三维时间模型

The three dimensional model of time

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摘要 Abstract

本文阐述了一种时间模型，继而建立了一种时空关系。并试图利用这种模型对目前已经认知的物理现象进行解释和推测，力求探索世界的本相。

This paper presents a model of time and establishes a relation between time and space. It also tries to use this model to explain and speculate the physical phenomena that have been recognized so as to explore the reality of the world.

验证模型的客观存在性并不是此文的主旨。在没有构建出合理有效的实验之前，还需要进一步的研究和探索。

Verifying the objective existence of the model is not the main purpose of this article. Further research and exploration are needed before a reasonable and effective experiment is constructed.

限于笔者的数学水平，此模型的计算还比较粗浅。欢迎数学高手不吝赐教。

Limited by the author's mathematical level, the calculation of this model is relatively shallow. Mathematics experts are welcome to give advice.

模型的构建集中了对哲学、语言学、数学、物理学、信息科学、以及计算机科学的学习，参阅的大量文献，借鉴了前人和大家的诸多见解和理论，在此不一一列举，并深表敬意和感谢。如有雷同绝非抄袭，敬请指正。

The construction of the model focuses on the study of philosophy, linguistics, mathematics, physics, information science, and computer science. It draws on the views and theories of predecessors. If there are similarities, it is not plagiarism. If the same is not plagiarism, Please criticize and correct.

由于绘图水平限制，文中图示大量来源于网络资料。若有冒犯，敬请谅解。

Due to the limitation of drawing level, the figures in this paper are almost from network data. Please forgive me if I have offended you.

关键词 Keywords

时间螺线、理想时间螺线、理想时间线、时间速度
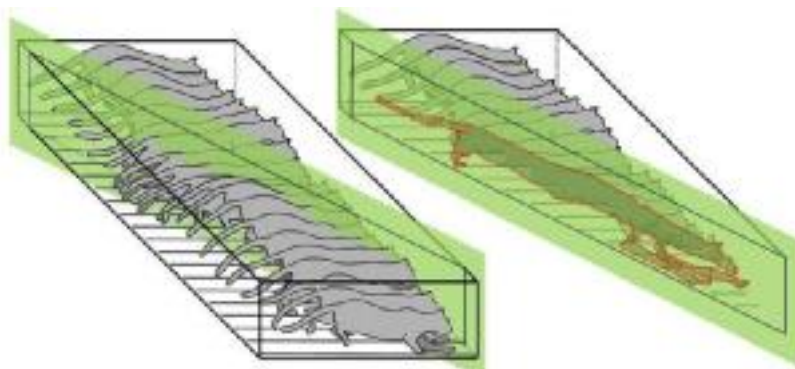time spiral, ideal time spiral, ideal time line, time speed

目录

CATALOG

一、 时空 **Time and Space**

1.1 四维时空 The four-dimensional space-time

时空就是时间和空间。四维时空观认为，世界由三维空间和一维时间组成。

Space-time is time and space. The four-dimensional space-time view holds that the world consists of three dimensions of space and one dimension of time.

一只静止不动的猫，在时间轴上可以形成连续的时间切片。与猫处于同一个时空中的观测者只能看到一个时间切片上的猫。其他时空的观测者就能够看到所有的切片。甚至在不平行于猫的时空，可以观测到猫的投影，一只被时间拉伸变形的猫。

A stationary cat can form a continuous time slice on the timeline. An observer in the same space-time as a cat can only see the cat on one slice of time. Observers of other space-time will be able to see all the slices. Even in a space time that is not parallel to the cat, the projection of the cat, a cat stretched out by time, can be observed.

1.2 时空构成关系 The constitution relations of space and time

认知、空间、时间是构成时空的三个要素。通常认为,认知是主观的，空间、时间是客观的。客观存在的空间在时间中的映像被主观的认知。

Cognition, space and time are the three elements of space-time. It is generally believed that cognition is subjective while space and time are objective. The image of the objectively existing space in time is recognized subjectively.

从纯逻辑的角度，三个要素件的关系应该有以下六种可能：

Use the tools of pure logic, the relationship between the three elements should have the following six possibilities:

① 认知是空间在时间中的映像；

　　Cognition is the reflection of space in time;

② 认知是时间在空间中的映像；

　　Cognition is the reflection of time in space;

③ 空间是时间在认知中的映像；

Space is the reflection of time in cognition;
④ 空间是认知在时间中的映像；
Space is the image of cognition in time;
⑤ 时间是空间在认知中的映像
Time is the reflection of space in cognition;
⑥ 时间是认知在空间中的映像；
Time is the image of cognition in space;

1.3 时间的客观性 Objectivity of time

如果时空是认知在空间或者时间中的映像,那么存在的主体都是认知。时空是认知的像,像又是认知。认知形成时空后,作为时空被再次认知,并形成的新认知。这种观点的核心是,认知是客观的存在, 时空是主观的。

If space-time is the reflection of cognition in space or time, then the subject of existence is cognition. Space-time is the image of cognition, and image is also cognition. A new cognition recognized again after the formation of space-time by cognition. The point is that cognition is objective and space-time is subjective.

如果时间是空间在认知中的映像，那么空间是存在的主体，认知是客体，空间被认知的结果是时间。空间是客观的，时间是被主观认知的结果，是主观的。

If time is the reflection of space in cognition, then space is the subject of existence, cognition is the object. The result of cognition of space is time. Space is objective, time is the result of subjective cognition, is also subjective.

以上推断都可以得出时间是主观的。本文讨论的前提是将时间假设为客观的,基于时间的客观性进行展开。

All of these assumptions lead to the conclusion that time is subjective. The premise of this paper is to assume time to be objective and develop it based on the objectivity of time.

