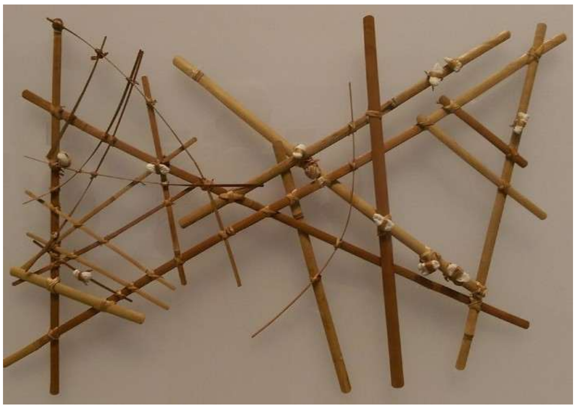
Sailors, Mudflat Hikers, London Taxi Drivers, and Mountain Guides Construct Templates Consisting of Two Autonomous Cognitive Representations Like Within All Other Motor Actions

Addendum to the final clarification of templates regarding motor sequential learning



Caught In A Line
The explanatory model of all motoric movement actions

N.J. Mol
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Contact: kwillinq@gmail.com
https://www.researchgate.net/profile/Nj-Mol/research
https://www.explanatorymodel.nl/

Abstract

The explanatory model of the motoric movement action provides a definitive account of motor sequence learning across all conceivable types of motor activity. It shows that executing the symbolic or numerical sequence of relevant action items results in a spatio-temporal representation between these items. Each distinct item in the sequence addresses the classical cognitive question of "what," while the spaces between the items pertain to the question of "how (the items must be spatially bridged)" in motor learning. These two aspects remain autonomous cognitive phenomena, yet together they form a unified template that underlies motor behavior. This template frequently governs our cognitive processing in a hybrid manner during most motor actions, integrating recognition and execution.

The clarity of this model has been confirmed across a wide range of motor behaviors. Nevertheless, some sceptical scholars continue to propose alternative explanations or follow unexplored theoretical paths. This article systematically challenges such attempts and demonstrates that all motoric actions—whether performed by sailors, mudflat hikers, taxi drivers, or mountain guides—are based on the exact same underlying cognitive template.

Introduction

Motor sequence learning is a fundamental cognitive process essential for skill acquisition and has been extensively studied within cognitive and neuroscientific research. Studies have shown that repeated execution of a numerical sequence on a keypad leads to faster and more efficient performance, suggesting that the brain encodes previously executed sequences as a spatiotemporal memory trace. However, despite decades of research, it remains unclear how motor and symbolic representations interact. Existing theories continue to assume a strict division between declarative memory (explicit knowledge, such as remembering a passcode) and procedural memory (implicit knowledge, such as effortlessly entering a familiar code). This implies that motor learning involves a gradual shift from declarative encoding to procedural automation through repetition.

The explanatory model of the motoric movement action (2016) introduces a paradigm shift, arguing that motor memory and declarative memory are not separate systems but cognitive variants of the same underlying principle[1]. Rather than being stored as isolated actions, motor sequences develop as cognitive templates of action trajectory shapes, which encode the spatial and temporal structure of sequential actions.

Keypad lock entry provides a clear empirical case of this dynamic interaction. When entering a numerical code, execution is initially explicitly guided by symbolic recognition—each digit is consciously identified before movement is initiated. Over time, however, a spatiotemporal action trajectory template develops, encoding the transition pathways between the keys. This emerging structure does not simply support execution but actively shapes it, allowing users to enter the code more fluidly, even when explicit perception of individual digits diminishes.

The clarification now completely fills the field of action execution and provides a conclusive explanation of the fundamental research questions regarding the *what* and the *how* in relationship to sequential actions. The “what (must be reached)”, within the symbolic-numerical representation, indicates which script items must be reached, while the “how (must it be reached)”, within the spatiotemporal representation, defines the empty dimension *between* (!) those script items and demonstrates that these representations can function autonomously but are predominantly used in a hybrid form.

Rather than representing separate stages in learning, these representations function as two cognitive variants of the same principle. While symbolic recognition and motor trajectory encoding can operate autonomously, they predominantly function in a hybrid form, dynamically shaping execution. This paradigm shift challenges traditional declarative-procedural memory models, demonstrating that motor execution is not merely implicit but an adaptive cognitive structure capable of guiding performance.

The clarity of this model has been confirmed across a wide range of motor behaviors. Nevertheless, some sceptical scholars continue to propose alternative explanations or follow unexplored theoretical paths. This article systematically challenges such attempts and demonstrates that all motoric actions—whether performed by sailors, mudflat hikers, taxi drivers, or mountain guides—are based on the exact same underlying cognitive template.

Part 1 reviews the insights of former scientific research. Within part 2 this information is translated to how sailors, mudflat hikers, taxi drivers, and mountain guides construct templates within their specific domains.

