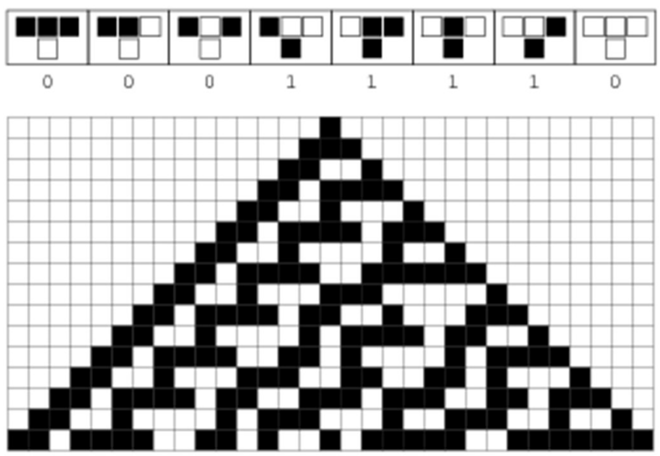
Prof. Dr. Alfred Toth

Die Autoreproduktion von Subzeichen in semiotischen Automaten

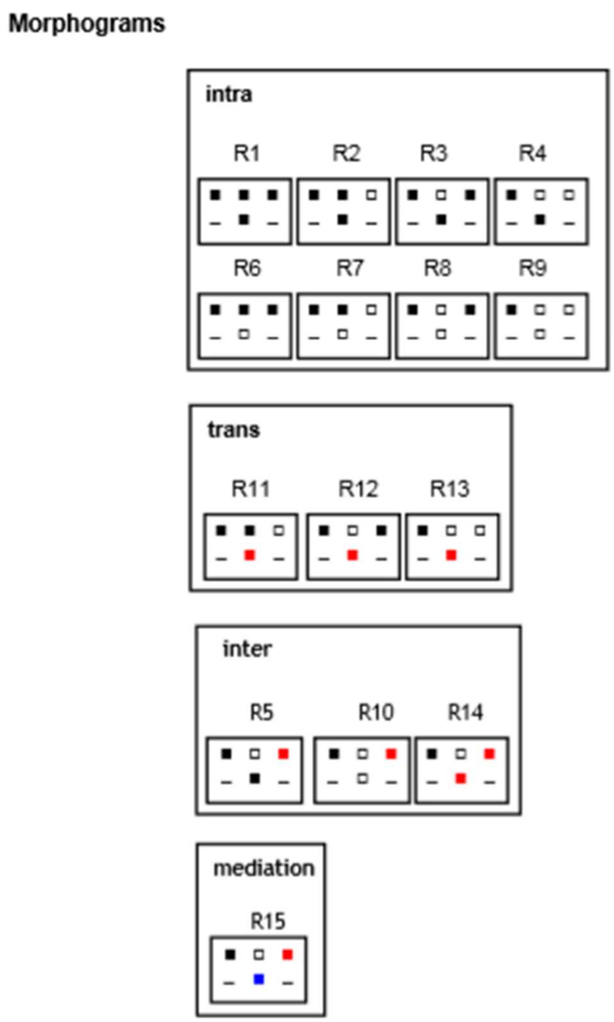
1. Im folgenden werden die Ergebnisse von Toth (2019) vorausgesetzt.

2. Zelluläre Automaten sind eine Form von autoreproduktiven Automaten (vgl. von Neumann 1966), die zuerst von John H. Conway entdeckt wurden (vgl. Gardner 1970). Ein CA (cellular automata) ist ein Pattern aus 4 Plätzen, die belegt („lebendig") oder unbelegt („tot") sein können. CAs werden durch 2^8 = 256 Regeln bestimmt, durch deren fortgesetzte Anwendung fraktalartige Gebilde entstehen; vgl. als Beispiel den CA der Regel 30.

