energy.

4.6. The developed program

The program was developed in C++ language, using version 2.8 of the wxWidgets library, with the IDE CodeBlocks. Figure 4.3 shows the graphical screen of the developed program. In Appendix A, it contains the code used in the simulation program in 3 spatial dimensions. The specific functions of creating the software were not placed, only the most relevant ones for the interpretation of the processing of the base existence.

Figure 4.3 - Program interface developed for simulations of base existence.



Source: Prepared by the author.

4.7. Simulation in 1 spatial dimension

Simulation was performed with 1 spatial dimension using the theory of existence. S was filled with the value of 5000 at the positions of x being 48, 49, 50 and 51, and for $z = 1$, and $y = 1$ fixed. The simulation occurred along $x = 0$ to $x = 99$.

An S -barrier was set at 3000 at the $x = 80$ position, without base existence. At $x = 0$ and $x = 99$, the value of S is 10000. A total of $5000 \times 4 = 20000$ base existence were used.

From $t = 1$ to $t = 300$, only white was used to represent the indices of S . For values above $t = 300$, white was used to represent S in t , red to represent S in $t + 1$ and orange to represent the S in $t + 2$.

From $t = 1$ to $t = 240$ a scale of 100 was used, which divided all values of S by 100, to represent them. From $t = 300$ a scale of 20 was used, which divided all values of S by 20.

A maximum v of 100 was used, thus, every 100 units of t , space S spreads. Figure 4.4 shows the results of the simulation.

At $t = 1$, we can see the presence of S values in the center of the image, whose amplitude is 50 pixels, since a scale of 100 was used. The barrier at $x = 80$ is also observed.

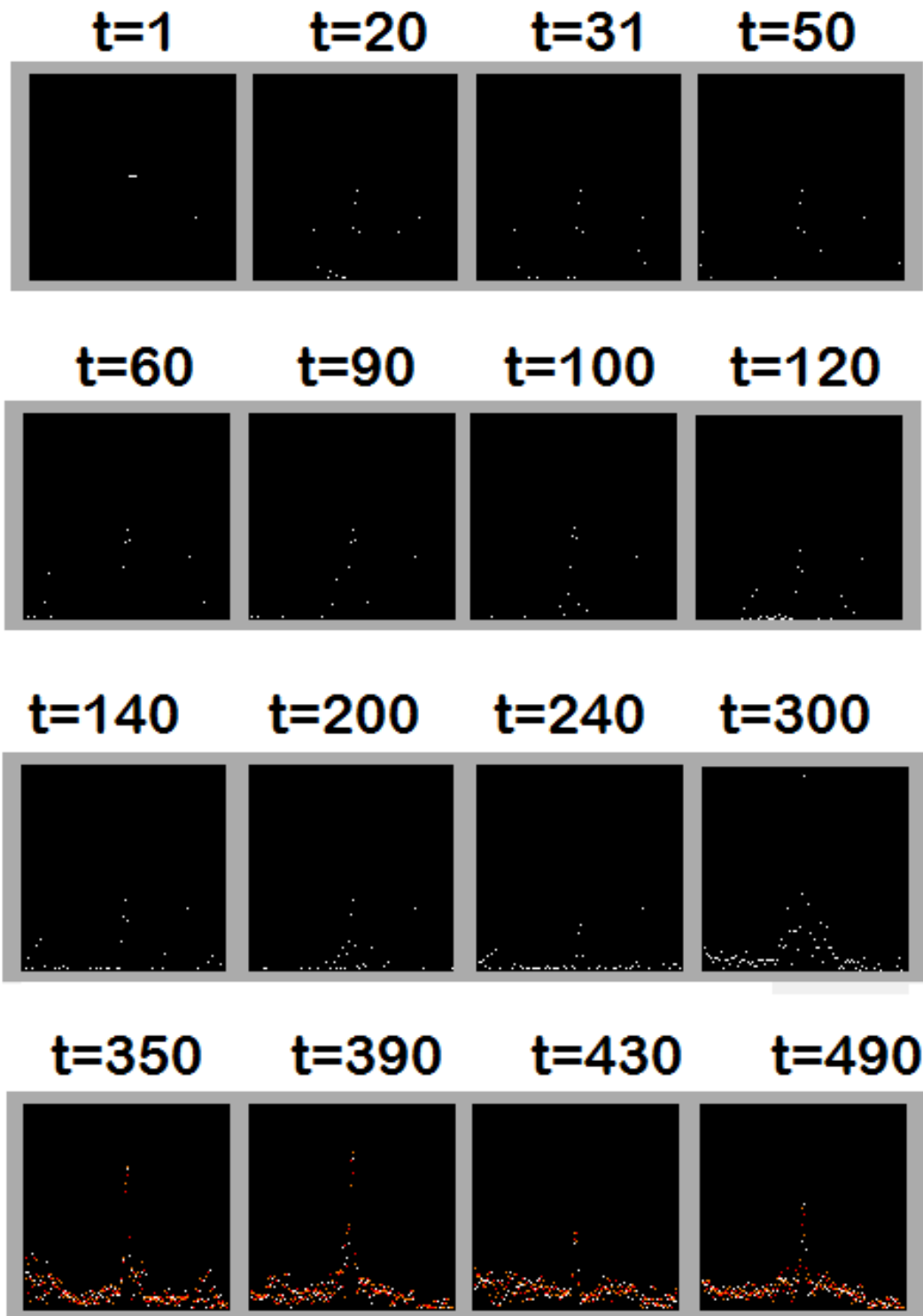
At $t = 20$, there were 20 processing of the base existence, causing the initial S extremity to spread along x . At $t = 31$, the right-sided end of S meets the 3000 barrier. As part of this extremity has v less than 3000, not all base existence can pass through the barrier and some are reflected. Another part of the base existences has V greater than 3000 and therefore pass through the barrier in S .

At $t = 50$ and $t = 60$, the left end and right part are at the boundary of the space at x , and therefore are reflected at indexes $x = 0$, and $x = 99$, respectively. Since V is less than 10,000, for all base existence, all reflect when reaching the extremes. At $t = 50$, a part of the end that was reflected by the barrier at $x = 80$, goes to the center of the x -range. Upon reaching the center, its velocity falls, and all these base existences are no longer processed until t is equal to 100.

At $t = 90$, the extremity that were reflected are in the center of the range of x , making S increase, and there being a large decrease of V . At $t = 100$, there is a new general processing of all base existences, including those with little speed. At $t = 120$, a new scattering of S occurs, where much of the energy is converted to V . At $t = 140$, the base existences advance towards the ends of x and a part of S is reflected by the 3000 barrier. At $t = 200$, the process that occurs at $t = 100$ is repeated. At $t = 240$, it is found that a good part of the base existence had their energy on S converted to the energy on V , and in general, the energy on S becomes less concentrated.

At $t = 300$, the scale is increased by 5 times, and thus the values of S are represented with a larger amplitude. Between $t = 350$ and $t = 490$, the values of S were represented with 3 colors. The above-average amplitudes are verified at certain indexes of S , due to the overlapping of the base existence in S , converting a part of V into S .

Figure 4.4 - Simulation of base existence in 1 spatial dimension.



Source: Prepared by the author.

4.8. Simulation in 3 spatial dimensions

The behavior of a filled S in the form of a sphere was simulated using its parametric equation, where each index of the sphere was filled with 500, that is, there are 500 base existence in the region of the sphere. The radius is 28 to 29 pixels. An S -barrier, also spherical, without base existences, with a value of 10000, was placed in each index. A total of 12462500 base existence were used for this simulation.

In this format, the images represent the positions x and y of S , where z and t were varied to show the relevant regions of S . A value of 100 was used as reference. Thus values of S that are greater than 90 are represented in white, between 80 and 90 are represented as red, and so on. Figure 4.5 shows the results of the S simulations, from $t = 1$ to $t = 40$.

At $t = 1$ the initial structure of S is shown, which consists of an outer spherical barrier and an inner spherical geometry filled with base existences. At $z = 50$ the maximum value of the spheres occurs, while decreasing as the ends of z are reached.

At $t = 10$ the structure of S is scattered along the dimensions of the space. By analyzing the outer space of the inner sphere, it is found that it spreads in all directions. It can be seen that the scattering is not totally spherical. This is due to the large increase in V at the edges, relative to the initial S , which have $V = 0$. In addition, because the system used is the cartesian, the dispersion of S occurs in the directions of the axes. As S spreads, such effect is reduced.