1.4 空间是主观认知 Space is subjective

以时间是客观的为前提，需要分析以下 3 个推断:
On the premise that time is objective, the following three inferences need to be analyzed:
◆ 认知是空间在时间中的映像。空间是存在的主体，时间是客体，认知是空间存在。

Cognition is the reflection of space in time. Space is the subject of existence, time is the object, and cognition is the existence of space.
◆ 认知是时间在空间中的映像。时间是存在的主体，空间是客体，认知是时间存在。

Cognition is the reflection of time in space. Time is the subject of existence, space is the object, and cognition is the existence of time.
◆ 空间是时间在认知中的映像。时间是存在的主体，认知是客体，空间是认知的结果。

Space is the reflection of time in cognition. Time is the subject of existence, cognition is the object, and space is the result of cognition.

从逻辑同一主体进行选择得出：

Select from the same subject of logic:

空间是时间在认知中的映像，认知是时间在空间中的映像。

Space is the image of time in cognition, and cognition is the image of time in space.

此论断在逻辑上是成立的，其现实存在需要进行验证。基于此论断进行展开是具有逻辑合理性的。论断的重点是:

This argument is logically valid and its reality needs to be verified. It is logical and reasonable to expand based on this argument. The main points of the argument are:

- ☑ 时间是客观的。

  Time is objective.

- ☑ 空间和认知是主观的，并且都是时间的映像。

  Space and cognition are subjective, and both are reflections of time.

- ☑ 空间的本质是时间，是时间被认知的结果。

  The essence of space is time, and it is the result of time being recognized.

- ☑ 认知的本质是时间，认知的结果是时间在空间的映像。

  The essence of cognition is time, and the result of cognition is the reflection of time in space.

- ☑ 万物的存在是时间存在。存在的本质是时间。

  The existence of everything is the existence of time. The essence of being is time.

- ☑ 存在个体的独立性决定每个存在都具有各自的时间。

  The independence of the beings determines that each has its own time.

二、 时间模型 **Time model**

2.1 必然性和可能性 Necessity and possibility

既然构成世界的客观要素是时间，那么以时间为出发点来观测世界就成为必然。也有就必要来创建一个以时间为主体的认知模型。

Since the objective element of the world is time, it is necessary to observe the world with time as the starting point. It is also necessary to create a cognitive model based on time.

空间的认知是三维的。人至少可以理解、观测和把握三维存在。基于目前的知识体系之上，人的感知和意识都是基于三维模型的。那么，建立三维的时间模型就具有可能性。

The perception of space is three-dimensional. Human can at least understand, observe, and grasp three-dimensional existence. Based on the current knowledge system, human perception and consciousness are based on the THREE-DIMENSIONAL model. Then, it is possible to build a three-dimensional model of time.

维度思维的本质是坐标。坐标不是客观存在而是一种认知手段，描述客观存在的手段。对于笛卡尔之前的人类，描述空间的使用的是"上、下、左、右、前、后"，方向就是维度。所谓时间模型，其本质也就是一个坐标模型，时间的三维坐标。

The essence of dimensional thinking is coordinates. Coordinates are not an objective being but a means of cognition, a means of describing an objective being. For human beings before Descartes, space was described as "up, down, left, right, front and back", and the direction was dimension. The so-called time model, its essence is also a coordinate model, the three-dimensional coordinates of time.

为了更好地建立这个三维坐标，首先需要了解时间的三维存在，建立一个时间的三维存在模型。

In order to better establish this three-dimensional coordinate, we first need to understand the three-dimensional existence of time and establish a three-dimensional existence model of time.

2.2 现有时间模型 Existing time model

零维的时间就是时间点。
Zero dimensional time is the point in time.

12:05
·

一维的时间就是直线。从过去到将来。
One dimensional time is a line. From the past to the future.

过去 PAST 将来 FUTURE

二维的时间是用角度来描绘的。

Two-dimensional time is represented by angles.

2.3 三维螺线模型 Three dimensional spiral model

一个静止的物体，随着时间变化，它的空间位置不发生改变。从时空坐标系观测，这个物体因为时间的流逝转了一个 θ 角。由此看来，对于此物体来说，在空间中，时间对其的作用不是平移，而是旋转。

A stationary object does not change its position in space as time changes. When you look at it from the space-time coordinate system, this object is rotated by θ because of the passage of time. From this point of view, the effect of time on the object in space is not translation but rotation.
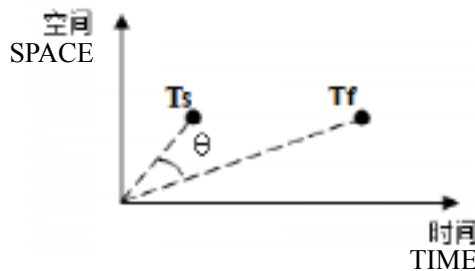

看来时间的轨迹不是直线，而是旋转前进的线，螺线。一维的认知仅仅是螺线的前进方向。由此，可以建立一个螺旋模型来描述时间。一个等螺距、等螺径、中心线为直线的模型就是时间的理想化模型，理想时间螺线。中心线就是理想时间线。

It seems that the trajectory of time is not a straight line, but a line of rotation, a spiral. One-dimensional cognition is simply the direction of the spiral. From this, a spiral model can be built to describe time. A model with equal pitch, equal diameter and straight center line is an idealized model of time, an ideal time spiral. The center line is the ideal time line.

需要强调的是，时间中心线是时间存在的中心，并不是整个空间的中心。

It should be emphasized that the time center line is the center of time existence, not the center of the whole space.
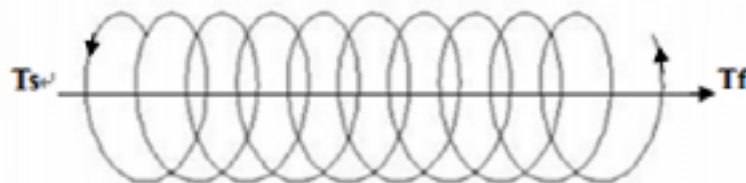
当时间的实际状态可能要复杂的多。无论多么复杂，总是可以打开、投影、简化为螺旋

模型。以下列举几种可能。事实的可能性可以更多，也可以是这些可能的叠加。

The actual state of time may be much more complicated. No matter how complex it is, it can always be extended, projected, and simplified to a spiral model. Here are a few possibilities. The possibilities of facts can be many more, and they can be superimposed on each other.

