

Recursive Function Space: 左手を節、右手を葉とする 再帰的視点変換によるメタ認知空間の探索

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自己イメージの起源を絶対的な要素に求めようとするうえでの困難は、ホムンクルスの誤謬としてよく知られている。本研究では、認知空間における自己イメージが、無限後退による直列的な視点移動と、他者視点による俯瞰的視座への視点変換により成立するという仮説的モデルを基礎に、HMD 空間上で、このような再帰的な視点変換を具体的に体験可能な『Recursive Function Space』を作成したので報告する。

Recursive Function Space: Exploring Meta-cognitive Scenery via HMD

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Recursive Function Space (RFS) is a virtual reality based interactive contents that prominently explores and activates a meta-cognitive function in our human cognition system. RFS consists of four (RFS 1.0) or six (RFS 2.0) clones of the player (HMD wearer), characterized in a distinctive perspective transition among these clones that gives an out-of-body-like experience of seeing oneself, how one looks at oneself, and how one is looked by oneself.

1. STATEMENTS

Recursive Function Space (RFS) entices you to find a core of yourself and get an implication that such an attempt has no specific goal after some explorations. Such a universal question concerning the origin of the subject (**O**) has been so far dealt with mainly in the mind of a susceptible young person, a story of novels, or notes of prominent philosophers. In RFS, such a thought experiment is unfolded as perspective transitions among multiple self-body images, which is a fairly specific operation in the three-dimensional space implemented in a specific environment of a head-mounted display (HMD) (using VIVE).

RFS is a singular space at an intersection among formal logic (Russell's paradox), brain science (out-of-body experience [1]), philosophy (Homunculus' infinite regress), quantum theory (many-worlds interpretation), psychoanalysis (petit objet a), and Buddhism (the palm of Buddha). In RFS, we understand that we (**O**), which is assumed to be the core of the subject) are actually dancing on the palm of Buddha and that Buddha is also on the palm of another Buddha. Conversely, we may understand that we are originally something like Buddha for another subject. Thus, RFS provides us with a unique intuition where we (and

our reality) are essentially ubiquitous in our phenomenal experience.

Indeed, our cognitive space is accompanied by a recursive structure because the cognition cannot separate “self-image” from “self who image self-image.” As the formal logic demonstrates, completeness of the system allowing recursive mapping is critically denied. Thus, the attempt to find **O**'s origin ends in failure. As in formal logic, RFS defines the basic elements representing “self-body image” positioning in a three-dimensional space and some basic mappings applied to the element, constructing a universal structure representing the failure to find **O**.



図 1 物理空間と HMD 空間の対応関係

Figure 1 Physical space and virtual space in HMD

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2. Descriptions Rule of RFS

Recursive Function Space (RFS) is a countable set of clones having a specific scale and posture in virtual reality space. Each clone follows a well-defined description rule.

O is a special element exclusively representing a person who wears an HMD. The position and head rotation of **O** follows those of the HMD wearer. For a specific element **P**, the function that moves **P** to the left hand of **P** is referred to as L Map and denoted as **PL**. For a specific element **P**, the function that moves **P** to the right hand of **P** is referred to as R# Map and denoted as **PR#**. The head rotation of **PL** (L Map of **P**) is in accordance with that of **P**. The head rotation of **PR#** (R# Map of **P**) is

always directing to the head of **P**. L Map and R# Map reduce the size to half; the body size of **PL** and **PR#** is half of that of **P**. When the L Map of an element **Q** corresponds with **P**, **Q** is denoted as **PL⁻¹**. Note that **L⁻¹** is the inverse map of L Map, and **PL⁻¹L = P** is satisfied. Conversely, L Map of **PL⁻¹** is **P**; the above rules are equally applied to the relation between **PL⁻¹** and **P**.

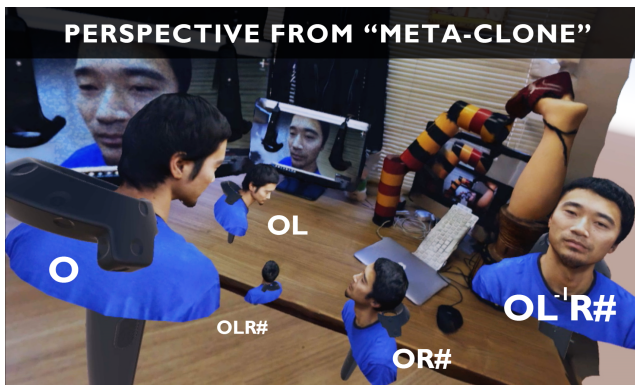


図 2 メタクローンからの視点の風景

Figure 2 Perspective from meta-clone (**OL⁻¹**)

3. RFS Implementation

3.1 RFS 1.0

RFS 1.0 includes the following four elements.

Table 1: Components of RFS 1.0

Scale	1	1 / 2	1 / 4
Clone	O	OR#	OLR#
		OL	

OL is L Map of **O**, **OR#** is R# Map of **O**, and **OLR#** is R# Map of **OL**. **O** is at HMD wearer, **OL** is at the left hand of **O**, **OR#** is at the right hand of **O**, and **OLR#** is at the right hand of **OL**.

The head rotation of **O** and **OL** accords with that of the HMD wearer, that of **OR#** is directing to **O**, and that of **OLR#** is directing to **OL**. When the body size of **O** is assumed to be 1, the body size of **OL** and **OR#** is 1/2 and that of **OLR#** is 1/4.

3.2 RFS 2.0

RFS 2.0 includes the following six elements.

Table 2: Components of RFS 2.0

Scale	2	1	1 / 2	1 / 4
	OL⁻¹	OL⁻¹R#		
Clone		O	OR#	OLR#
			OL	

OL⁻¹ is inverse L Map of **O**, and **OL⁻¹R#** is R# Map of **OL⁻¹**. **OL⁻¹** is an element that has **O** at its left hand, and **OL⁻¹R#** is at the right hand of **OL⁻¹**. The head rotation of **OL⁻¹** accords with that of the HMD wearer, and that of **OL⁻¹R#** is directing to **OL⁻¹**. When the body size of **O** is assumed to be 1, that of **OL⁻¹** is 2 and that of **OL⁻¹R#** is 1. The remaining four elements (**O**, **OR#**, **OL**, and **OLR#**) follow RFS 1.0 definition.

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