Analyzing the inner space of S , it is noted that the base existence spread towards the center, and the effect observed in the outer region does not occur. Thus, at the z -ends, base existence are a few units apart, while in the central region, base existence are more distant. It can be seen that for $z = 75$, at $t = 3$, a concentration of S occurs due to scattering of the z region, and a concentration of S occurs in the central region due to scattering in the direction of x and y .

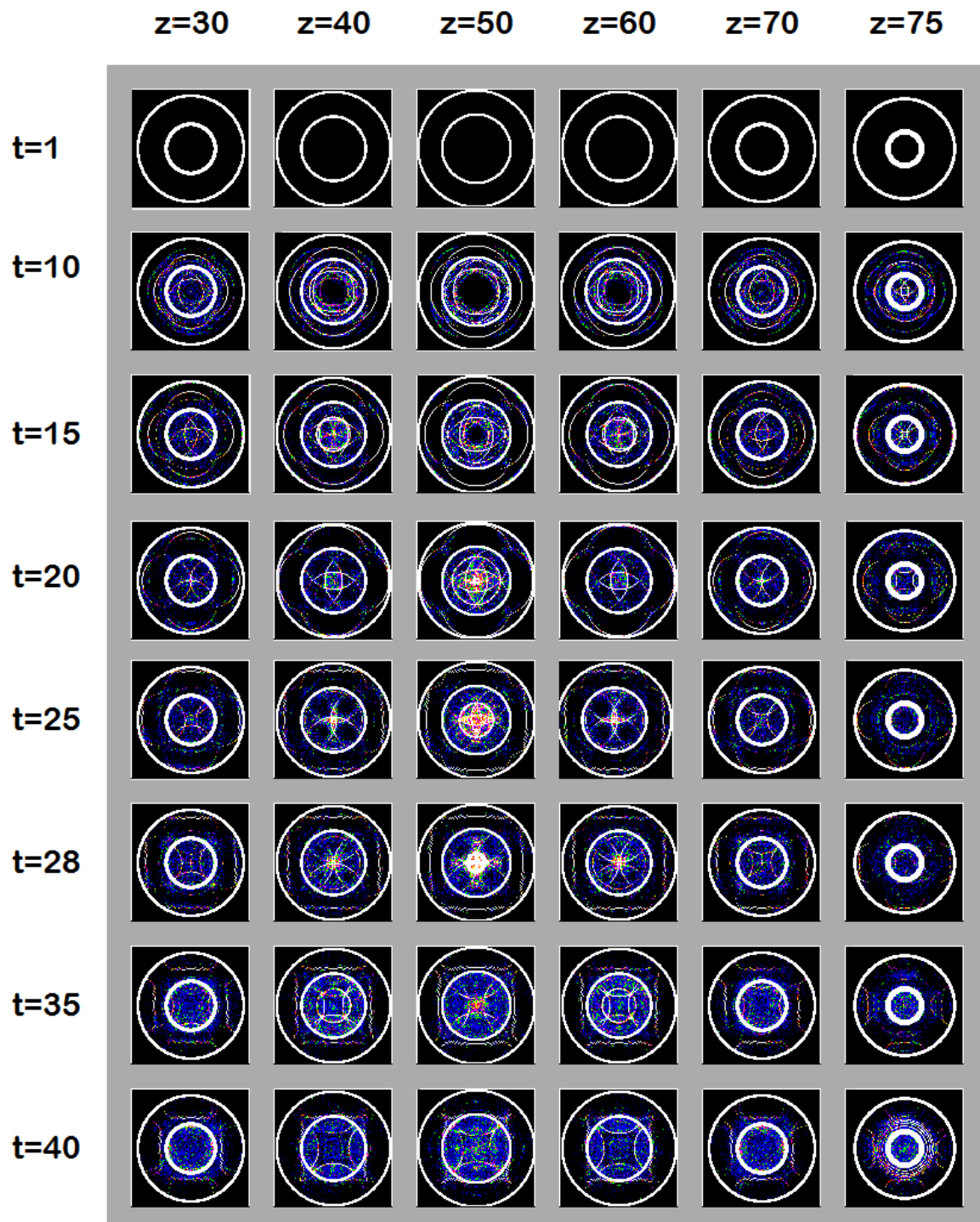
At $t = 15$, $z = 75$ base existence have already passed through the central region of S and due to the high value of V in relation to S , the inversion of V does not occur. At $z = 40$ and $z = 60$ part of the amplitude of S is influenced by the scattering of S in the z -region.

At $t = 20$ and for $z = 30$ and $z = 60$ the encounter of the initial S ends occurs in the central region of x and y . Note that in the central region of $z = 50$ the amplitude of S begins to grow considerably.

For $t = 25$ the reflection of the outer edges occurs, and at $z = 40$ and $z = 60$ there is a growth of the amplitude of S in the central region. At $t = 28$ the maximum peak at $z = 50$ occurs in the central region. This is due to the encounter of the initial S scattering of the three spatial dimensions.

At $t = 35$ and $t = 40$, the displacement of the external base existence toward the center occurs. In the inner region of initial S , base existence move away from the center.

Figure 4.5 - Simulation of base existence in 3 spatial dimensions between $t = 1$ and $t = 40$.



Source: Prepared by the author.

At $t = 45$, there is an increase in energy at $z = 30$ and $z = 70$, relative to the z -shift of base existences. At $t = 50$, base existences are reflected as they reach the inner limits of initial S , since they have a large energy over S , relative to the remainder of S , since their energy has not yet been converted to V .

From $t = 60$ to $t = 100$, the base existences move back to the center, and then toward the inner edges of the initial S .

At $t = 110$, the second general processing of all base existences has already occurred, and a new spread of S occurs.

At $t = 120$, a concentration of S occurs at the center of $z = 50$, due to the scattering of S . Also, reflection of the outer edge occurs at the barrier in S . At $t = 130$ and $t = 140$, the outer edge is directed to the center, repeating the process that occurs at $t < 100$.

From $t = 150$, the inner space of initial S has an S with few variations, and some peaks at certain rates of t . This fact occurs due to the conversion of V to S .

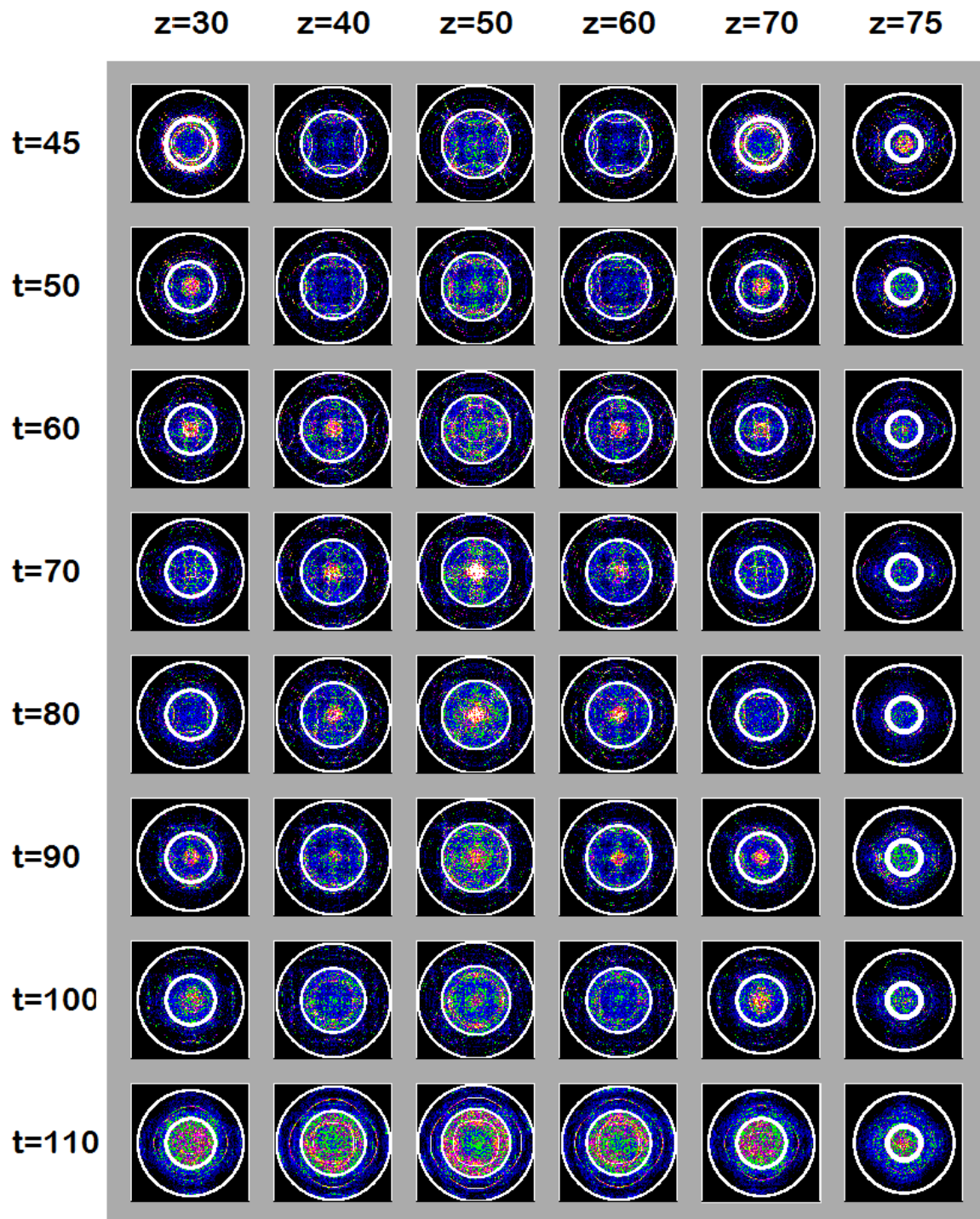
At $t = 210$, a new general spread of all base existences can be noted, however, due to the little energy difference between the initial edges of S and the S at this index of t , the internal effect of the scattering is reduced. The external scattering, of initial S , is perceptible. At $t = 310$, a new scattering occurs, but its effect is greatly reduced. It can be seen that at $t = 410$ the initial edges of S are barely visible due to the small value of S with respect to the initial S .