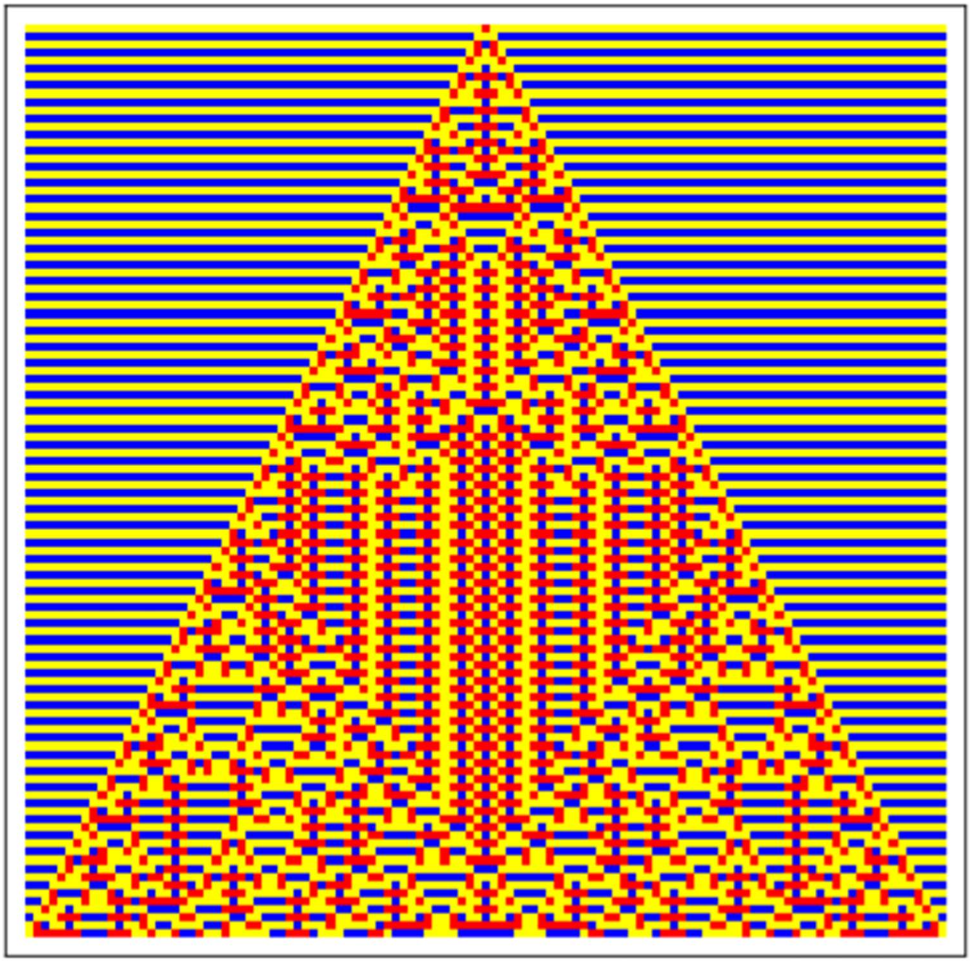
rule 30



Eine besondere Schwierigkeit bestand darin, CAs für die 15 Basis-Morphogramme der Güntherlogik zu konstruieren. Nach Kaehr (2015a, S. 5) sind die CAs der Morphogramme in Intra-, Trans-, Inter- und mediative CAs differenzierbar.



Wie man sieht, genügen die 256 Regeln für quantitative CAs für sog. morpho-CAs nicht mehr. Rudolf Kaehr hat seine letzten Lebensjahre bis zum Tage seines Todes damit verbracht, Regeln zu erzeugen, mit denen Proto-, Deutero- und Trito-Sequenzen als polykontexturale Automaten dargestellt werden können. Das folgende illustrative Beispiel stammt aus Kaehr (2015b, S. 3).



3. Eine besondere Stellung innerhalb der qualitativ-mathematischen CAs nehmen die semiotischen ein, und hier stellen sich noch viel beträchtlichere Schwierigkeiten, denn bei semiotischen CAs gibt es keine unbelegten Zellen. Legt man $ZR^{2,3}$ zugrunde, dann sind 6 Elemente (Subzeichen) auf 4 Plätze zu verteilen. Man erhält also $\binom{6}{4} = (720 : 2) = 360$ polykontexturale semiotische CAs, die im folgenden durch die Subzeichen (z) von $Z^{2,3}$ statt durch Farben dargestellt werden. Die 360 semio-CAs sind nach Gruppen von Mengen von $z \in Z^{2,3}$ geordnet, welche als Input für einen semiotischen CA und dessen Permutationen verwendet werden.