1. 螺线的中心线很可能是一条曲线。

   The center line of a spiral is likely to be a curve.

2. 时间的起点也也有可能就是时间的终点，螺线的中心线甚至可以是一个闭环。

    The beginning of time may also be the end of time, and the center line of the spiral may even be a closed loop.

3. 结合事物发生、成长、衰弱、消亡的自然规律，时间的三维螺线就可以表达为一个由渐开发展到渐闭的形状。

    In conjunction with the natural order in which things occur, grow, decay, and die, the three-dimensional spiral of time can be expressed as a gradual progression from opening to closing.
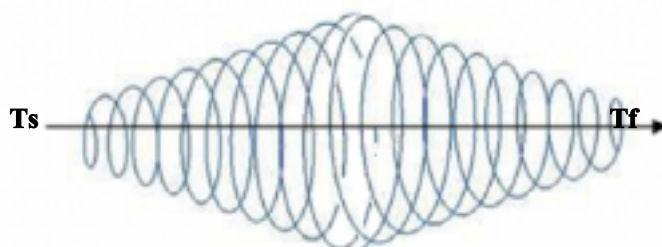
4. 一个海螺壳，很有可能就是这个海螺的时间螺线留下的痕迹。

    A conch shell is probably the trace left by the conch's time spiral.

5. 甚至也可理解为物体存在于三维螺旋时间的隧道中，并且与这个隧道是一体的。因为，物体的存在就是时间存在，通过存在体的认知才能形成空间。

    It can even be understood that objects exist in a three-dimensional spiral tunnel of time and are integral to this tunnel. Because, the existence of objects is time existence, a

space is formed through cognition of the existence.

# 2.4 螺线模型的二维投影 A two-dimensional projection of a spiral model

观测者的角度不同，所获得的螺线模型的二维投影是不同的。

The two dimensional projection of the spiral model is different with different angles of the observer.

2.4.1 圆周运动 Circular motion

从过去面向未来，观测到的应该是一个螺线平面，简单地说就是一个圆。螺线的无限延伸就是永无止境的圆周运动。时间的长度就是圆周运动经过的角度。

From the past to the future, the observed surface should be a spiral plane, in simple terms, a circle. An infinite extension of a spiral is an endless circular motion. The length of time is the Angle at which the circle moves.
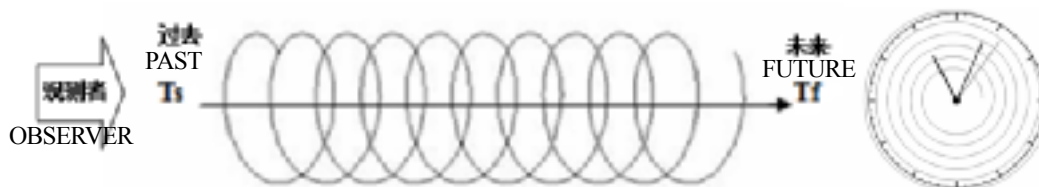
螺线模型是遵循右手螺旋定则的。从过去观测未来时间是顺时针变化的。反之，时间就是逆时针的。

The spiral model follows the right hand spiral rule. The future time observed from the past changes clockwise. On the other hand, time goes counterclockwise.
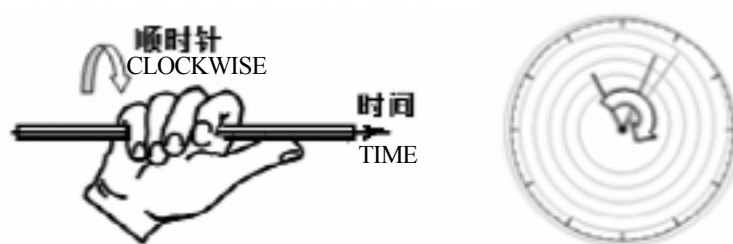
2.4.2 波 Wave

　　从不与螺线中心线平行的角度观测，时间的三维理想化模型的投影应该是波。观测方向从过去向将来，波的前进方向就与时间方向一致。反之，波的前进方向就与时间方向相反。

　　Never observed at an Angle parallel to the Central Line of a spiral, the projection of a three-dimensional idealized model of time should be a wave. From the observed direction in the past to the future, the wave will travel in the direction of time. The wave, on the other hand, moves in the opposite direction of time.

　　时间的理想化模型的理想观测状态是一条正弦曲线。当然，实际的螺线投影波形可能会十分复杂。复杂的波形意味着：

　　The ideal observed state of an idealized model of time is a sinusoidal curve. Of course, the actual spiral projection waveform can be quite complex. Complex waveforms mean:

- 时间是能够被影响的。

  Time can be affected.