It can be seen that at $t = 499$ a large part of the value of S was converted to V , and that in some indices of t , peaks in S occur due to the meeting of V . As it is advanced in t , it is noted that all concentrations of Energy on S are being reduced due to conversion to V .

In Figure 4.6 the simulations between $t = 45$ and $t = 110$ are shown. Figure 4.7 shows the simulations between $t = 120$ and $t = 499$.

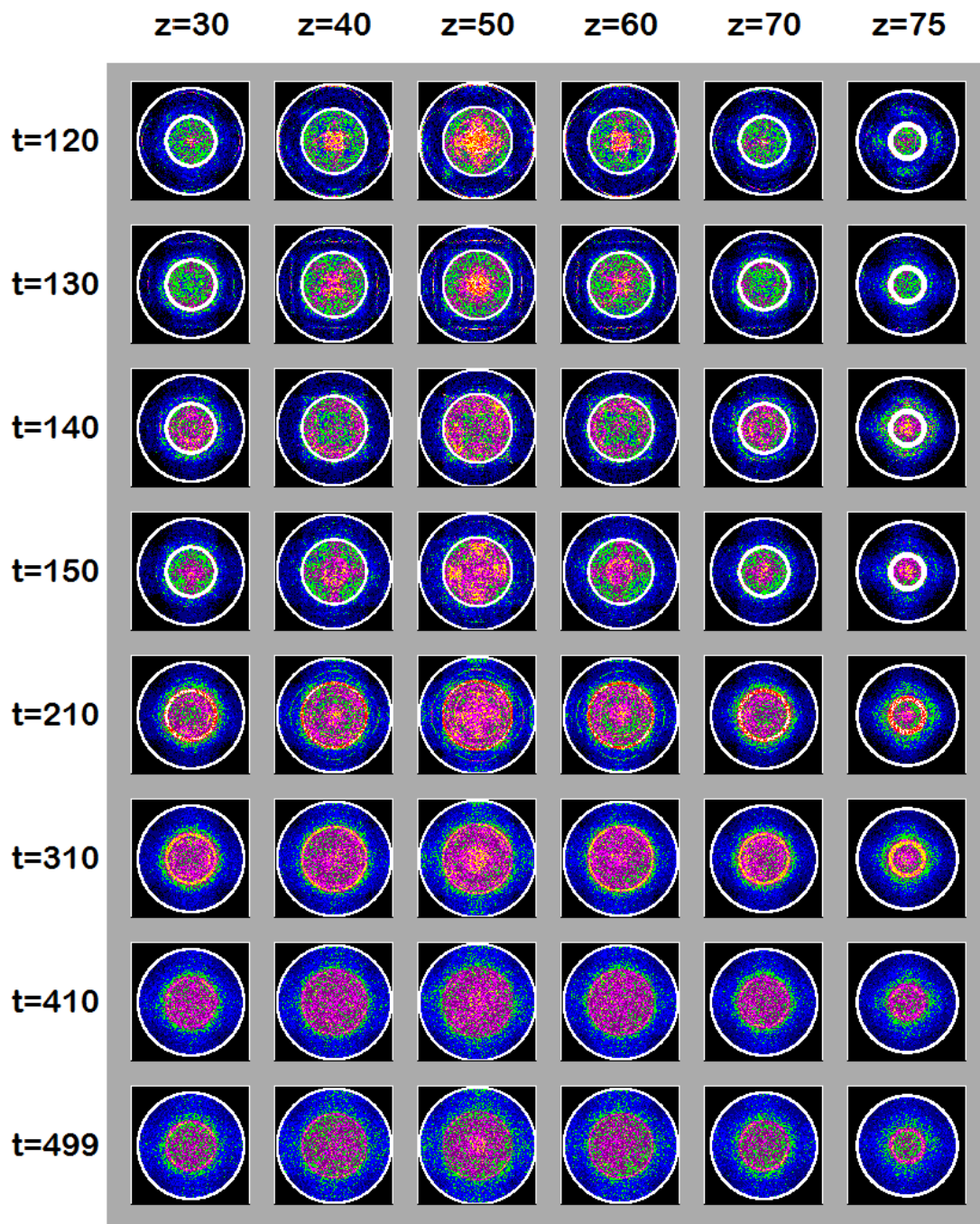
Due to the computer used in the base existence simulations did not have sufficient memory and processing capacity, it was not possible to conclude on the exact behavior of the periodic nonexistence, since in order to analyze it, a greater number of intervals of dimensions is necessary. In addition, some simulations lasted for a few days, in the processor used, which made it difficult to vary parameters and to verify the energy behavior of the periodic nonexistence.

Figure 4.6 - Simulation of base existences in 3 spatial dimensions between $t = 45$ to $t = 110$.



Source: Prepared by the author.

Figure 4.7 - Simulation of base existences in 3 spatial dimensions between $t = 120$ and $t = 499$.



Source: Prepared by the author.

5. Applications of the theory of existence in physics

5.1. Proportionality Constants

In the development of the next topics will only discuss the proportionalities. Constants are ways to get out of proportionality and go for equality. As an arbitrary value was defined for the energy of the base existence, such value should be considered for agreement for the experimental results.

5.2. Movement of basic existences

We can associate for base existences the quantities: position, which is the region occupied in E , with index n ; Of velocity, which is the rate of change of E , with the advance of t , that is, is the energy V ; And the acceleration, which is the rate of change of V with the advancement of t .

5.3. Laws of Newton

Analyzing Newton's first law, it can be noted that if a base existence is in a place where there are no variations in S , V does not change. Thus, the rate of change of E with the advancement of t will not change.

Newton's second law can be visualized when there is a energy difference between consecutive S 's. In this way there is a variation of V , which is the acceleration, and therefore there is the appearance of a force.

Newton's third law can be visualized in any interaction between existences. When two existences interact, one causes influence on the energy of the other, through S . In interactions between compound existences, when one existence interacts with the other, both are affected by the change of energy over space S .

5.4. Relative speed

Assuming that a set of base existences move with velocity v , and one of them rises a barrier in S , and has its velocity reduced. Assuming that all velocities are positive, as the speed decreases, this base existence will have a negative velocity in relation to the other existences. As the other existences have higher V , the existence that had its reduced V will move less than the others, and there will be a relative displacement between them. Thus, although absolute negative values are not used, in relation to the others, this speed becomes negative.

Thus, the theory of existence is in agreement with the concept of relative velocities, since one must choose a reference to compare velocities, and each of the base existences has a relative velocity with the others.

5.5. Theory of relativity

According to the theory of relativity, the speed of light is the same in any inertial frame, and therefore an observer can not move at the speed of light. Similarly, a compound existence has a structure that changes as it increases its V . Thus, with the geometry of the distribution of the changed energy, the periods in space and time also change.

Assuming that there is a maximum velocity for the displacement of the base existences of a compound existence, then if the compound existence would move at that velocity, the base existences would no longer converge to a central region, and the compound existence would cease to exist.