3.1. R = ((1.1), (1.2), (1.3), (2.1))

(1.2) (1.3) (2.1)	(1.2) (2.1) (1.3)	(1.3) (1.2) (2.1)
(1.1)	(1.1)	(1.1)

(1.3) (2.1) (1.2) (1.1)	(2.1) (1.2) (1.3) (1.1)	(2.1) (1.3) (1.2) (1.1)
(1.1) (1.3) (2.1) (1.2)	(1.1) (2.1) (1.3) (1.2)	(1.3) (1.1) (2.1) (1.2)
(1.3) (2.1) (1.1) (1.2)	(2.1) (1.1) (1.3) (1.2)	(2.1) (1.3) (1.1) (1.2)
(1.1) (1.2) (2.1) (1.3)	(1.1) (2.1) (1.2) (1.3)	(1.2) (1.1) (2.1) (1.3)
(1.2) (2.1) (1.1) (1.3)	(2.1) (1.1) (1.2) (1.3)	(2.1) (1.2) (1.1) (1.3)
(1.1) (1.2) (1.3) (2.1)	(1.1) (1.3) (1.2) (2.1)	(1.2) (1.1) (1.3) (2.1)
(1.2) (1.3) (1.1) (2.1)	(1.3) (1.1) (1.2) (2.1)	(1.3) (1.2) (1.1) (2.1)

3.2. R = ((1.1), (1.2), (1.3), (2.2))

(1.2) (1.3) (2.2) (1.1)	(1.2) (2.2) (1.3) (1.1)	(1.3) (1.2) (2.2) (1.1)

(1.3) (2.2) (1.2)	(2.2) (1.2) (1.3)	(2.2) (1.3) (1.2)
(1.1)	(1.1)	(1.1)
(1.1) (1.3) (2.2)	(1.1) (2.2) (1.3)	(1.3) (1.1) (2.2)
(1.2)	(1.2)	(1.2)
(1.3) (2.2) (1.1)	(2.2) (1.1) (1.3)	(2.2) (1.3) (1.1)
(1.2)	(1.2)	(1.2)
(1.1) (1.2) (2.2)	(1.1) (2.2) (1.2)	(1.2) (1.1) (2.2)
(1.3)	(1.3)	(1.3)
(1.2) (2.2) (1.1)	(2.2) (1.1) (1.2)	(2.2) (1.2) (1.1)
(1.3)	(1.3)	(1.3)
(1.1) (1.2) (1.3)	(1.1) (1.3) (1.2)	(1.2) (1.1) (1.3)
(2.2)	(2.2)	(2.2)
(1.2) (1.3) (1.1)	(1.3) (1.1) (1.2)	(1.3) (1.2) (1.1)
(2.2)	(2.2)	(2.2)

3.3. R = ((1.1), (1.2), (1.3), (2.3))

(1.2) (1.3) (2.3)	(1.2) (2.3) (1.3)	(1.3) (1.2) (2.3)
(1.1)	(1.1)	(1.1)

(1.3) (2.3) (1.2)   (2.3) (1.2) (1.3)   (2.3) (1.3) (1.2)
(1.1)   (1.1)   (1.1)

(1.1) (1.3) (2.3)   (1.1) (2.3) (1.3)   (1.3) (1.1) (2.3)
(1.2)   (1.2)   (1.2)

(1.3) (2.3) (1.1)   (2.3) (1.1) (1.3)   (2.3) (1.3) (1.1)
(1.2)   (1.2)   (1.2)

(1.1) (1.2) (2.3)   (1.1) (2.3) (1.2)   (1.2) (1.1) (2.3)
(1.3)   (1.3)   (1.3)

(1.2) (2.3) (1.1)   (2.3) (1.1) (1.2)   (2.3) (1.2) (1.1)
(1.3)   (1.3)   (1.3)

(1.1) (1.2) (1.3)   (1.1) (1.3) (1.2)   (1.2) (1.1) (1.3)
(2.3)   (2.3)   (2.3)

