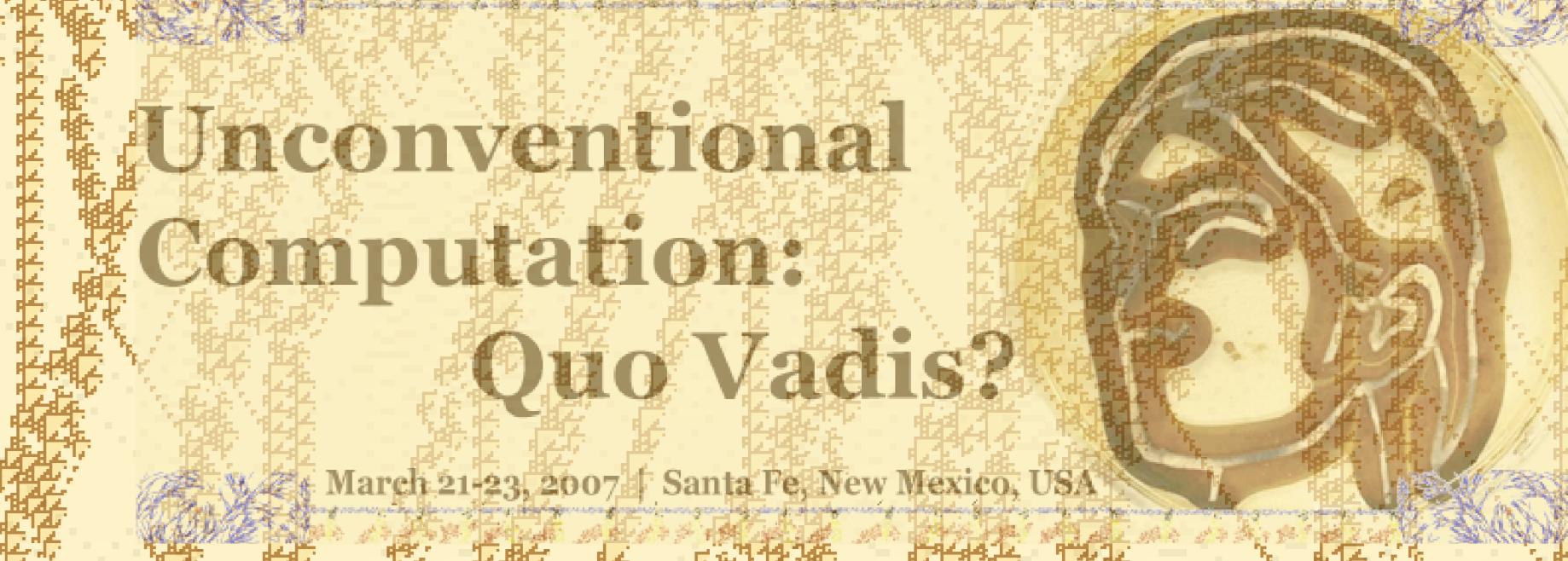
DESIGNING COLUSION-BASED COMPUTERS IN ELEMENTARY CELLULAR AUTOMATA



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PARTICLE SYSTEM IN RULE 110

Unconventional Computing Using Particles in ECA

known in

A collision-based computer is an architecture-less device, where signals are represented by particles (gliders or self-localizations), and logical operations are calculated in collisions between particles. We detect and classify all possible collisions between particles in one-dimensional cellular automata, and construct a catalogue of binary collisions. Therefore, we develop formal languages via de Bruijn diagrams to represent particles in evolution space of Rule 54 and

GUN IN self-

guns,

does not

DE BRUIN DIAGRAMS CALCU-LATING PARTICLES IN RULE 54

Rule 110 cellular automata using regular expressions. Finally, we present a subset of regular expression to code each particle