One of the consequences of the minimum time of base existence is the speed limitation of compound existence. Such limitation is expressed by the maximum velocity of a compound existence, as in the case of the maximum velocity of a photon.

The theory of general relativity predicts that the presence of matter curves the space-time around it. From the point of view of existence theory, space is constituted of energy. The presence of a compound existence modifies the energy around it by interacting with periodic non-existence. In this way, the modification of the scales is not in space but in compound existence.

5.6. Particle and wave

The theory of existence shows that a base existence behaves like a particle when its V is smaller than the S to be overcome. Under these conditions, the base existence can not surpass S and has the V inverted, as it does in light reflection, or even when one particle collides with another.

A base existence that has a V greater than the S to be overcome has the property of interference, and in this way the overlapping of the base existences, which begin to occupy a region of the same index, causes that V diminishes, since it is used to overcome S . The value of S also increases, because there is more base existences occupying the same region.

5.7. The light

The properties of light can be explained by the theory of existence. In the geometric optics, one has the reflection and the refraction, whereas in the physical optics has the interference and the diffraction. In the case of reflection, this occurs when the total energy is less than the S to be exceeded. Thus, if the light tries to cross a very large barrier relative to its total energy, it has its V inverted, as in the collision of a low-energy photon with an atom.

In the case of refraction, if the total energy is sufficiently large, base existences may cross the barrier, and in a case where there is a barrier in three spatial dimensions, depending on where the incidence occurs in the barrier, the light will be diverted from a determined angle.

In the case of interference, the base existences of different photons may overlap, resulting in the energy summation at each index, which may be destructive or even constructive.

In the diffraction, for a propagating wave, it spreads mainly in the direction of propagation, since in the other regions there is the same value of S , and there is no increase of V in these directions. When the light passes through a slit, the regions of S that cross the slit will not have lateral barriers, and thus will spread in these directions as new wave sources.

5.8. The temperature

Since the temperature measures the amount of agitation of the particles, a temperature may be associated, taking into account the energy in a region. In this way, with increasing energy, the temperature is increased.

The laws of thermodynamics can be applied to the theory of existence. The first law says that the variation of internal energy is equal to energy supplied by heat minus the work done. In this way, analyzing the 3-dimensional simulation, it is verified that when supplying base existences, the internal energy of the space where S was 0 increases, that is, the initial S functions as a source of heat. As in the simulation there is no energy that comes out of the barrier, there is no performing work.

According to the second law of thermodynamics, which states that it is not possible to convert all heat into mechanical work, in theory of existence this is a natural consequence. Since S has its energy converted to V, it is not possible for the V of all base existences to have the energy converted to S again, in exactly the same way. This phenomenon can be noticed in the simulation in three spatial dimensions. After a while, much of the energy on S is converted to the energy on V, but it does not return to the initial S. In this way, the energy is distributed, and can be used to carry out a new work in case the external barrier is eliminated.

5.9. Potential energy and kinetic energy

The work to be performed by a particle of mass m , is the product of the force by the displacement Δx that it effected, under the influence of an acceleration a . Work W can be obtained by using the rate of change of potential energy ΔU :

$$W = -\Delta U = -ma\Delta x$$

Changing the variables is obtained:

$$\Delta U = m \frac{\Delta v}{\Delta t} \Delta x$$

In the same way, the work can be written in function of the kinetic energy:

$$W = \Delta K = ma\Delta x = m \frac{\Delta v}{\Delta t} \Delta x$$

In this way, adjusting the variables we have that:

$$\Delta K = m\Delta v \frac{\Delta x}{\Delta t}$$

The work related to potential energy can be rewritten considering the following proportions: mass m is proportional to the quantity N of base existences, the term $\frac{\Delta v}{\Delta t}$ is proportional to $\frac{\Delta S}{\Delta t}$, since the higher this energy the greater the rate of change of V with respect to time. Then we have the following equation:

$$\Delta U \propto \frac{N \Delta S \Delta x}{\Delta t}$$

Thus, the variation of the potential energy, or the work performed by a compound existence, depends on the quantity N of base existences involved, the variation of the energy on the space and the displacement realized. Such dependence on the interval is due to the periodicity of the compound

existence, which has its energy distributed throughout the space, and the larger the displacement, the greater the amount of energy involved.

Work related to kinetic energy can be written in terms of existence theory by substituting Δv for ΔV , since the energy variation on V is proportional to the speed variation. The magnitude $\frac{\Delta x}{\Delta t}$ can be replaced by V , since the rate of change of the displacement of the compound existence is proportional to V . Then, we have the following equation:

$$\Delta K \propto NV\Delta V$$

The kinetic energy variation is proportional to the value of V because this energy causes the compound existence to shift. A higher V will cause compound existence to reach a greater number of periodic regions, and therefore there will be more energy involved.

Thus, by making equality, and considering that the terms of S and V are chosen to satisfy equalities, we have:

$$\Delta K = -\Delta U$$

$$NV\Delta V = -\frac{N \Delta S \Delta x}{\Delta t}$$

$$\frac{N\Delta x\Delta V}{\Delta t} = -\frac{N \Delta S \Delta x}{\Delta t}$$

$$\Delta V = -\Delta S$$

$$V_2 - V_1 = S_1 - S_2$$

$$S_1 + V_1 = S_2 + V_2$$

In this way, it falls into the equation of the theory of existence for the base existence.

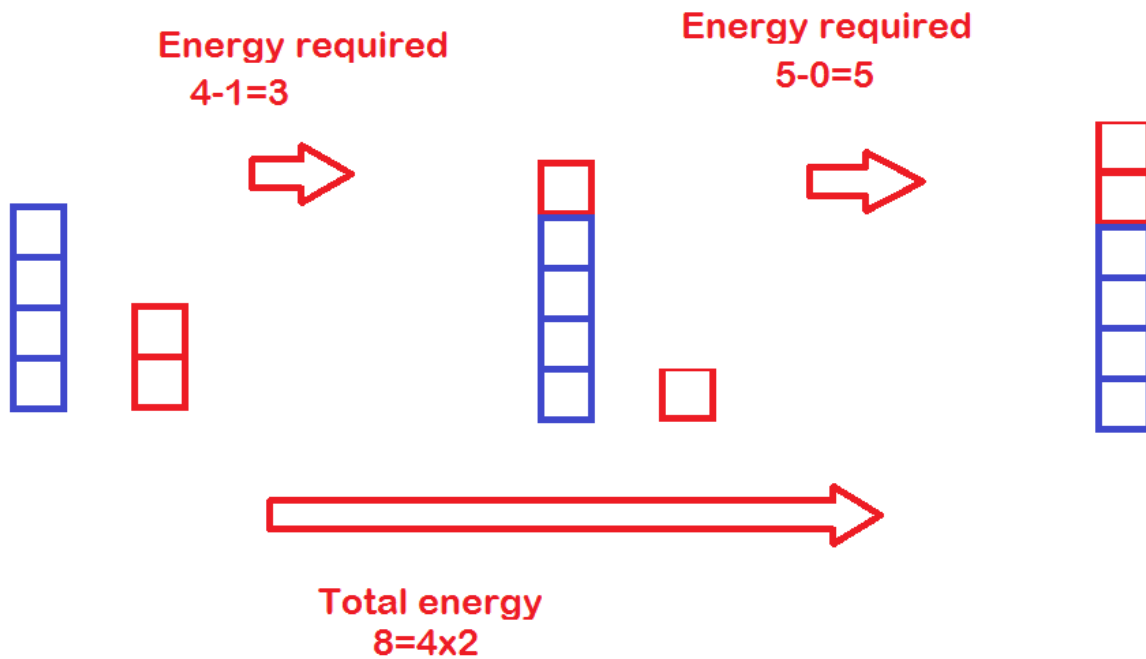
5.10. Electromagnetism

5.10.1. Energy and electric force

The theory of existence is compatible with the equations of electromagnetism. Firstly, the Coulomb law and electric energy will be analyzed.

According to Coulomb's law, the electric force between two charges is proportional to the charges, and is inversely proportional to the square of the radius that separates them. Energy is proportional to force and displacement. Figure 5.1 shows a numerical example of the proportionality between electric charges.

Figure 5.1 - Numerical example of the proportionality between electric charges.



Source: Prepared by the author.

Assuming that in a region of interaction between compound existences there is a square for each unit of charge, each of the units in red will have to overcome the barrier of each of the units of charge in blue, and thus, the total energy is the product of blue charge units with red charge units.