(1.2) (1.3) (1.1)   (1.3) (1.1) (1.2)   (1.3) (1.2) (1.1)
(2.3)   (2.3)   (2.3)

3.4. R = ((1.1), (1.2), (2.1), (2.2))

(1.2) (2.1) (2.2)   (1.2) (2.2) (2.1)   (2.1) (1.2) (2.2)
(1.1)   (1.1)   (1.1)

(2.1) (2.2) (1.2) (2.2) (1.2) (2.1) (2.2) (2.1) (1.2)
(1.1) (1.1) (1.1)

(1.1) (2.1) (2.2) (1.1) (2.2) (2.1) (2.1) (1.1) (2.2)
(1.2) (1.2) (1.2)

(2.1) (2.2) (1.1) (2.2) (1.1) (2.1) (2.2) (2.1) (1.1)
(1.2) (1.2) (1.2)

(1.1) (1.2) (2.2) (1.1) (2.2) (1.2) (1.2) (1.1) (2.2)
(2.1) (2.1) (2.1)

(1.2) (2.2) (1.1) (2.2) (1.1) (1.2) (2.2) (1.2) (1.1)
(2.1) (2.1) (2.1)

(1.1) (1.2) (2.1) (1.1) (2.1) (1.2) (1.2) (1.1) (2.1)
(2.2) (2.2) (2.2)

(1.2) (2.1) (1.1) (2.1) (1.1) (1.2) (2.1) (1.2) (1.1)
(2.2) (2.2) (2.2)

3.5. R = ((1.1), (1.2), (2.1), (2.3))

(1.2) (2.1) (2.3) (1.2) (2.3) (2.1) (2.1) (1.2) (2.3)
(1.1) (1.1) (1.1)

(2.1) (2.3) (1.2)   (2.3) (1.2) (2.1)   (2.3) (2.1) (1.2)

(1.1)   (1.1)   (1.1)

(1.1) (2.1) (2.3)   (1.1) (2.3) (2.1)   (2.1) (1.1) (2.3)

(1.2)   (1.2)   (1.2)

(2.1) (2.3) (1.1)   (2.3) (1.1) (2.1)   (2.3) (2.1) (1.1)

(1.2)   (1.2)   (1.2)

(1.1) (1.2) (2.3)   (1.1) (2.3) (1.2)   (1.2) (1.1) (2.3)

(2.1)   (2.1)   (2.1)

(1.2) (2.3) (1.1)   (2.3) (1.1) (1.2)   (2.3) (1.2) (1.1)

(2.1)   (2.1)   (1.3)

(1.1) (1.2) (2.1)   (1.1) (2.1) (1.2)   (1.2) (1.1) (2.1)

(2.3)   (2.3)   (2.3)

(1.2) (2.1) (1.1)   (2.1) (1.1) (1.2)   (2.1) (1.2) (1.1)

(2.3)   (2.3)   (2.3)

3.6. R = ((1.1), (1.2), (2.2), (2.3))

(1.2) (2.2) (2.3)   (1.2) (2.3) (2.2)   (2.2) (1.2) (2.3)

(1.1)   (1.1)   (1.1)

(2.2) (2.3) (1.2) (1.1)	(2.3) (1.2) (2.2) (1.1)	(2.3) (2.2) (1.2) (1.1)
(1.1) (2.2) (2.3) (1.2)	(1.1) (2.3) (2.2) (1.2)	(2.2) (1.1) (2.3) (1.2)
(2.2) (2.3) (1.1) (1.2)	(2.3) (1.1) (2.2) (1.2)	(2.3) (2.2) (1.1) (1.2)
(1.1) (1.2) (2.3) (2.2)	(1.1) (2.3) (1.2) (2.2)	(1.2) (1.1) (2.3) (2.2)
(1.2) (2.3) (1.1) (2.2)	(2.3) (1.1) (1.2) (2.2)	(2.3) (1.2) (1.1) (2.3)
(1.1) (1.2) (2.2) (2.3)	(1.1) (2.2) (1.2) (2.3)	(1.2) (1.1) (2.2) (2.3)
(1.2) (2.2) (1.1) (2.3)	(2.2) (1.1) (1.2) (2.3)	(2.2) (1.2) (1.1) (2.3)