1. Templates within ordinary actions

The explanatory model of the motoric movement action can be illustrated through the simple example of opening a keypad lock with a numeric code[2]. This example demonstrates how templates emerge and

[1] https://www.researchgate.net/publication/389705565_Through_the_Repeated_Execution_of_a_Numerical_Sequence_of_Script_Items_an_Implicit_Autonomous_Spatiotemporal_Template_of_Action_Trajectory_Shapes_Between_the_Script_Items_Develops_-_The_explanation_of?_sg%

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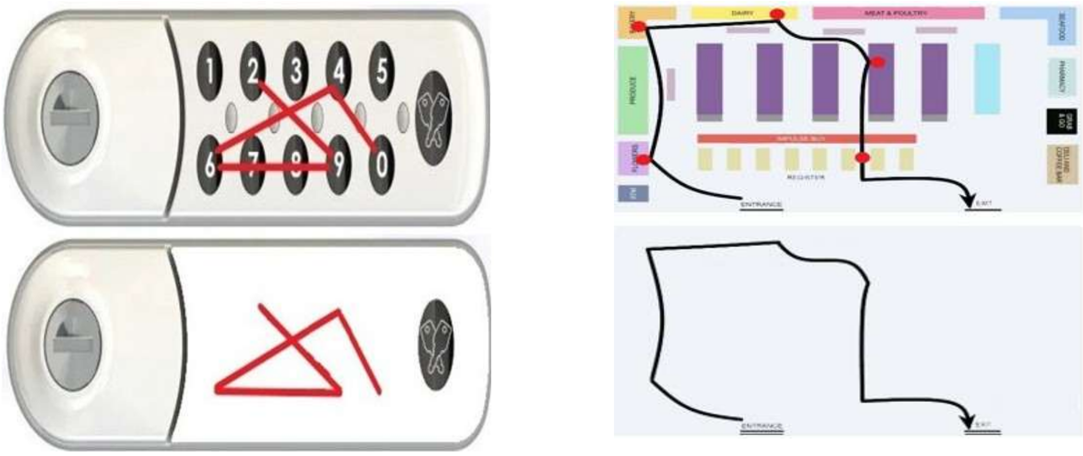
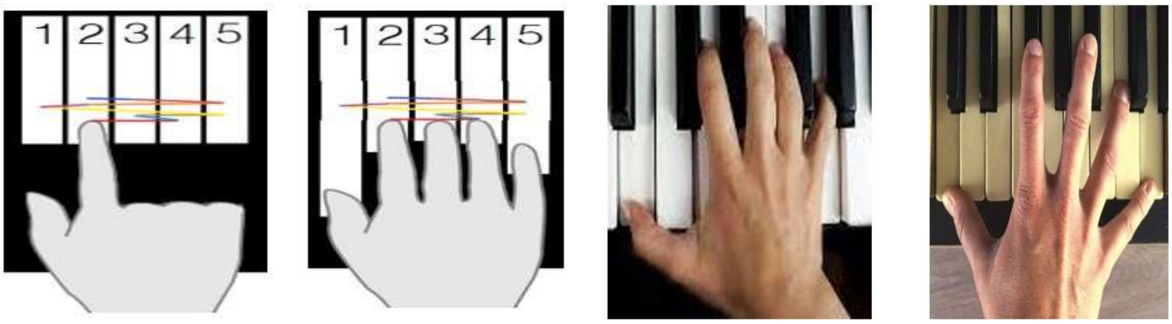
provides a complete explanation of the substantive content of this familiar motor action. In the same way, it can be shown that the very same template arises when shopping in a familiar supermarket.



Illustrations: *Whether locating the distinct numbers of the code or identifying the required groceries in an unfamiliar supermarket, a spatio-temporal line structure emerges between the scripted items. These autonomous cognitive representations together form a template. Most often this template is employed in a hybrid constellation, yet it is fully capable of guiding successful task execution independently.*

The explanatory model of the motoric movement action further shows how this principle must necessarily be transferred to scientific interpretations of fingertapping research, and from there extended to a comprehensive account of piano performance.

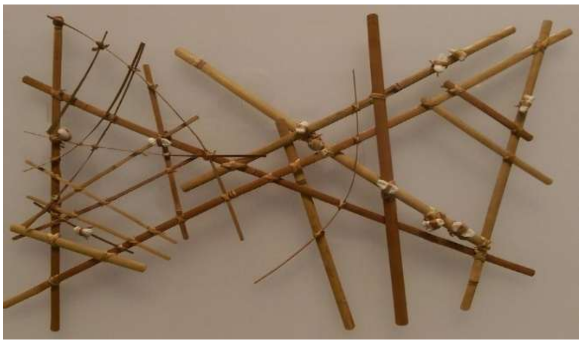


Illustrations: *Whether identifying the obligatory tapping sequence in experimental settings or locating the correct piano keys from a musical score, the very same spatio-temporal line structures emerge between the scripted items. Although in some cases these templates may appear in a somewhat "flattened" form, this makes no essential difference for the underlying cognitive representations across these domains.*

2. Templates within sailing, mudflat hiking, taxi driving or mountain guiding

a. Sailing

Sailors, fishermen, and sailing guides employ precisely the same cognitive templates as those found in ordinary everyday activities such as entering a code on a keypad or shopping in a familiar supermarket. By navigating their familiar waters and executing the corresponding script items, a spatio-temporal template emerges between these elements. This template is not merely a practical tool but a fundamental cognitive structure that governs action. It is grounded in the perception of clear, transparent water that reveals bottom patterns, the recognition of specific wind patterns and water currents, and the identification of distinct landmarks along the coastline. At the same time, these navigators also incorporate celestial benchmarks—such as stars, the moon, and the sun—yet without relying on them exclusively.