Energy is also proportional to the density of base existences in a region. The more base existences there are in this region, the greater the energy involved in the interaction. Thus, in the radius r_p of the center of a compound existence, has the following density of energy D :

$$D = \frac{N}{\pi r_p^2} \propto \frac{N}{r_p^2} \propto \frac{1}{r_p^2}$$

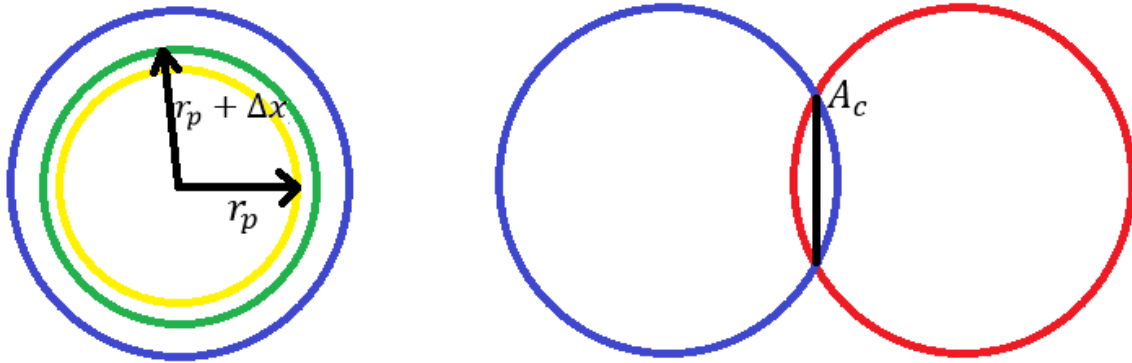
The variable N is the quantity of base existences in a region bounded by a sphere. Since the energy flux is constant, then the quantity N is approximately the same for the region of a spherical shell between r_p and $r_p + \Delta x$, where Δx is a relatively small interval. Thus, as it moves away from the center, the density decreases because there is a larger area and approximately the same quantity N of base existences.

Thus the total energy in the interaction between the compound existence in blue and red of figure 5.2 is proportional to the contact area A_c between the two existences. The energy in the interaction between these existences will be proportional to the total amount of existences involved N_t , and consequently to the contact area multiplied by the energy density.

$$W \propto N_t \propto D A_c \propto \frac{1}{r_p^2}$$

Because the contact area is approximately constant when the interaction involves large distances relative to the range of the interaction, the product of these quantities will give the total amount of base existences interacting. Then the energy will be proportional to $\frac{1}{r_p^2}$.

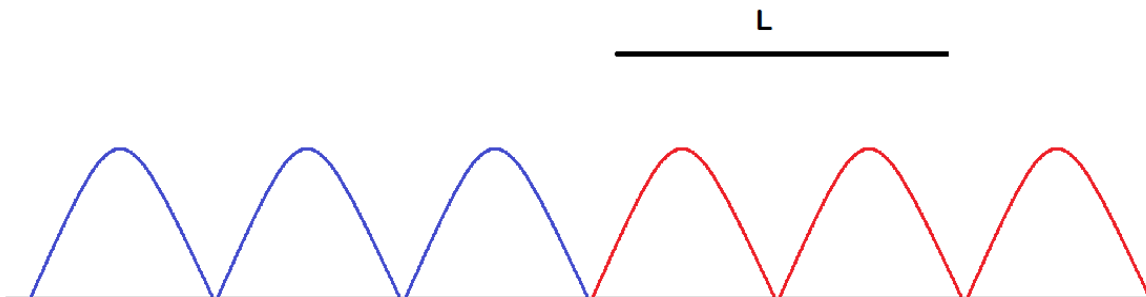
Figure 5.2 - Contact region in the interaction between compound existences.



Source: Prepared by the author.

It is also known that energy is proportional to the distance traveled, as shown in Figure 5.3, the larger the L , the greater the number of energy periods involved, and the greater the total energy involved.

Figure 5.3 - Relationship between energy and displacement in a compound existence.



Source: Prepared by the author.

The charge q indicates how intense the amplitude of S is, and for a given r_p , there is so much that this amplitude decreases as it moves away from the center of the compound existence. In this way, the electric force will be proportional, in a given region, by the number of base existences that contain a certain value of S . In this way, the force becomes:

$$F \propto NS$$

5.10.2. Gauss's Law

Gauss's law states that the electric flux through any closed surface is proportional to the internal charge to that surface. In this way, this is in accordance with the constant energy flow hypothesis: in any region of a compound existence, the energy flow is the same, and depends on the total amount of base existences that forms the compound existence.

5.10.3. Electric field and the law of induction

The electric field E' can be produced when there is a rate of change of the magnetic field with time in a given region, as stated by the law of induction. Thus, the electric field is generated either by a charge, which manifests itself through the energy on S , or by the variation of the energy over V with respect to time, as will be addressed in the magnetic field session.

$$E' \propto N \left(S + \frac{\Delta V}{\Delta t} \right)$$

5.10.4. Magnetic field

The magnetic field can be produced by moving loads. It is proportional to velocity v as well as to charge q and inversely proportional to radius r . Written in terms of the theory of existence, the magnetic field module B_q becomes:

$$B_q = \frac{\mu_0 q v}{4\pi r^2} \propto \frac{NV}{r^2}$$

The charge is proportional to the number N of base existences, the velocity to the value of the energy over V . Since the dependence on the radius is a relation that establishes the amount of energy for that particular radius, then the magnetic field for a given distance will be proportional to: $B_r \propto NV$

According to Ampere's law, the magnetic field originates from moving charges, as expressed above, and from the rate of change of electric field flux with time t . The electric field B is proportional to the energy on S . Thus, it has:

$$B \propto B_r + \frac{\Delta E'}{\Delta t}$$

$$B \propto N \left(V + \frac{\Delta S}{\Delta t} \right)$$

It is verified that the magnetic field is a manifestation of the energy on V , and that can be produced by the variation of the energy on S .

5.11. Quantum mechanics

One of the forms of photon absorption is the photoelectric effect, which consists of the emission of electrons when light is collide on a surface. In this way the maximum kinetic energy of the electrons are determined by the energy of the electromagnetic wave, and the amount of electrons emitted depends on the intensity of the light. Likewise, the emission of photons occurs, such as the collision of electrons in a metal plate producing x-ray. In addition, a photon may have its energy altered by passing close to matter, with an angular deviation, explained by Compton scattering.

The emission of photons occurs when there is a change in the velocity of charges. An electron being braked by a metal plate causes its energy on V to be converted to the energy of a photon. In the absorption of photons, they occupy the same region in S, and thus have their energy converted to energy over V of electrons. In Compton scattering, a partial absorption of the photons occurs.

One of the fundamental consequences of the theory of existence is that by establishing the energies on S and on V in a range of initial dimensions, such energies will already be determined at all other intervals. Once an algorithm has been established for processing base existences, the entire behavior of compound existences is already determined.

When you simulate a compound existence, you have knowledge about all your basic existences. Thus, the uncertainty principle is not valid, since the whole V and S of compound existence is known. However, within the reality created by a simulation, it is not possible to have knowledge about such values, since it is necessary to interact with compound existence, and this interaction alters their energies. Naturally, within a simulation, the uncertainty principle arises, since to have information about one of the energies of some dimension, one has to change one of the others.

Likewise, probability does not exist in the theory of existence. But within the reality created in the simulation, it has no knowledge about the energy states. Then naturally occur unknown events, which may be associated with probability, as predicted by quantum mechanics.

In the experiment of double-slot interference made with electrons, it turns out that the electron forms an interference figure, but that by observing it by focusing on photons, its behavior changes. By applying the theory of existence to phenomena like this, it turns out that all information regarding velocity and position are available, but the slit changes the structure of compound existence, since it is a barrier in S. The barrier changes the geometrical properties of compound existence, and thus their behavior changes.

A similar effect occurs with the electrons surrounding the atomic nucleus. An electron alone, has its energy distributed in circular format, which changes with the distance of it. Being in an atomic nucleus, it changes the format of its compound existence to a format distributed in a region in space. Its energy remains periodic, but the distribution is altered, due to interaction with other energies.

The Schödinger equation states that the energy over V plus the energy over S is the total energy of a compound existence. In this way, it is compatible with the theory of existence.

A compound existence has internal energy, which can overcome potential barriers, and thus, it can be reconstituted outside the regions of potential barriers, as in tunneling.