3.7. R = ((1.1), (1.3), (2.1), (2.2))

(1.3) (2.1) (2.2) (1.1)	(1.3) (2.2) (2.1) (1.1)	(2.1) (1.3) (2.2) (1.1)

(2.1) (2.2) (1.3) (1.1)	(2.2) (1.3) (2.1) (1.1)	(2.2) (2.1) (1.3) (1.1)
(1.1) (2.1) (2.2) (1.3)	(1.1) (2.2) (2.1) (1.3)	(2.1) (1.1) (2.2) (1.3)
(2.1) (2.2) (1.1) (1.3)	(2.2) (1.1) (2.1) (1.3)	(2.2) (2.1) (1.1) (1.3)
(1.1) (1.3) (2.2) (2.1)	(1.1) (2.2) (1.3) (2.1)	(1.3) (1.1) (2.2) (2.1)
(1.3) (2.2) (1.1) (2.1)	(2.2) (1.1) (1.3) (2.1)	(2.2) (1.3) (1.1) (2.1)
(1.1) (1.3) (2.1) (2.2)	(1.1) (2.1) (1.3) (2.2)	(1.3) (1.1) (2.1) (2.2)
(1.3) (2.1) (1.1) (2.2)	(2.1) (1.1) (1.3) (2.2)	(2.1) (1.3) (1.1) (2.2)

3.8. R = ((1.1), (1.3), (2.1), (2.3))

(1.3) (2.1) (2.3) (1.1)	(1.3) (2.3) (2.1) (1.1)	(2.1) (1.3) (2.3) (1.1)

(2.1) (2.3) (1.3)   (2.3) (1.3) (2.1)   (2.3) (2.1) (1.3)

(1.1)   (1.1)   (1.1)

(1.1) (2.1) (2.3)   (1.1) (2.3) (2.1)   (2.1) (1.1) (2.3)

(1.3)   (1.3)   (1.3)

(2.1) (2.3) (1.1)   (2.3) (1.1) (2.1)   (2.3) (2.1) (1.1)

(1.3)   (1.3)   (1.3)

(1.1) (1.3) (2.3)   (1.1) (2.3) (1.3)   (1.3) (1.1) (2.3)

(2.1)   (2.1)   (2.1)

(1.3) (2.3) (1.1)   (2.3) (1.1) (1.3)   (2.3) (1.3) (1.1)

(2.1)   (2.1)   (2.1)

(1.1) (1.3) (2.1)   (1.1) (2.1) (1.3)   (1.3) (1.1) (2.1)

(2.3)   (2.3)   (2.3)

(1.3) (2.1) (1.1)   (2.1) (1.1) (1.3)   (2.1) (1.3) (1.1)

(2.3)   (2.3)   (2.3)

3.9. R = ((1.1), (1.3), (2.2), (2.3))

(1.3) (2.2) (2.3)   (1.3) (2.3) (2.2)   (2.2) (1.3) (2.3)

(1.1)   (1.1)   (1.1)

(2.2) (2.3) (1.3)   (2.3) (1.3) (2.2)   (2.3) (2.2) (1.3)
(1.1)   (1.1)   (1.1)

(1.1) (2.2) (2.3)   (1.1) (2.3) (2.2)   (2.2) (1.1) (2.3)
(1.3)   (1.3)   (1.3)

(2.2) (2.3) (1.1)   (2.3) (1.1) (2.2)   (2.3) (2.2) (1.1)
(1.3)   (1.3)   (1.3)

(1.1) (1.3) (2.3)   (1.1) (2.3) (1.3)   (1.3) (1.1) (2.3)
(2.2)   (2.2)   (2.2)

(1.3) (2.3) (1.1)   (2.3) (1.1) (1.3)   (2.3) (1.3) (1.1)
(2.2)   (2.2)   (2.2)

(1.1) (1.3) (2.2)   (1.1) (2.2) (1.3)   (1.3) (1.1) (2.2)
(2.3)   (2.3)   (2.3)