- 并且能够影响时间的因素非常多。

  And there are many factors that can affect time.
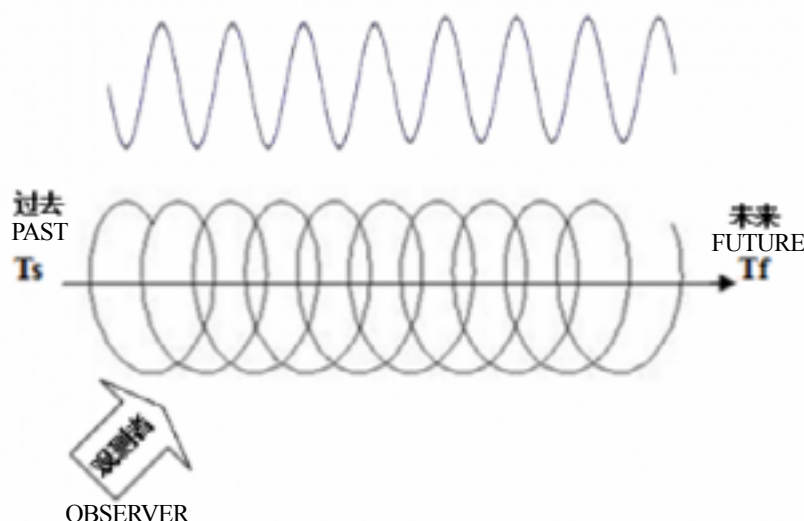
2.4.2 空间角变量 Spatial Angle variable

　　时间在空间中的映像是空间角变量。

　　The image of time in space is a spatial Angle variable.

1. 圆周运动的本质是角度的变化。

   The essence of circular motion is the change of Angle.

2. 波的本质是角度变化的叠加。

   The essence of waves is the superposition of Angle changes.

　　再复杂的波也可以被拆分为若干正弦波的组合。每一个波就意味着一个影响被观测体的时间的因素所带有的时间轨迹。

　　Even the most complex wave can be broken down into a combination of sine waves. Each wave represents a time trajectory associated with a factor that affects the time of the observed
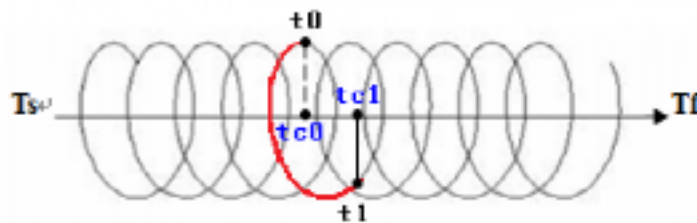
object.

FREQUENCY DOMAIN 频域图像 THE TIME DOMAIN 时间图像

TIME 时间方向 → 频率方向 → FREQUENCY
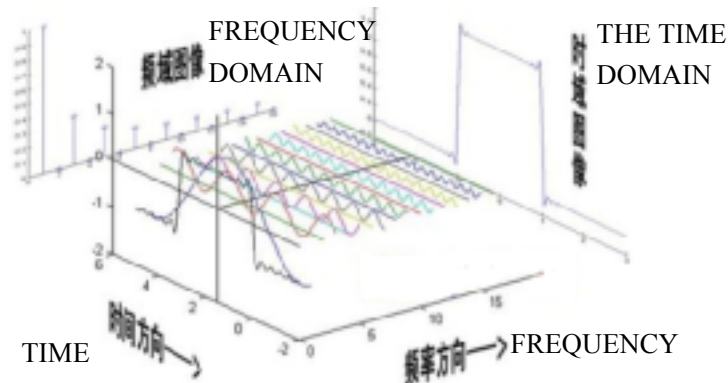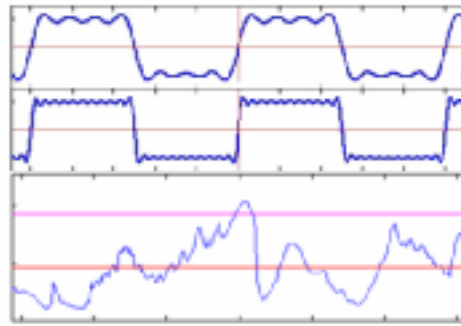
这些波的叠加的结果可描述为一串诸如下式的只与角度有关的函数的和。

$$\frac{4}{\pi}Sin(\theta)+\frac{4}{3\pi}Sin(3\theta)+\frac{4}{5\pi}Sin(5\theta)+\frac{4}{7\pi}Sin(7\theta)+......$$

The result of the superposition of these waves can be described as the sum of a series of angular dependent functions such as the following.

2.5 时间的度量 Measurement of time

2.5.1 理想时间 The ideal time

时间 t 是结束时间与起始时间的差值。t 理想螺线时长，也叫理想螺旋时长。

Time t is the difference between the end time and the start time. Ideal spiral length t, also known as ideal spiral length.

$$t = t_1 - t_0$$

在理想时间线上，结束与起始时间投影的差值为 t_c。t_c 是理想时长，也叫理想时间。

On an ideal time line, the difference between the end and the start time projections is the length of the ideal time, t_c. It's also called the ideal time.

$$t_c = t_{c1} - t_{c0}$$

显而易见，t_c 是小于 t 的。

Obviously, t_c is less than t.

$$t_c < t$$

如果时间螺线模型的螺径足够大，那么投影 t_c 可能是远远小于螺线长 t 的。

If the spiral diameter of the time spiral model is large enough, the projection t_c may be much smaller than the spiral length t.

$$t_c << t$$

在实际的时间螺线上，实际的时间长度 t_s，即事实时长，是结束时间 t_{s1} 与起始时间 t_{s0} 的差值。

In an actual spiral of time, the actual length of time t_s, the actual length of time, is the difference between the end time t_{s1} and the beginning time t_{s0}.

$$t_s = t_{s1} - t_{s0}$$

t_s 一定是与 t 不一致的。观测者总是站在自己的立场上来考察时间的，所以通常被关注的时间是 t_s 而不是 t_c 和 t。

t_s must be inconsistent with t. The observer is always check the time from his own point of view. So, the time is usually concerned with t_s, not t_c or t.

为了更好的理解时间，建立时间三维坐标，本文中会更多地使用理想时间螺线，用理想螺旋时长 t 来代替事实时长 t_s。

In order to better understand time and establish three-dimensional coordinates of time, ideal time spirals will be used more often in this paper, Ideal spiral time t will be used to replace the actual time t_s.