5.12. Particles

Four fundamental types of forces are known. Two of them, electromagnetic and gravitational, are dependent on $\frac{1}{r^2}$, just like the model presented for the coulomb law. The others do not have such a relationship. Faced with the theory of existence, this simple dependence of r is a consequence of the geometry of base existence. If the interactions between two base existences involve an area of interaction with little energetic variation along this area, one can adopt such a model. However for forces that have a relatively small radius of actuation, the energy distribution varies in relation to the area of actuation, and thus, it is not possible to find a simple relation to the force.

Thus, the theory of existence is a unifying theory, since it states how the energy distribution and the interaction force for whatever the interaction is. It also states that there may be several other interactions that exist in periodic non-existence. In order for a force to be detectable it is necessary a

compound existence that interacts with that force, that is, it must have energy in the shape of the force that must be detected.

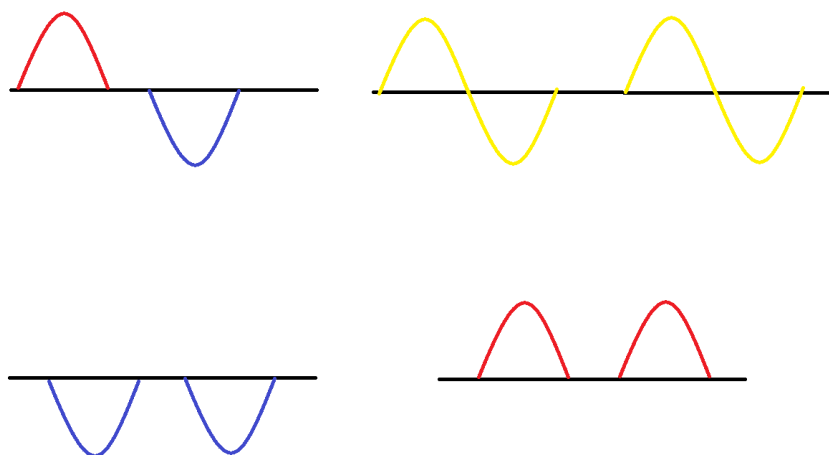
In the standard model, interactions are interpreted as the exchange of virtual particles. In the theory of existence, periodic nonexistence itself functions like these virtual particles. At the same time it shapes the format of compound existence, it also establishes how the interaction between compound existences will be.

A particle, in the point of view of the theory of existence, is defined as the whole region in space that contains the energy of a given interaction, for each of the interactions it participates in.

For the case of the particles and the antiparticles, in the same way that the energy on S can be positive, as approached in the present work, it can be negative. Or, depending on the reference energy of S, it may be bigger than the reference, referred to as a particle, or smaller than the reference, designated as anti-particle. Being bigger or smaller is just a matter of reference.

In this way, for every interaction that a compound existence does, there is an energy, or an anti-energy. An electron and a proton attract by one own energy and the other anti-energy. In gravitational attraction, there is energy and anti-energy in the interaction, as shown in Figure 5.4. In this figure the black line indicates the reference, the red symbolizes energy, blue anti-energy, and the two yellow.

Figure 5.4 - Energy and anti-energy formats in relation to a reference.



Source: Prepared by the author.

In the two interactions from above, the attraction occurs, since the sum of the energy on S final is smaller than the energy on initial S and the energy on S is converted on V. In the two interactions of low occurs the repulsion, that is, the energies on S are summed up, and thus the energy on S final is greater than the initial energy, and a natural movement occurs moving away the compound existences.

Within this context there is dark matter. From the point of view of the theory of existence, it can be considered as a compound existence that does not interact with light, that is, it has no energy on the electromagnetic form.

As the universe expands, it occupies an ever larger range of spatial dimensions. As it spreads, the energy S of the edge is converted to V, which may explain the fact that the universe is accelerating

as well as the existence of dark energy. In this way, as the universe occupies more and more intervals of space, the energy within S decreases, and compound existences seem to be increasingly distant.

The big bang is considered the beginning of our universe, in which all the energy would be concentrated in a region of the space with reduced dimensions in relation to the dimensions occupied after its expansion. It is possible to simulate the creation of the universe by placing a large number of base existences in only a single spatial dimension range. By expanding internally to this single interval, several components of periodic non-existence are formed, and if the number of base existences is large enough, compound existences are formed. At the edges, there is a large concentration of S , with large V , resulting from the initial expansion.

One of the natural consequences of the theory of existence is that energy distributions tend to be symmetrical, since S spreads across all dimensions. This symmetry can be observed in the equilibrium between S and V , which alternate.

6. Conclusion

The theory of existence is a simple way of visualizing the behavior of the various known interactions. It is based on basic logical principles, and on fundamental concepts observable in nature, such as the principle of superposition and conservation of energy.

It is assumed that energy already exists and is stable. Thus, through the proposed tools, it is not possible to affirm what causes and maintains the existence of energy in the universe. However, through simulation, existence is constructed from binary logical levels that, when grouped and processed, have a meaning of existence. In this way, the logical existence is created from representative states.

Such representative states are created by other compound existences that are part of a digital system, such as the atoms that form the transistors. Thus, whatever the computational simulation, it requires logical states, and such states are created by other compound existences at the physical level. So it is only possible to simulate base existences, through the states of other base existences.

It is noted that the theory of existence is very embracing. In this way, using its concepts, it is possible to create whatever fragment of reality, not necessarily ours. It is possible to simulate compound existences that have behaviors totally different from our reality, and that are stable.

The theory of existence can be developed in as many dimensions as necessary. It is enough for this, to make the mathematical rules to access elements, and to distribute the energies according to the associations of these dimensions.

The theory of existence has been developed to the dimensions that are commonly referred to in known physics. In this way, it is possible that compound existences form in associations of energies different from those that were approached in the development of the theory.

The concepts of energy were defined differently from those known by classical physics. Such classical concepts involve the relation of energies present in compound existences. In this way, geometry influences the calculation of the total energy involved, and its conversions. However, when it comes to base existences, the concepts are independent of the geometry involved.

The theory of existence requires a large capacity for processing a digital system as well as high memories. In the system used for the simulations it was not possible to obtain conclusive answers about the compound existence as well as the periodic nonexistence. Both have periodic geometry, so that in order to observe them it is necessary intervals of dimensions large enough for them to manifest.

It was decided to save the energies on S for all intervals of dimensions. Thus, although it consumes a lot of RAM, it is easier to analyze the behavior of the base existences, since to access elements of other intervals of t , it would have to process them again, and for this there is a consumption of time, and the analyzes become complex to interpret.

The algorithm of processing the basic existences is a little optimized algorithm, since the objective of the algorithm is to present as the theory of existence behaves. There is a lot to optimize so that it can run efficiently.

The sizes of the variables must be adapted according to the development environment of the theory of existence. Thus, as space indices are increased, all variable sizes must be increased so that there is no overflow.

The base existence algorithm was written in the C ++ language, for ease of writing and understanding. However, for processing to become more efficient, one must use the assembly

programming language. In addition, it is possible to build digital systems that work specifically to execute the codes of the base existence, adapting its architecture.

In order for the equations of an analog environment to be adapted to the digital model, some modifications have become necessary. In an analog model there will always be intermediate values, and thus, when a base existence is executed in a digital system, discrete behaviors must be considered.

The theory of existence does not state the limits of the analog model. It is not possible to determine whether our universe, on some very small scale, has a digital foundation. But with the approximations of the digital model, it is possible to represent the analog behavior.

It was observed in the digital simulations, due to the Cartesian model of the coordinates, that the base existences initially do not spread in a perfectly symmetrical way in small scales, even using symmetric S distribution algorithms. Symmetry is something present in nature, and naturally arises when base existences are performed and interpreted on a larger scale. Since the energy on S is converted to energy on V at wide scales, the distribution occurs in all directions, and there is symmetry.

One of the notable problems of digital simulation is that when analyzing small regions in relation to the index size of the base existence, the analyzed behavior is discrete and its analysis has errors in relation to the expected analog result. As the scale of observation of base existences increases, errors decrease, and it becomes more and more like the analogous behavior, which is characteristic of the observable universe.

Scale is an essential tool for all analyzes of the theory of existence. It is through her that existence has meaning.

In the simulations, it was necessary to establish high energy regions on S, so that base existences would be confined to the available energy space. In this way, whenever such a region is reached, the base existence would be reflected in the opposite direction of its movement. In these regions they did not have basic existences, since if they were, they would spread and the barrier would be undone.

If a base existence exceeds the allowed regions, unavailable memory can be accessed, and thus, the operating system terminates the program by accessing something that is not available.

The initial geometry of S and V are fundamental to any analysis in the theory of existence. They establish how the behavior of all base existences will be in any range of dimensions. Thus, established an initial geometry, the entire behavior of any base existence at any t will be the same for a particular algorithm.