Rule 54 and Rule SELF-ORGANIZATION IN RULE 54 BY COLLISIONS problems like selfproduction of

particle	production sequence
$w^{ ightarrow}$	$g_o, w^{\leftarrow}; e_1 * 0^{4n-2} e_2 * \forall n > 0$
w^{\leftarrow}	$w^{\rightarrow}, g_o; e_1 * 0^{4n} e_2 * \forall n > 0$
g_o	$w^{\to}, w^{\leftarrow}; e_1^*10^n e_1^* \ \forall \ n > 0 \text{ and odd}$
g_e	$e_1*10^n e_1* \forall n > 0 \text{ and even}$
glider gun	$w^{ ightharpoonup}, 2g_e; \ 2g_e, w^{\leftarrow}$
glider gun^n	$w^{\rightarrow}, g_e, 2g_e; 2g_e, g_e, w^{\leftarrow}$

TILES DETERMINE

The research both complex

diagrams

The tool offer a simple with the some problems like: organization of production of glider of cyclic tag systems in and logical gates in important indication is

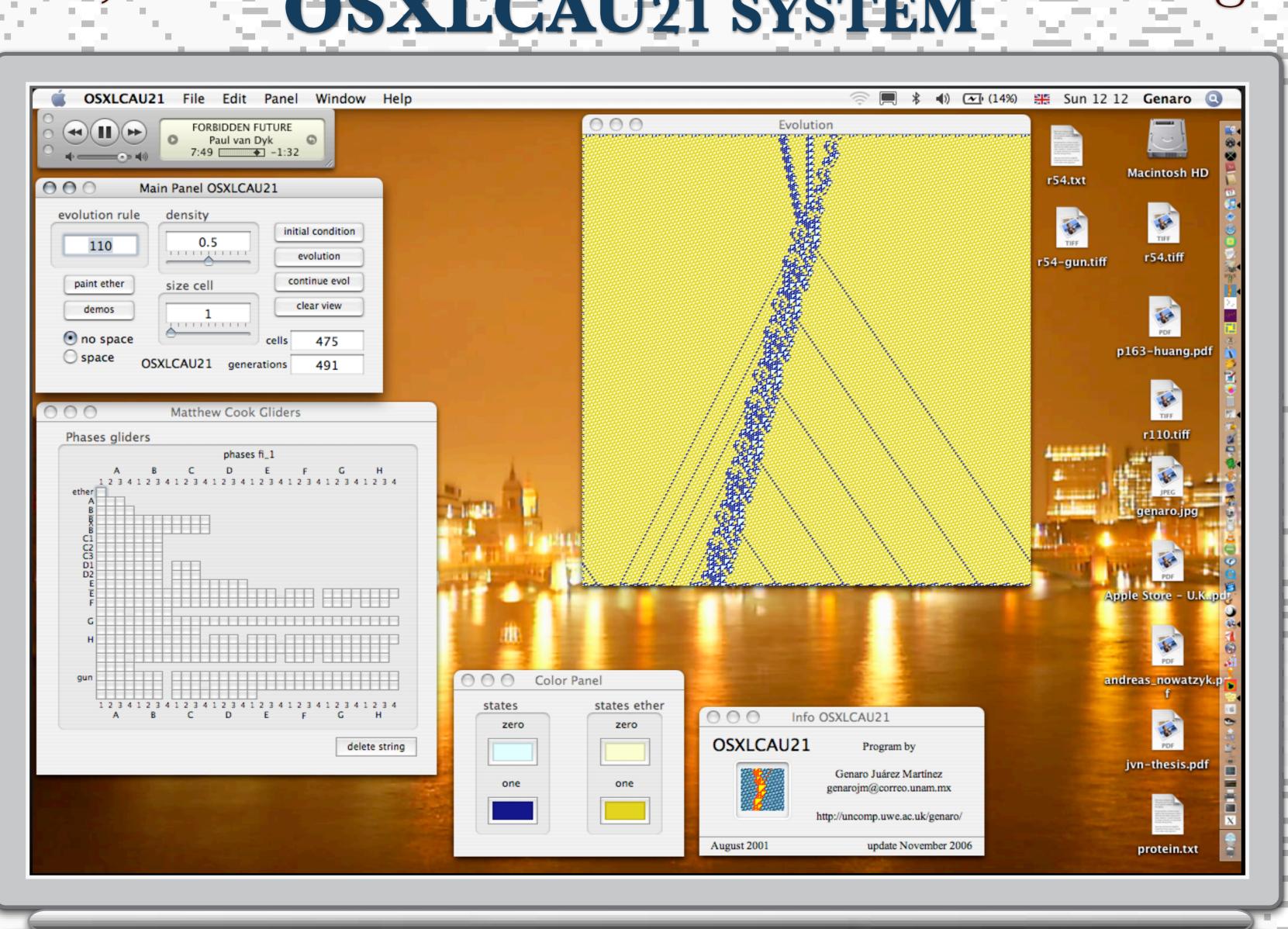
include extensions or packages of them.