2.5.2 时间长度 Length of time

处于三维空间中，用空间认知获得的时间度量是空间的角度的变化，用角度来代替的时间的长度。但是在空间中，我们关心的是时间的长度，所有的时间单位的本质是长度单位。需要强调的是，时间虽然有长度，可以想象成类似空间的存在，但是不占有空间。占有空间的是物质个体的时间轨迹。空间的本质也就是物质个体时间轨迹的集合。

In three-dimensional space, the measure of time obtained by spatial cognition is the change of spatial angle changes, and the length of time replaced by angle.

But in space, what we care about is the length of time, and all units of time are essentially units of length.

It should be emphasized that although time has length, it can be imagined similar as the existence of space, but it does not occupy space. What occupies space is the time track of the physical individual matters.

The essence of space is the collection of time traces of individual matters.

时间的长度，也就是时间的距离，是由螺线线长决定的。决定螺线线长的因素有螺线圈数、螺距、螺圈直径。

The length of time, the distance of time, is determined by the length of the spiral. The factors that determine the length of spiral line include spiral number, spiral pitch and spiral diameter.
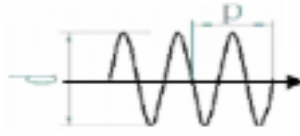
n：螺线圈数 spiral number

p：螺圈螺距 spiral pitch

d：螺圈直径 spiral diameter

L：螺线线长 spiral length

时长等于螺线长，因此被观测者的时间 t 为：

The length is equal to the length of the spiral, so the time of the observed object t is:

$$t=\sqrt{(n*p)^2+(\pi*d)^2}$$

被观测者理想时间线时间 t_c 为：

The ideal time line of the observed object t_c is:

$$t_c=n*p$$

三、 时空关系 **Relationship of time and space**

3.1 时空可能的关系 Possible relations between space and time

空间的本质是时间，对时间的认知形成了空间认知。

The essence of space is time, and the cognition of time forms the cognition of space.

1. 时空不可分割。没有时间就没有空间。没有空间，对于认知，时间也失去了价值。

    Space and time are indivisible. No time, no space. Without space, time has no value for cognition.

2. 时空映射比例是主观认知的结果，并不影响认知逻辑本身。

    Space-time map scale is the result of the subjective cognition, does not affect cognitive logic itself.

3. 时空认知的主次，会对认知逻辑的顺序产生影响，改变认知结果。因此在进行时空认知时首先要明确时空关系。认知的主次有两种。

    The cognition order of space-time will affect the order of cognitive logic and change the cognitive results. Therefore, in the process of spatiotemporal cognition, the relationship between space and time should be clarified first. There are two kinds of cognition.
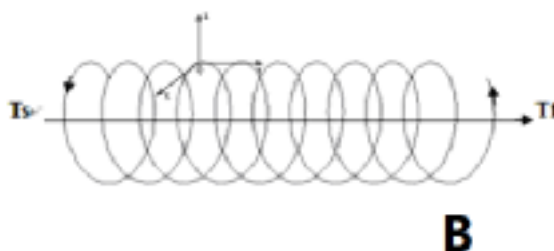
    ■ 时空关系 A：空间为主

    A：Space is first.

A
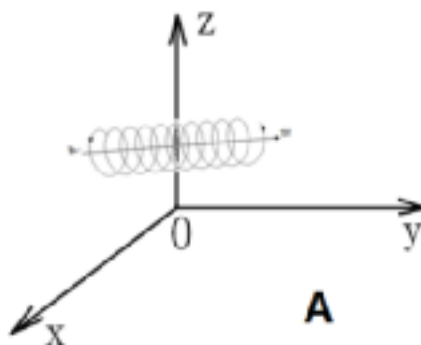
    ■ 时空关系 B：时间为主

    B: Time is first.

B

3.2 时间形成的空间

从逻辑的角度，事实时长 t_s、理想时长 t_c 间至少存在以下几种可能。

From a logical point of view, there are at least the following possibilities between the fact duration and the ideal duration.

