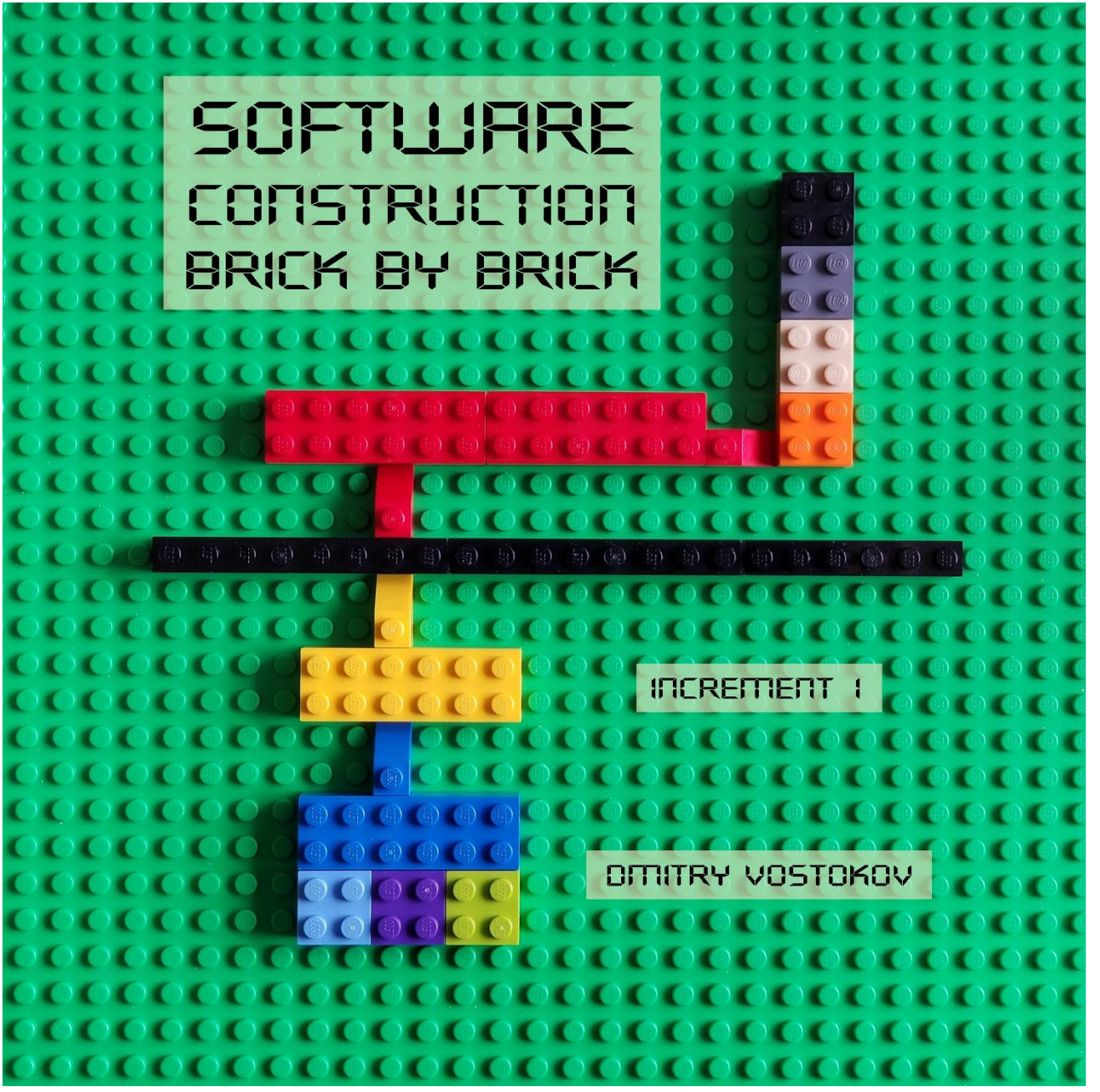
SOFTWARE CONSTRUCTION BRICK BY BRICK



INCREMENT 1

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Software Construction Brick by Brick, Increment 1: Using LEGO® to Teach Software Architecture, Design, Implementation, Internals, Diagnostics, Debugging, Testing, Integration, and Security

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Preface

My interest in using LEGO® for teaching software internals goes back to Memory Dump Analysis Anthology[1], Volume 9b,[2] where I explained heap corruption, and illustrated linked lists, stacks, packed and unpacked structures. Later I applied the same technique for depicting trace and log analysis patterns[3]. My LEGO® modeling skills got a boost when I invented a baseplate representation of chemical structures[4]. Then I got an idea to represent machine learning topics using bricks[5], and even abstract mathematics such as graphs and category theory[6]. After that, I recalled my usage of colored block diagrams to illustrate pointers[7], Unified Modeling Language to represent Windows operating system internals such as drivers and their interaction[8] and colored UML diagrams for debugging and diagnostic software construction patterns[9]. So all that fused into these series of short books (increments) you are reading now.