Illustrations: *Transparent waters enable clear templates. Which can be translated to stick patterns of which all shell intersection points show the distinct sequence items*[3].

The explanatory model of the motoric movement action thus shows that maritime navigation, although highly complex, is structured by the very same mechanisms that organize far more mundane activities. In both domains, the cognitive process involves identifying discrete script items (*the "what"*) and connecting them through spatial and temporal relations (*the "how"*). These autonomous but complementary representations form a hybrid system, capable of functioning either in close integration or independently of one another. For sailors and fishermen, this means that practical orientation in dynamic natural environments—dominated by water, wind, and currents—is governed by the same universal cognitive template that explains sequential learning in all motor actions, ranging from scientific fingertapping experiments to the execution of a musical score on the piano.

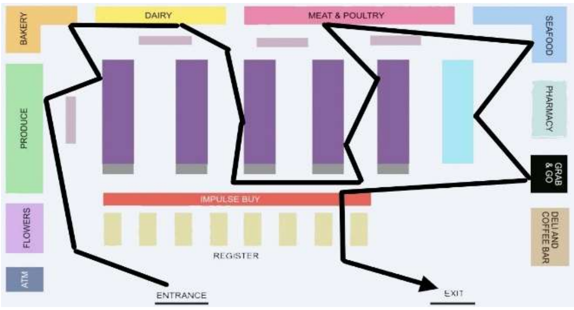
b. Mudflat hiking

Mudflat hiking[4] becomes possible when the low tide exposes passages between fixed land areas. Similar to the process of sailing, the execution of sequential items—covering distinct stretches of terrain—gives rise to a cognitive template. Within this template, the seabed, the air, and the surrounding environment provide highly specific benchmarks. It is precisely the endless variety of these specific environmental constellations that equips experienced professionals with the necessary information to navigate successfully and to follow the template in the correct manner.

[3] A Micronesian navigational chart from the Marshall Islands, made of wood, sennit fiber and cowrie shells.
[4] https://www.youtube.com/watch?v=AP69vaI8Bg8

c. Taxi driving

London taxi drivers provide another compelling example of how cognitive templates emerge in the execution of complex motor and navigational tasks. In order to obtain their license, drivers must master *The Knowledge*—a detailed mental map of thousands of streets, routes, and landmarks across the city. Through the repeated execution of sequential items, such as moving from one street segment to another or linking landmarks into efficient journeys, a spatio-temporal template is formed. This template enables drivers to anticipate upcoming decisions, integrate traffic conditions, and adapt to unexpected obstacles.



The urban environment itself offers the benchmarks necessary for this process: road layouts, intersections, bridges, and distinctive buildings serve as highly specific markers that anchor the driver's orientation. These benchmarks, much like the stars for sailors or the exposed seabed for mudflat hikers, form constellations that are endlessly variable yet cognitively reliable. For the professional driver, this system of spatial cues makes it possible to follow the template fluently and effectively, even under pressure. Thus, London taxi drivers demonstrate once again that the explanatory model of motor movement action extends beyond scientific or experimental domains, capturing the universal cognitive structure underlying even the most complex forms of human navigation.

d. Mountain guiding

Mountain guiding offers yet another illustration of how cognitive templates govern complex motor and navigational behavior. Professional guides are responsible for leading groups through challenging and often unpredictable terrain, where safety depends on accurate orientation and sequential decision-making. By executing successive route segments—choosing a trail, negotiating a ridge, or identifying a safe passage across loose rock or snow—a spatio-temporal template emerges between these actions. This template integrates multiple environmental cues into a coherent cognitive representation that structures the guide's behavior.

Illustrations: *By executing sequence items within the mountains an implicit representation of the space between those items occurs. Which is capable to autonomously guide a successful hike. The personal "specialist" cognitive representation can be made available for non-professionals by constructing detailed maps of all features of the mountain. Which is identical to making sailing-charts, city roadmaps or mudflat land crossings.*

In this context, the benchmarks are provided by the mountain environment itself: rock formations, slope angles, vegetation patterns, snow conditions, and shifting weather phenomena. These cues are not static but appear in highly variable constellations that demand expertise and flexibility. Much like the celestial markers for sailors or the landmarks for London taxi drivers, these environmental signatures function as anchors that allow the guide to navigate with precision. For the professional mountain guide, the successful execution of the template ensures both efficiency and safety, demonstrating once again that the explanatory model of motor movement action applies universally across diverse and demanding domains of human practice.