① $t_s >> t_c$
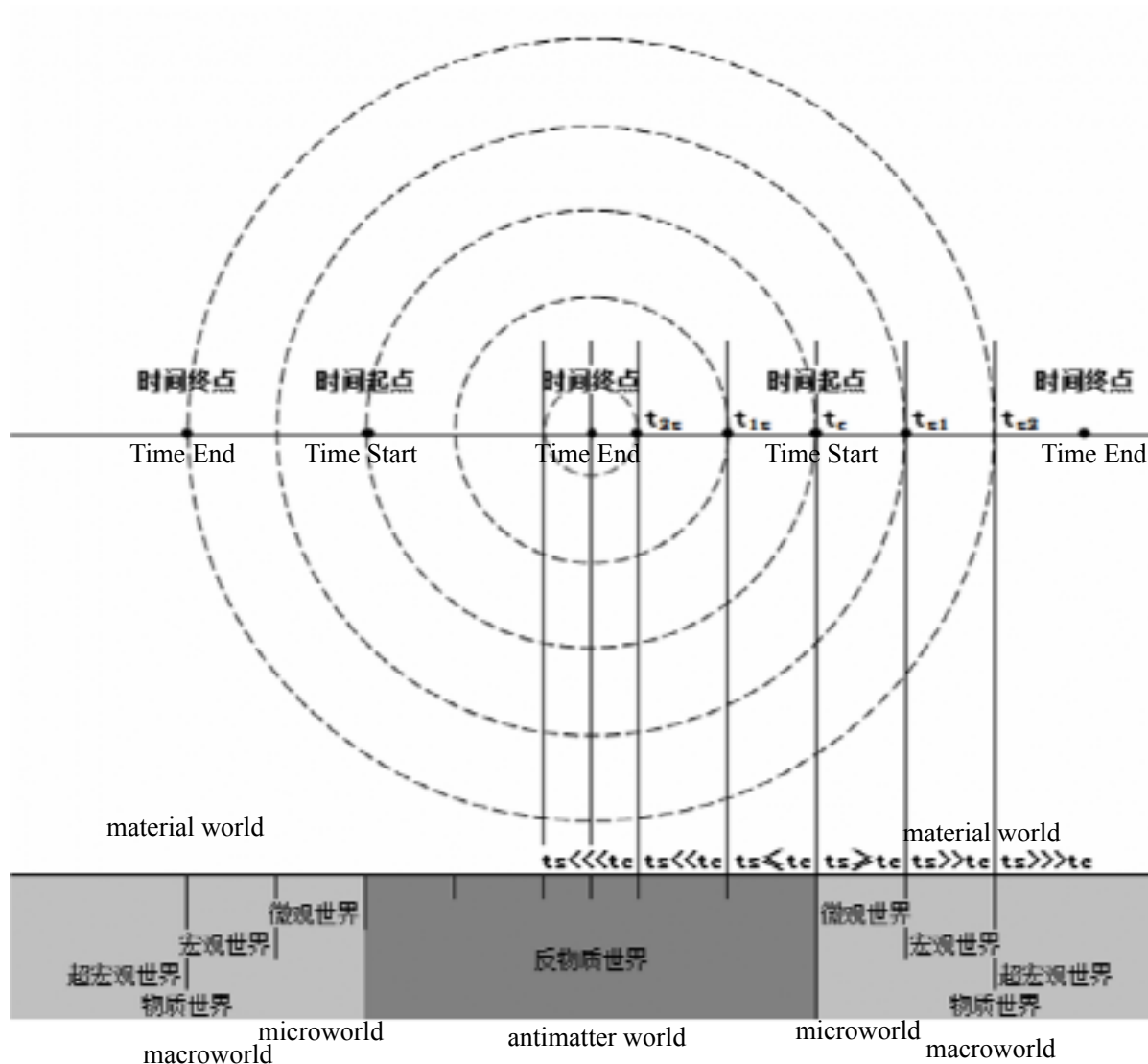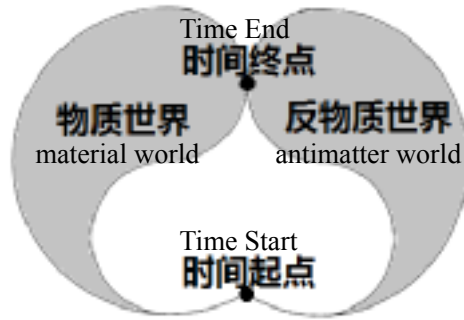
② $t_s \geq t_c$

③ $t_s \leq t_c$

④ $t_s << t_c$

用图形示意时间映像形成的空间如下。

Graphically, the space formed by the time image is shown below.
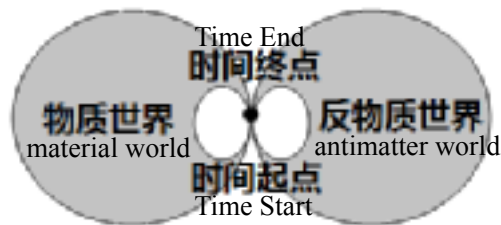

15

上图的空间平面示意图如下。

如果起点和终点是一致的。只需要将两点再重合即可。起点与终点的重合能够更好地诠释世界运行生生不息、延绵不断的能量守恒。

If the starting point and the ending point are the same. You just have to bring them back together. The coincidence of starting point and ending point can better explain the energy conservation of the continuous and continuous operation of the world.
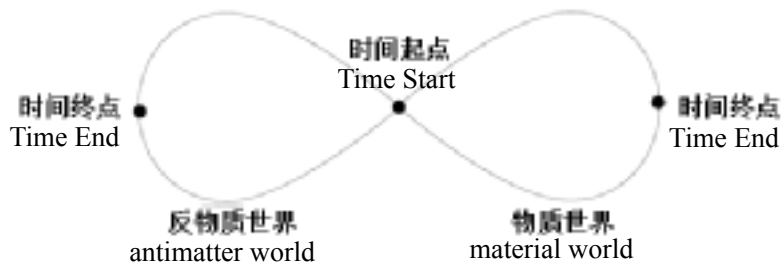

太极图可能就是一个时间的映像。

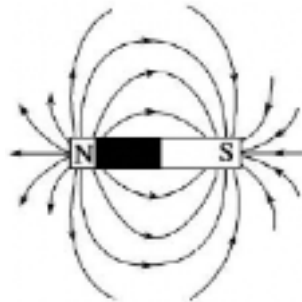Taiji diagram may be an image of time.

将这个空间在二维平面打开，将会得到下图。

Opening this space in two dimensions will give you the following image.

3.3 关于物质的猜想 Conjecture about matter

时间像极了一块磁铁的磁力线。从一个起点，无数的磁力线涌出，最终又汇合到了终点。每一根磁力线就是一个时间螺旋线的中心线，理想时间线。

Time resembles the magnetic field lines of a magnet. From a starting point, countless lines of magnetic force flow out and eventually converge to an end point. Each magnetic field line is the center line of a time spiral, the ideal time line.
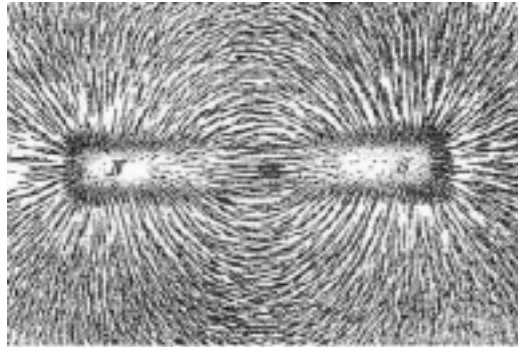
虽然时间不短涌出的源动力还有待探究，但是可以认为时间的交汇形成了物质，物质的堆积形成物体，正所谓"缘起性空"。物质个体的独立性决定其分别具有独立的时间。每个个体的时间都有起点和终点。个体时间都是三维的，是螺旋前进的，并且具有理想时间线。

Although the source force of the long outpouring remains to be explored, it can be considered that the convergence of time forms matter, and the accumulation of matter forms objects. The independence of the material individuals determines their respective independent time. Every individual's time has a beginning and an end. Individual time is three-dimensional, spirals forward, and has an ideal timeline.