(1.3) (2.2) (1.1)   (2.2) (1.1) (1.3)   (2.2) (1.3) (1.1)
(2.3)   (2.3)   (2.3)

3.10. R = ((1.1), (2.1), (2.2), (2.3))

(2.1) (2.2) (2.3)   (2.1) (2.3) (2.2)   (2.2) (2.1) (2.3)
(1.1)   (1.1)   (1.1)

(2.2) (2.3) (2.1) (1.1)	(2.3) (2.1) (2.2) (1.1)	(2.3) (2.2) (2.1) (1.1)
(1.1) (2.2) (2.3) (2.1)	(1.1) (2.3) (2.2) (2.1)	(2.2) (1.1) (2.3) (2.1)
(2.2) (2.3) (1.1) (2.1)	(2.3) (1.1) (2.2) (2.1)	(2.3) (2.2) (1.1) (2.1)
(1.1) (2.1) (2.3) (2.2)	(1.1) (2.3) (2.1) (2.2)	(2.1) (1.1) (2.3) (2.2)
(2.1) (2.3) (1.1) (2.2)	(2.3) (1.1) (2.1) (2.2)	(2.3) (2.1) (1.1) (2.2)
(1.1) (2.1) (2.2) (2.3)	(1.1) (2.2) (2.1) (2.3)	(2.1) (1.1) (2.2) (2.3)
(2.1) (2.2) (1.1) (2.3)	(2.2) (1.1) (2.1) (2.3)	(2.2) (2.1) (1.1) (2.3)

3.11. R = ((1.2), (1.3), (2.1), (2.2))

(1.3) (2.1) (2.2) (1.2)	(1.3) (2.2) (2.1) (1.2)	(2.1) (1.3) (2.2) (1.2)

(2.1) (2.2) (1.3)   (2.2) (1.3) (2.1)   (2.2) (2.1) (1.3)

(1.2)   (1.2)   (1.2)

(1.2) (2.1) (2.2)   (1.2) (2.2) (2.1)   (2.1) (1.2) (2.2)

(1.3)   (1.3)   (1.3)

(2.1) (2.2) (1.2)   (2.2) (1.2) (2.1)   (2.2) (2.1) (1.2)

(1.3)   (1.3)   (1.3)

(1.2) (1.3) (2.2)   (1.2) (2.2) (1.3)   (1.3) (1.2) (2.2)

(2.1)   (2.1)   (2.1)

(1.3) (2.2) (1.2)   (2.2) (1.2) (1.3)   (2.2) (1.3) (1.2)

(2.1)   (2.1)   (2.1)

(1.2) (1.3) (2.1)   (1.2) (2.1) (1.3)   (1.3) (1.2) (2.1)

(2.2)   (2.2)   (2.2)

(1.3) (2.1) (1.2)   (2.1) (1.2) (1.3)   (2.1) (1.3) (1.2)

(2.2)   (2.2)   (2.2)

3.12. R = ((1.2), (1.3), (2.1), (2.3))

(1.3) (2.1) (2.3)   (1.3) (2.3) (2.1)   (2.1) (1.3) (2.3)

(1.2)   (1.2)   (1.2)

(2.1) (2.3) (1.3) (1.2)	(2.3) (1.3) (2.1) (1.2)	(2.3) (2.1) (1.3) (1.2)
(1.2) (2.1) (2.3) (1.3)	(1.2) (2.3) (2.1) (1.3)	(2.1) (1.2) (2.3) (1.3)
(2.1) (2.3) (1.2) (1.3)	(2.3) (1.2) (2.1) (1.3)	(2.3) (2.1) (1.2) (1.3)
(1.2) (1.3) (2.3) (2.1)	(1.2) (2.3) (1.3) (2.1)	(1.3) (1.2) (2.3) (2.1)
(1.3) (2.3) (1.2) (2.1)	(2.3) (1.2) (1.3) (2.1)	(2.3) (1.3) (1.2) (2.1)
(1.2) (1.3) (2.1) (2.3)	(1.2) (2.1) (1.3) (2.3)	(1.3) (1.2) (2.1) (2.3)
(1.3) (2.1) (1.2) (2.3)	(2.1) (1.2) (1.3) (2.3)	(2.1) (1.3) (1.2) (2.3)