It is possible to use pseudo-random algorithms for the symmetry and distribution of base existences. These algorithms have behavior that depends on the execution time. In this way, the behavior of base existences will not be the same. However, in order to allow the results of the simulations to be redone in any computer, and the analyzes compared with those of this document, it was decided not to use such algorithms.

Through the simulation in one dimension it was possible to observe the behavior of the existence theory in a simple way, in which it can visualize how the basic existences behave when there are barriers in S. Such barriers have made a part of the existences to be reflected, and another part to be overlapping. It was also possible to observe the scattering of S and the conversion of energy over S to the energy over V. In addition, one can see several of the properties of classical mechanics in such simulations.

The simulation in 1 spatial dimension is useful to verify the basic properties of the base existence as well as to test the processing algorithm. In addition, the memory required for such simulation, and the processing time are much smaller than the 3-dimensional simulations.

Simulation in 3 spatial dimensions is more complex to do and to analyze. As there are 4 dimensions involved in the total, navigating through the dimensions and visualizing the existences becomes more difficult. On the other hand, through these simulations, it was possible to observe several physical properties.

It was verified through the simulations that Newton's laws are valid for base existences. In the same way, the concept of relative movements are valid, according to the adopted reference.

The theory of existence makes great changes in the concept of what space is. Space becomes energy, and this energy has a behavior that establishes how particles and interactions can exist. Although it appears to be in contradiction with spacetime interpreted by general relativity theory, the properties of change in the scale of time and space are contained in the geometry of compound existence.

In physics, it is not possible to use wave and particle concepts at the same time. They establish properties that conflict when used simultaneously. In the theory of existence, such concepts are no longer contradictory. The behavior of a particle or interaction is established by the values of the energies S and V .

The properties of the thermodynamics were verified in the simulation in 3 dimensions. Although the concept of temperature refers to particles, it can be extended to base existences. There was a scattering of energy, and this can be interpreted as heat transfer from a high temperature region to a region that previously had little energy. Thus, it was also possible to see that high temperature concentrations did not happen again, which demonstrates that it is a natural process to spread heat to cooler regions as observed in the universe.

It has been found that the concepts of kinetic energy and potential energy are useful to be applied in compound existences, since such concepts involve displacement as a unit in which it interferes with the total energy. Such property is due to the geometry of compound existences, in which energy is distributed throughout space. When the dependencies of space for the base existence were taken away, it is verified that it has a simpler energy expression.

Through electromagnetism, a general analysis was made of how interactions can behave when work is done, and what influences energy when there is interaction between compound existences. We conclude that the electric field is a form of energy manifestation on S , and as the basic existence equation states, the energy on S changes when there is a rate of change of energy on V , which is compatible with Theory of existence.

It was concluded through the theoretical analysis that the magnetic field is a manifestation of the energy on V , and that it can be obtained as the rate of change of the energy on S , as it is expressed in the equation of the base existence.

The uncertainty principle is one of the most important equations in quantum mechanics. It is a consequence of the theory of existence, since in order to have knowledge about one of the energies of an existence, one must interact with it, modifying them. However, it is possible to know all the energies of an existence by performing a simulation. Since in simulation it is not necessary to have interactions to have knowledge about energies, all their levels are known, and the uncertainty principle does not apply.

In quantum mechanics, the probability is of fundamental importance in determining the location of the particle. Already in the theory of existence the interpretation of a particle changes: the particle is seen as a compound existence defined by the set of interactions that it has. The concept of location must be associated with each specific interaction, which will have a defined scope. A particle has its properties due to its energetic geometry, and thus, when the occupied region is regarded as a point, the errors will become larger as the scale considered approaches the range of interactions.

It is possible to create mathematical models for the behaviors of compound existences, but depending on the energetic relations, such models will have limitations in distances, which can represent the real behavior, with small errors.

Already the concepts of energy and anti-energy are ways of interpreting how there can be interactions that attract or repel. These concepts are relative to the reference energy. Our universe has stability, since it has interactions of attraction and repulsion. In this way, in many cases, a balance is created in compound existences, preventing the energies from annihilating the anti-energies.

In physics, for a theory to be proved, it must be proved experimentally. But the theory of existence suggests the opposite: If through theory, it is possible to create the experiment, and the same represents reality, in any case, then theory represents reality. The next step is to prove compound existence and periodic non-existence. Once proven, it is necessary to find the geometry of our universe. Since there is such a basic geometry, it is expected that whatever the simulation, using such geometry, it will represent our reality, and the same results will be obtained.

7. References

Young H. D. and Freedman R. A.(2009). Física IV: ótica e física moderna. São Paulo: Pearson, p. 167-169, 371-372, 380-381.

Halliday D, Resnick R. and Walker J.(1996). Fundamentos de física 4 ótica e física moderna. Rio de Janeiro: LTC, p. 331.

8. Appendix A - Program used for simulation in 3 spatial dimensions.

```
//Here the variables are declared
int X_TAMANHO=100;
int Y_TAMANHO=100;
int Z_TAMANHO=100;
int T_TAMANHO=500;
#define N_TAMANHO 50000000
unsigned short int *S;
unsigned char imagem[3*100*100];
unsigned char *E;
signed short int *V;
long int n_utilizado=0;
unsigned char matriz_cor[3][10]={{255, 255, 255, 255, 255, 128, 0, 0, 0, 0},
                                  {255, 0, 128, 255, 0, 0, 255, 0, 0, 0},
                                  {255, 0, 0, 0, 255, 128, 0, 255, 128, 0}};
int maior_valor=0;
int t_atual=0;
int z_atual=0;
int t_processado=0;
int n_processar=T_TAMANHO-1;
int t_intervalo=1;
int t_gravado=0;
int dist_0=1;
int v_maximo=5;
int cores=9;
bool variaveis_inicializadas=0;
bool espaco_inicializado=0;
bool pausar_processamento=1;
bool s1=1;

//The processing of the base existences is done in this function.
void processar(long int i, int eixo){
    long int atual=0;
    long int proximo=0;
```

```
//For the base existence with energy on V null, a distribution is made over the direction to be
//processed.
```

```
if (V[i+eixo]==0){
    if (dist_0==1){
        dist_0=2;
    }else if (dist_0==2){
        dist_0=1;
    }else if (dist_0==3){
        dist_0=2;
    }else if (dist_0==4){
        dist_0=1;
    }
}
}else{
    if (dist_0==1){
        dist_0=3;
    }
    else if (dist_0==2){
        dist_0=4;
    }
}
}
```

```
// The current index of S is calculated, based on the values of the current E, and the base existence
//of the current S is taken.
```

```
atual = E[i+2]*(X_TAMANHO*Y_TAMANHO)+E[i+1]*X_TAMANHO+E[i];
S[atual]--;
```

```
// Processing for the x-axis, under the two conditions of V.
```

```
if (eixo==0){
    if ((V[i]>0) || (dist_0==1)){
        proximo=(E[i+2]*(X_TAMANHO*Y_TAMANHO)+(E[i+1])*X_TAMANHO+(E[i]+1));
        if (proximo>=0){
            if (V[i]+S[atual]>S[proximo]){
                V[i]+=S[atual]-S[proximo];
            }else{
                V[i]=-V[i];
            }
        }
        if (V[i]>0){
```

```

        E[i]++;
        S[proximo]++;
    }else{
        S[atual]++;
    }
}
}
else if ((V[i]<0) || (dist_0==2)){
    proximo=(E[i+2])*(X_TAMANHO*Y_TAMANHO)+(E[i+1])*X_TAMANHO+(E[i]-1);
    if (proximo>=0){
        if (-V[i]+S[atual]>S[proximo]){
            V[i]+=S[proximo]-S[atual];
        }else{
            V[i]=-V[i];
        }
        if (V[i]<0){
            E[i]--;
            S[proximo]++;
        }else{
            S[atual]++;
        }
    }
}
}
}

```

// Processing for the y-axis, under the two conditions of V.

```

else if (eixo==1){
    if ((V[i+1]>0) || (dist_0==1)){
        proximo=(E[i+2])*(X_TAMANHO*Y_TAMANHO)+(E[i+1]+1)*X_TAMANHO+(E[i]);
        if (proximo>=0){
            if (V[i+1]+S[atual]>S[proximo]){
                V[i+1]+=S[atual]-S[proximo];
            }else{
                V[i+1]=-V[i+1];
            }
        }
        if (V[i+1]>0){
            E[i+1]++;
        }
    }
}