四、 时间的感知 Perception of time

4.1 时间感知比 Time perception ratio

忽略观测者的时间对被观测者时间的影响。单纯地研究被观测者的时间。假设被观测者的时间是理想时间螺线。时长等于螺线长，因此被观测者的时间 t 为：

Ignore the effect of the observer's time on the observed's time. Simply study the time of the observer. Suppose the observed time is the ideal time spiral. The length is equal to the length of the spiral, so the time of the observer is:

$$t^2 = \left(n*p\right)^2 + \left(\pi*d\right)^2$$

被观测者理想时间线时间 t_c 为：
The ideal time line of the observer is:

$$t_c{}^2 = \left(n*p\right)^2$$

被观测者理想时间螺线的时间与理想时间线的时间的比值 t/t_c ：

The ratio of the time of the ideal time spiral to the time of the ideal time line:

$$t^2/t_c{}^2 = 1 + \left(\frac{\pi*d}{n*p}\right)^2$$

设螺线时间长度与理想时间长度比为 Ω ，

The ratio of the spiral time length to the ideal time length is set as Ω ,

$$\Omega = \frac{d}{n*p}$$

那么：
So:

$$t^2/t_c{}^2 = 1 + \left(\pi*\Omega\right)^2$$

假设：被观测者的理想时间螺线的螺径非常大，远远大于理想时间线。也就是螺径 d 远远大于螺距 p 。即

Hypothesis: the ideal time spiral diameter of the observed is very large, far larger than the ideal time curve. That is, the diameter of the screw is much larger than the pitch.

$$\left(\frac{\pi * d}{n * p}\right)^2 >> 1 \; ; \; \left(\pi * \Omega\right)^2 >> 1$$

那么 1 可以忽略。被观测者理想时间螺线的时间与理想时间线的时间的比值 t/t_c 可以改写为：

So 1 is negligible. The ratio of the time of the ideal time spiral of the observer to the time of the ideal time line can be rewritten as:

$$t/t_c = \pi * \Omega$$

我们将这个比值称为时间感知比。

We call this ratio the time perception ratio. We call this ratio the time perception ratio.

4.2 时间的螺径 The spiral diameter of time

假设：光的理想时间螺线十分接近被观测者的理想时间螺线的理想时间线。

Hypothesis: The ideal time spiral of light is very close to the ideal time spiral of the observed.

设被观测者的空间速度为 v_r，时间为 t_r；光的空间速度为 v_c，时间为 t_c；那么：

Let the spatial velocity of the observer be v_r and the time be t_r. The spatial velocity of light is v_c and the time is t_c. So:

$$t_r/t_c = t/t_c = \pi * \Omega$$

被观测物体的速度：

The velocity of the observed object:

$$v_r = s/t_r$$

光的速度：

Speed of light:

$$v_c = s/t_c$$

那么光速与被观测物体的速度比：

Then the ratio of the speed of light to the observed object:

$$t_r/t_c = v_c/v_r$$

v_c 是光速，而 v_r 远远小于 v_c，对于 v_c，假设 v_r 为 1，那么：

v_c is the speed of light, while v_r is far less than v_c. For v_c, assume v_r as 1, then:

$$\pi * \Omega = 3 * 10^7$$

得到：

So:

$$\Omega \approx 10^6\text{-}10^7$$

结论：

Conclusion:

1. 空间移动速度快的物体的时间螺圈直径小，移动相同空间距离所用的时间距离少。因此可以考虑减小时间罗圈直径来提高速度。光的速度非常快，就是因为光的螺线直径非常小，光的时间非常接近理想时间线。

   Objects moving fast in space have smaller time spiral diameter and less time distance for the same space distance. Therefore, it can be considered to reduce the time coil diameter to improve the speed. The speed of light is very fast, because the spiral diameter of light is very small, and the time of light is very close to the ideal time line.

2. 理想时间螺线时间的理想时间线时间的比约为 $10^6\sim10^7$。如果我们的宏观世界以米为单位来考察，那么 10^{-6}m，也就是纳米以下就可以看作是微观世界。纳米也就是宏观世界和微观世界的分界点。

   The ratio of ideal time to ideal time for spiral time is about $10^6\sim10^7$. If we look at the macroscopic world in terms of meters, then 10^{-6}m, below the nanometers, we can think of it as a microscopic world. Nanometer is the boundary point between macro world and micro world.

4.3 时间的存在 Existence of time

我们再来考察这个等式：

Let's look at this equation again:

$$t^2/t_c^2 = 1 + \left(\pi * \Omega\right)^2$$

在 t_c 远远大于 t 时，可以认为 t/t_c 等于 0，那么等式变为：

When t_c is far greater than t, t/t_c can be considered to be equal to 0, then the equation becomes:

$$0 = 1 + \left(\pi * \Omega\right)^2$$

根据欧拉公式：

According to Euler's formula:

$$0 = 1 + e^{i\pi}$$

由此可得：

Thus it can be obtained that:

$$e^{i\pi} = \left(\pi * \Omega\right)^2$$

$$\pi\Omega = e^{\frac{i\pi}{2}}$$

$$\pi\Omega = \cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)$$

$$i = \pi * \Omega$$

而时间感知比：

And time perception ratio:
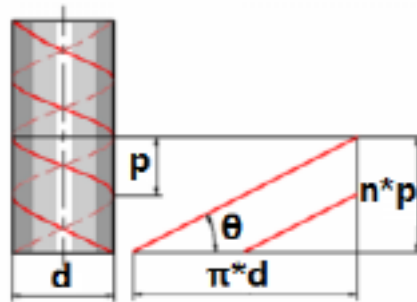
$$t/t_c = \pi * \Omega$$