The first increment covers memory, memory addresses, pointers, program loading, kernel and user spaces, virtual process space, memory isolation, virtual and physical memory, memory paging, memory dump types.

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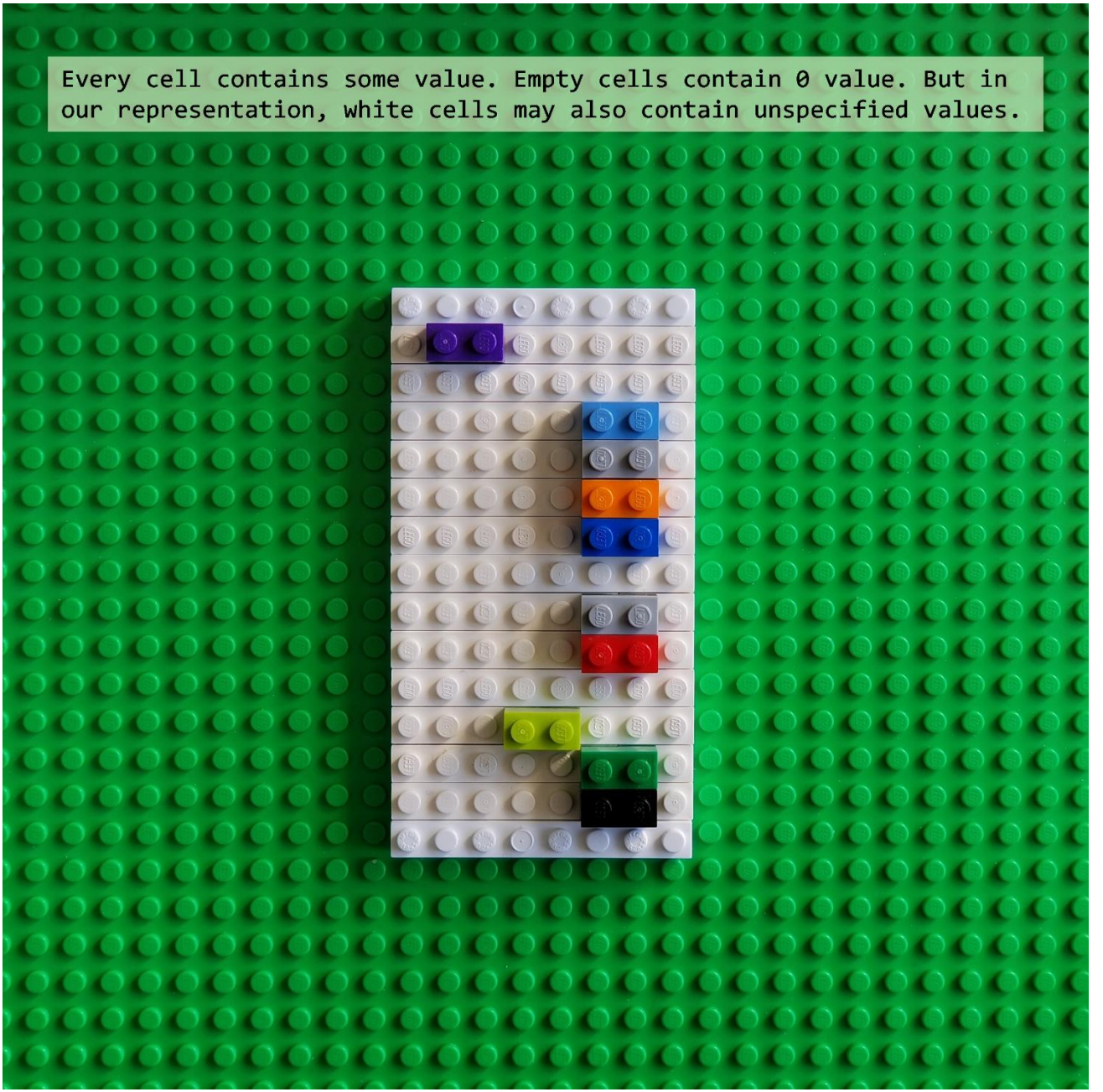
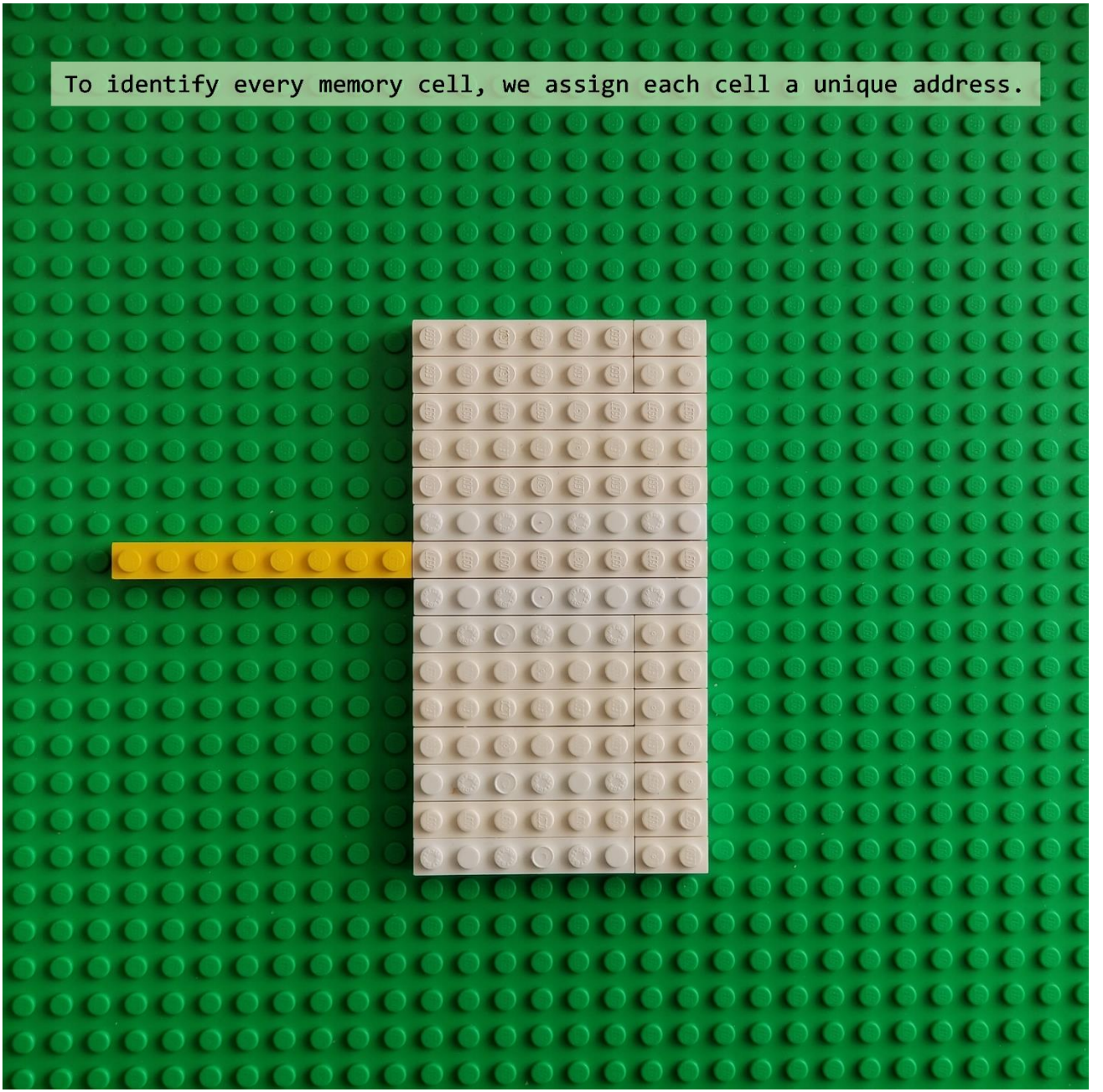
[1] https://www.dumpanalysis.org/advanced-software-debugging-reference
[2] https://www.dumpanalysis.org/Memory+Dump+Analysis+Anthology+Volume+9b
[3] https://www.dumpanalysis.org/lego-log-analysis
[4] https://www.opentask.com/lego-baseplate-representation-of-chemical-structure
[5] https://www.dumpanalysis.org/machine-learning-brick-by-brick-series
[6] https://www.dumpanalysis.org/visual-category-theory
[7] https://www.dumpanalysis.org/SoftwareConstruction/PointerInternalsDraft2015.pdf
[8] https://www.dumpanalysis.org/advanced-windows-memory-dump-analysis-book
[9] https://www.dumpanalysis.org/blog/index.php/debugware-patterns/


We represent computer memory as a linear sequence of memory cells.


Every cell contains some value. Empty cells contain 0 value. But in our representation, white cells may also contain unspecified values.


To identify every memory cell, we assign each cell a unique address.