MiTiempo

Supplementary part

Version 2017.5

Life and time

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< Introduction >

As summarized in the Features of time, the time we feel is through tracing outside movements by our brain. There arises a possibility that our life would be an essence to recognize time passing.

Living things like human beings can detect stimuli from outside, record them and recall them later. By using a computer system, we can perform a very similar process. We often say that an image on a computer screen is virtual whereas what we see is real. However, what we see is not a direct outcome of tracing by our brain but a projected image on a screen inside the brain. What we perceive through eye, ear or skin is essentially a virtual outcome computed by our brain based on detected signals.

We may newly define the term "life", covering both living life and virtual one by computer, from the perspective of time and recognition of time passing. Before advance to the next page, please read again and confirm the Features of time.

The concept "life" extracted from the living life

- Call the life of living beings as the living life.
- Take the new concept "life", which is deducted by the living aspect from the living life. In case a living being has the life, we call it the living life.
- There are many definitions for living beings, which include capability of self-reproduction etc.
- A well-programmed computer equipped with detectors can detect outside signals, record them, recall them and make actions responding to the information in accordance with installed programs. When the computer is running the programs, we may regard that it has similar natures of the life while it is not a living being.

A life has its own time to trace outside movements.

- A living being detects outside signals successively and grasps them as a chronological change. This means that it traces outside movements.

- In order for a movement to work as a tracing dimension, it should show the imaginary order of freedom when traced by a common measuring time such as the Observed Time or a time based on a clock. Therefore, a living being should have an internal movement showing imaginary order of freedom to trace outside movements.

- Inside a cell or an organ, a living being has such an internal movement, either a pre-existing clock function or sequential records of outside signals. (Such records can work as a time.)

- We can expect that a life should comprise a function of its own time to trace outside movements. Such a time should not always pass constantly by our common clock.

Recognition of time-passing requires access to recorded information of past.

- Energy exists only at a single point of time, which is the present.
- The past is a record of what happened in the past, existing at present. The future is a present expectation to happen in the future.
- Measuring a movement is done by Remote tracing and Chronological recording.
- We feel the time is passing by recalling recorded information of past in parallel to detecting current signals.

Life requires autonomous actions.

- Even without orders from outside, a life should perform actions by itself. Autonomy of action is a key factor for life.
- Programs enable autonomous actions.
- Autonomous actions include detection of outside signals, internal processing of information, reactions to such input, etc.
- Not only pre-existing programs, stored information and experiences amend the programs for actions.
- In case of living lives, the primary program is genes, and amended by epigenetic modifications, intra and inter cellular reactions, records in brain etc.

Definition of the life

If an object performs the following actions, define that it has the "life".

1. **Detect outer signals.**
2. **Record detected information.**
3. **Recall recorded information.**
4. **Carry out the above and responding actions in accordance with internal programs (autonomous actions).**

- Detecting outside signals and successive recording of them provide an internal movement showing the imaginary order of freedom when traced by our common time. It works as a tracing dimension for outside movements, that is, the unique and own time of the object. Refer it to as the "primary time" of the object.
- Long-term records and access to them provide another internal time for the object to feel time passage. Call it as the "memory-based time".

Identity of a life

- Take a computer system equipped with all requirements for a life, for instance an autonomously acting robot.
- When the power of the system is turned off, it no longer meets the requirements for life. The system has a life only when the power is on and programs are running.
- However, if key events happened in the system during former runs are recorded and the system can access to them properly in a new run, the current system has a continuous identity of life from former runs. In trace by outside observers, the system interrupted when the power was off. But for the system there was no time then. Accordingly, it recognizes continuous time passage combining each runs.
- In case of us human being, there are many kinds of life; that of a cell, of an organ and of the whole body with respective times. It is because we have past memories in the brain that we can feel own identity and own time passage. From viewpoint of our recognition, the term during we sleep is skipped from one's time, but we can restart the time when awake, similar to on-off switching of power in the above case of the system.