所以得到：

So we get:

$$t/t_c = i$$

另外，我们知道，螺线的导程角为：

In addition, we know that the lead Angle of the spiral is:

$$\tan(\theta) = \frac{n*p}{\pi*d} = \frac{1}{\pi*\Omega}$$

从而得到：

Thus:

$$t/t_c = \frac{1}{\tan(\theta)}$$

结论：

Conclusion:

1. 导程角越大，螺线传动效率越高，但是也越难实现。因此，越接近理想时间线所用时长会越短，产生的空间速度会越大，时间效率也会越大。但是要接近理想时间线，实现的难度也越大。

The larger the lead Angle is, the higher the spiral transmission efficiency is, but it is also more difficult to achieve. Therefore, the closer to the ideal time line, the shorter the time taken, the greater the space velocity generated, and the greater the time efficiency. But getting close to the ideal timeline is more difficult.

2. 时间感知比 t/t_c 同时拥有实数和虚数的表现。可见，世界应该有两种存在。其中实数表现是物质世界。我们猜想虚数表现可能是反物质世界的存在。

    Time perception ratio has both real and imaginary representation. Therefore, there should be two kinds of existence in the world. Where real Numbers represent the physical world. We suspect that the imaginary representation might be the existence of an antimatter world.

4.4 时间速度 Time speed

事实上，我们的感知时间却与测量时间经常是不同的。我们会感到有快有时慢。这是因为，测量的是时间的角速度，ω 是恒定的。而感知的是时间的线速度，称为时间速度。

In fact, our perception of time is often different from our measurement of time. We may feel fast or slow. And that's because we're measuring the angular velocity in time, and ω is constant. And the perceived linear velocity of time is called the velocity of time.

真实存在的时间螺线，A、B 两点，由于螺径变化，造成了线速度的改变。时间速度不是匀速的。

The real time spiral, point A and Point B, caused the change of linear velocity due to the change of screw diameter. The velocity of time is not constant.

并且，线速度是时间螺线的切线，方向与切点的螺线前进方向一致。因此，A、B 两点时间的方向也不尽相同。

Moreover, the linear velocity is the tangent of the time spiral, and the direction is consistent with the advance direction of the tangent point spiral. Therefore, the directions of time A and B are not the same.
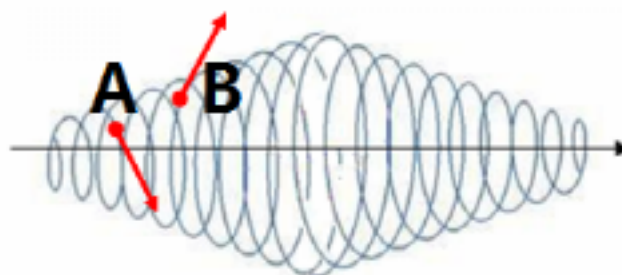
如果某个体时间螺线的二维投影如图。

If a two-dimensional projection of a time spiral of an individual is shown.

■ A 经过 B 到达 C 为一个周期。
   A over B to C for A cycle.
■ C 经过 D 到达 E 为一个周期。
   C over D to E for A cycle.
■ B 经过 C 到达 D 为一个周期。
   B over C to D for A cycle.
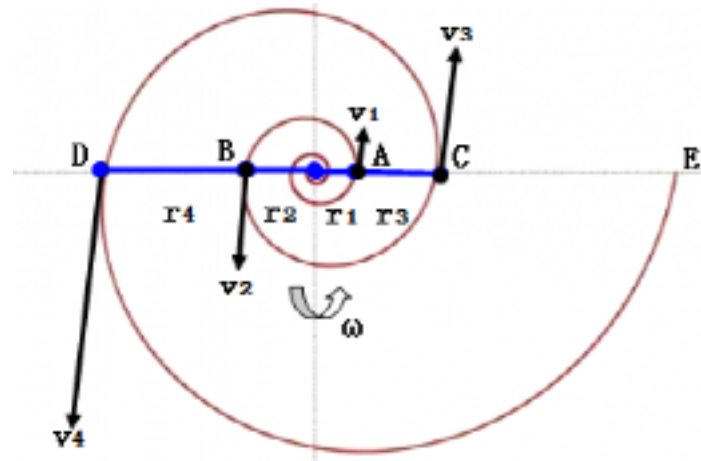
由于是螺线，时间螺线的周期一定不是闭合的。

Since it is a spiral, the period of a time spiral must not be closed.

■ v_1 和 v_2 的线速度，也就是时间速度方向是相反的。

The linear velocity of v_1 and v_2, that is, the direction of time velocity is opposite

■ v_3 和 v_4 的线速度，也就是时间速度方向是相反的。

The linear velocity of v_3 and v_4, that is, the direction of time velocity is opposite

$$v_1 = \omega * r_1$$

$$v_2 = \omega * r_2$$

$$v_3 = \omega * (r_1 + r_3)$$

$$v_4 = \omega * (r_2 + r_4)$$

$$v_4 > v_3 > v_2 > v_1$$

由于宏观个体的时间螺径十分大，螺径改变是缓慢的，时间方向又是连续变化的，因此对于时间速度大小和方向改变的感知也不会十分强烈。

Since the macro individual's time diameter is very large, the change of time diameter is slow, and the time direction changes continuously, the perception of time velocity and direction change will not be very strong.

但是，两个时刻的方向正相反时，还是能感知到这种区别的。时间方向的周期性改变，也就形成了生物钟和生物钟周期。

However, the difference can be perceived when the two moments are in opposite directions. Periodic changes in the direction of time also form the biological clock and biological clock cycle.