```



```

        S[proximo]++;
    }else{
        S[atual]++;
    }
}
}
else if ((V[i+1]<0) || (dist_0==2)){
    proximo=(E[i+2])*(X_TAMANHO*Y_TAMANHO)+(E[i+1]-1)*X_TAMANHO+(E[i]);
    if (proximo>=0){
        if (-V[i+1]+S[atual]>S[proximo]){
            V[i+1]+=S[proximo]-S[atual];
        }else{
            V[i+1]=-V[i+1];
        }
        if (V[i+1]<0){
            E[i+1]--;
            S[proximo]++;
        }else{
            S[atual]++;
        }
    }
}
}
}

```

// Processing for the z-axis, under the two conditions of V.

```

else if (eixe==2){
    if ((V[i+2]>0) || (dist_0==1)){
        proximo=(E[i+2]+1)*(X_TAMANHO*Y_TAMANHO)+(E[i+1])*X_TAMANHO+(E[i]);
        if (proximo>=0){
            if (V[i+2]+S[atual]>S[proximo]){
                V[i+2]+=S[atual]-S[proximo];
            }else{
                V[i+2]=-V[i+2];
            }
            if (V[i+2]>0){
                E[i+2]++;
                S[proximo]++;
            }
        }
    }
}

```



```
}
```

//// For the case of only one spatial dimension, 0 is assigned to all the color positions of the image matrix. Then, if the analyzed index y is equal to the amplitude of S divided by the scale, the value of a color is assigned to that index, which will depend on the amount of colors used. For each color used, the next value of S in the dimension of t is represented.

```
    if (s1==1){
        imagem[3*((X_TAMANHO*y)+x)]=0;
        imagem[(3*((X_TAMANHO*y)+x))+1]=0;
        imagem[(3*((X_TAMANHO*y)+x))+2]=0;
        for (int t=t_atual;t<t_atual+cores;t++){
            if
(t<T_TAMANHO)temp_zt=(t*(X_TAMANHO*Y_TAMANHO*Z_TAMANHO))+z_atual*(X_TAMANHO*Y
_TAMANHO);
            if (maior_valor>0)temp=S[temp_zt+1*X_TAMANHO+x]/maior_valor;
            temp=(Y_TAMANHO-1)-temp;
            if (y==temp){
                imagem[3*((X_TAMANHO*temp)+x)]=matriz_cor[0][t-t_atual];
                imagem[(3*((X_TAMANHO*temp)+x))+1]=matriz_cor[1][t-t_atual];
                imagem[(3*((X_TAMANHO*temp)+x))+2]=matriz_cor[2][t-t_atual];
            }
        }
    }
}
```

// For the three-dimensional case, the color is assigned to the image index according to the value representing the quantity of base existences in the region. The more existences, the closer to white.

```
    }else{
        imagem[3*((X_TAMANHO*y)+x)]=matriz_cor[0][9-temp];
        imagem[(3*((X_TAMANHO*y)+x))+1]=matriz_cor[1][9-temp];
        imagem[(3*((X_TAMANHO*y)+x))+2]=matriz_cor[2][9-temp];
    }
}
}
}
```

void inicializar_variaveis(){//Here variables are initialized

```
    E=(unsigned char*)malloc(N_TAMANHO*3*sizeof(unsigned char));
    for (long int i=0; i<N_TAMANHO*3; i++){
        E[i]=0;
    }
    V=(signed short int*)malloc(N_TAMANHO*3*sizeof(signed short int));
```

```

for (long int i=0; i<N_TAMANHO*3; i++){
    V[i]=0;
}
S=(unsigned short
int*)malloc(X_TAMANHO*Y_TAMANHO*Z_TAMANHO*T_TAMANHO*sizeof(unsigned short int));
for (long int temp=X_TAMANHO*Y_TAMANHO*Z_TAMANHO*T_TAMANHO; temp>0; temp--){
    S[temp-1]=0;
}
}

```

```

void inicializar_espaco_2(){//A geometry is established for S
float f_temp=0;
long int i_temp=0;
long int n_temp=0;
int precisao=500;
int deslocamento=X_TAMANHO/2;
int raio=30;
int x=0, y=0, z=0;
if (s1==1){// The values for initial S are loaded if only one dimension is used
    for (int i=0; i<4; i++){
        S[1*(X_TAMANHO*Y_TAMANHO)+1*X_TAMANHO+i+48]=5000;
    }
}
else{//If 3 spatial dimensions are used, an S sphere is initialized
    f_temp=M_PI/precisao;
    for (;raio>28;raio--){
        for (int teta=0; teta<precisao; teta++){
            for (int fi=0; fi<precisao*2; fi++){
                x=raio*sin(teta*f_temp)*cos(fi*f_temp);
                y=raio*sin(teta*f_temp)*sin(fi*f_temp);
                z=raio*cos(teta*f_temp);
                x+=deslocamento;
                y+=deslocamento;
                z+=deslocamento;
                S[z*(X_TAMANHO*Y_TAMANHO)+y*X_TAMANHO+x]=500;
            }
        }
    }
}
}

```



```

        z+=deslocamento;
        S[z*(X_TAMANHO*Y_TAMANHO)+y*X_TAMANHO+x]=10000;
    }
}
}
}

//The value of S is reconstructed using the positions of the base existences.
n_temp=0;
for (int n=0; n<n_utilizado; n++){
    S[E[n_temp+2]*(X_TAMANHO*Y_TAMANHO)+E[n_temp+1]*X_TAMANHO+E[n_temp]]++;
    n_temp+=3;
}
}

//Two threads were used to execute the program, one for processing and another for the user
//interface. Here begins the execution of the thread responsible for the processing of the base
//existence.
wxThread::ExitCode minha_thread::Entry()
{
    int simetria=0, valor_final=0, valor_inicial=0, valor_incremento=0;
    int v=0;
    while(pausar_processamento){
        wxMilliSleep(1000);
    }
}

//The routines are used to initialize the variables and assign the initial values of S.
if (variaveis_inicializadas==0){
    inicializar_variaveis();
    variaveis_inicializadas=1;
}
if(espaco_inicializado==0){
    inicializar_espaco_2();
    espaco_inicializado=1;
}

//Here a loop is placed that occurs until all intervals in t are processed.
while (1)
{

```



```

while(t_gravado<T_TAMANHO){
    while(pausar_processamento){
        wxMilliSleep(1000);
    }
//The values processed in the current t range are saved in the general matrix of S. An interval has
//been defined, in which you can choose to each how many intervals of t the saving occurs in the
//general matrix.
    if (t_processado%t_intervalo==0){
        t_gravado++;
        if (t_gravado<T_TAMANHO){
            for (int x=0; x<X_TAMANHO; x++){
                for (int y=0; y<Y_TAMANHO; y++){
                    for (int z=0; z<Z_TAMANHO; z++){

S[t_gravado*(X_TAMANHO*Y_TAMANHO*Z_TAMANHO)+z*(X_TAMANHO*Y_TAMANHO)+y*X_TAM
ANHO+x]=
                        S[z*(X_TAMANHO*Y_TAMANHO)+y*X_TAMANHO+x];
                    }
                }
            }
        }
        else{
            break;
        }
    }
}

//A condition of symmetry is placed in which the order of processing of base existence is reversed.
int divisao=0;
v_maximo=100;
int v_parada=1;
int contador=0;
if (v>=v_maximo)v=0;
for (; v<v_maximo; v++){
    if (simetria==0){
        simetria=1;
        valor_inicial=0;
        valor_incremento=3;
    }else{

```

```

simetria=0;
valor_inicial=3*(n_utilizado-1);
valor_incremento=-3;
}

```

//An algorithm for distribution of processing of base existences was made. The maximum velocity is //divided by V, whose value represents the number of times the base existence is processed. So if //the remainder of the division of a counter with this value is null, then the base existence is //processed.

```

for(long int j=valor_inicial;; j=j+valor_incremento){
    if ((j<0) || (j>3*n_utilizado))break;
    contador++;
    for (int i=0; i<3; i++){
        contador++;
        if (s1==1){
            contador=0;
            i=3;
        }
        divisao=V[j+(contador%3)];
        if (divisao<0)divisao=-divisao;
        if (divisao>v_maximo){
            divisao=1;
        }else if (divisao>0){
            divisao=v_maximo/divisao;
        }else{
            divisao=v_maximo;
        }
        if (v%divisao==0){
            processar(j, contador%3);
        }
    }
}
if (v%v_parada==0){
    v++;
    break;
}
}

```

```
        t_processado++;  
    }  
    wxMilliSleep(1000);  
}  
}
```