3.13. R = ((1.2), (1.3), (2.2), (2.3))

(1.3) (2.2) (2.3) (1.2)	(1.3) (2.3) (2.2) (1.2)	(2.2) (1.3) (2.3) (1.2)

(2.2) (2.3) (1.3) (1.2)	(2.3) (1.3) (2.2) (1.2)	(2.3) (2.2) (1.3) (1.2)
(1.2) (2.2) (2.3) (1.3)	(1.2) (2.3) (2.2) (1.3)	(2.2) (1.2) (2.3) (1.3)
(2.2) (2.3) (1.2) (1.3)	(2.3) (1.2) (2.2) (1.3)	(2.3) (2.2) (1.2) (1.3)
(1.2) (1.3) (2.3) (2.2)	(1.2) (2.3) (1.3) (2.2)	(1.3) (1.2) (2.3) (2.2)
(1.3) (2.3) (1.2) (2.2)	(2.3) (1.2) (1.3) (2.2)	(2.3) (1.3) (1.2) (2.2)
(1.2) (1.3) (2.2) (2.3)	(1.2) (2.2) (1.3) (2.3)	(1.3) (1.2) (2.2) (2.3)
(1.3) (2.2) (1.2) (2.3)	(2.2) (1.2) (1.3) (2.3)	(2.2) (1.3) (1.2) (2.3)

3.14. R= ((1.2), (2.1), (2.2), (2.3))

(2.1) (2.2) (2.3) (1.2)	(2.1) (2.3) (2.2) (1.2)	(2.2) (2.1) (2.3) (1.2)

(2.2) (2.3) (2.1) (1.2)	(2.3) (2.1) (2.2) (1.2)	(2.3) (2.2) (2.1) (1.2)
(1.2) (2.2) (2.3) (2.1)	(1.2) (2.3) (2.2) (2.1)	(2.2) (1.2) (2.3) (2.1)
(2.2) (2.3) (1.2) (2.1)	(2.3) (1.2) (2.2) (2.1)	(2.3) (2.2) (1.2) (2.1)
(1.2) (2.1) (2.3) (2.2)	(1.2) (2.3) (2.1) (2.2)	(2.1) (1.2) (2.3) (2.2)
(2.1) (2.3) (1.2) (2.2)	(2.3) (1.2) (2.1) (2.2)	(2.3) (2.1) (1.2) (2.2)
(1.2) (2.1) (2.2) (2.3)	(1.2) (2.2) (2.1) (2.3)	(2.1) (1.2) (2.2) (2.3)
(2.1) (2.2) (1.2) (2.3)	(2.2) (1.2) (2.1) (2.3)	(2.2) (2.1) (1.2) (2.3)

3.15. R = ((1.3), (2.1), (2.2), (2.3))

(2.1) (2.2) (2.3) (1.3)	(2.1) (2.3) (2.2) (1.3)	(2.2) (2.1) (2.3) (1.3)

(2.2) (2.3) (2.1) (1.3)	(2.3) (2.1) (2.2) (1.3)	(2.3) (2.2) (2.1) (1.3)
(1.3) (2.2) (2.3) (2.1)	(1.3) (2.3) (2.2) (2.1)	(2.2) (1.3) (2.3) (2.1)
(2.2) (2.3) (1.3) (2.1)	(2.3) (1.3) (2.2) (2.1)	(2.3) (2.2) (1.3) (2.1)
(1.3) (2.1) (2.3) (2.2)	(1.3) (2.3) (2.1) (2.2)	(2.1) (1.3) (2.3) (2.3)
(2.1) (2.3) (1.3) (2.2)	(2.3) (1.3) (2.1) (2.2)	(2.3) (2.1) (1.3) (2.2)
(1.3) (2.1) (2.2) (2.3)	(1.3) (2.2) (2.1) (2.3)	(2.1) (1.3) (2.2) (2.3)
(2.1) (2.2) (1.3) (2.3)	(2.2) (1.3) (2.1) (2.3)	(2.2) (2.1) (1.3) (2.3)

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