solitons, big triangles, subset of regular Ψ_{R54} and Ψ_{R110} describing all particles

The interface of OSXLCAU21 system

dominated by buttons and windows. The system is able to work with all the ECA rules. Nevertheless, the **OSXLCAU21 SYSTEM** handling of particles is only for Rule 54 and Rule 110: the system

Rule 54 and is still in but it suitably its use. If we particular to click in the desired phase fragment of assigned and Evolution contains all gun in

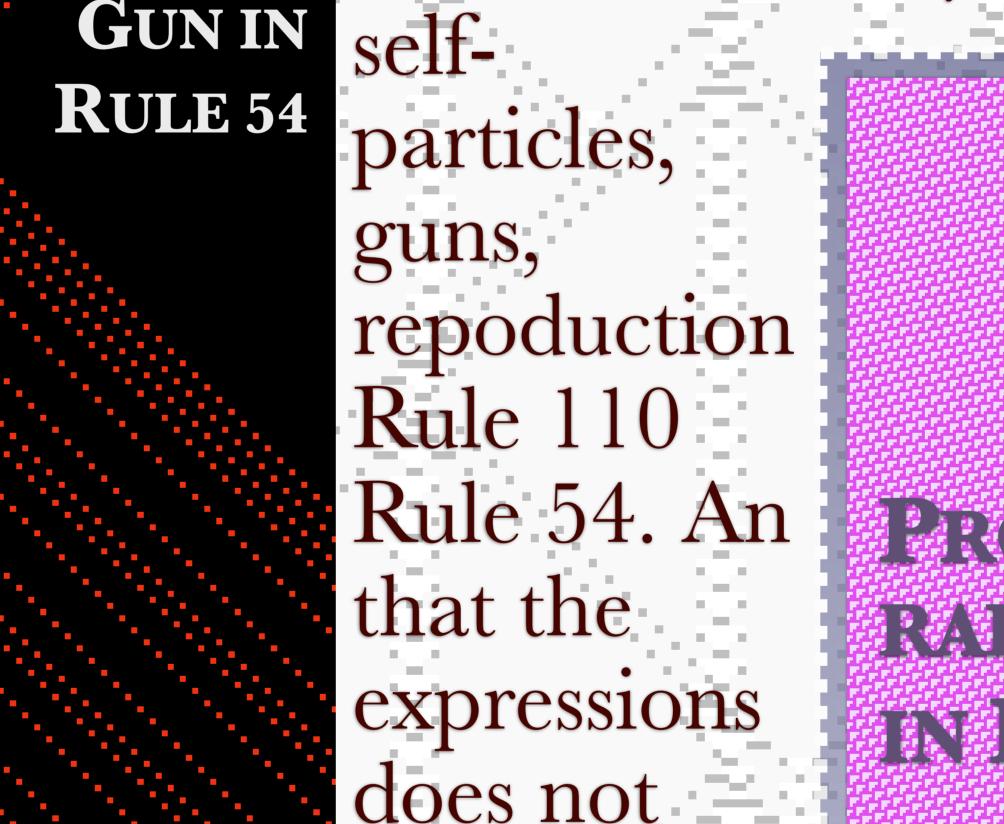


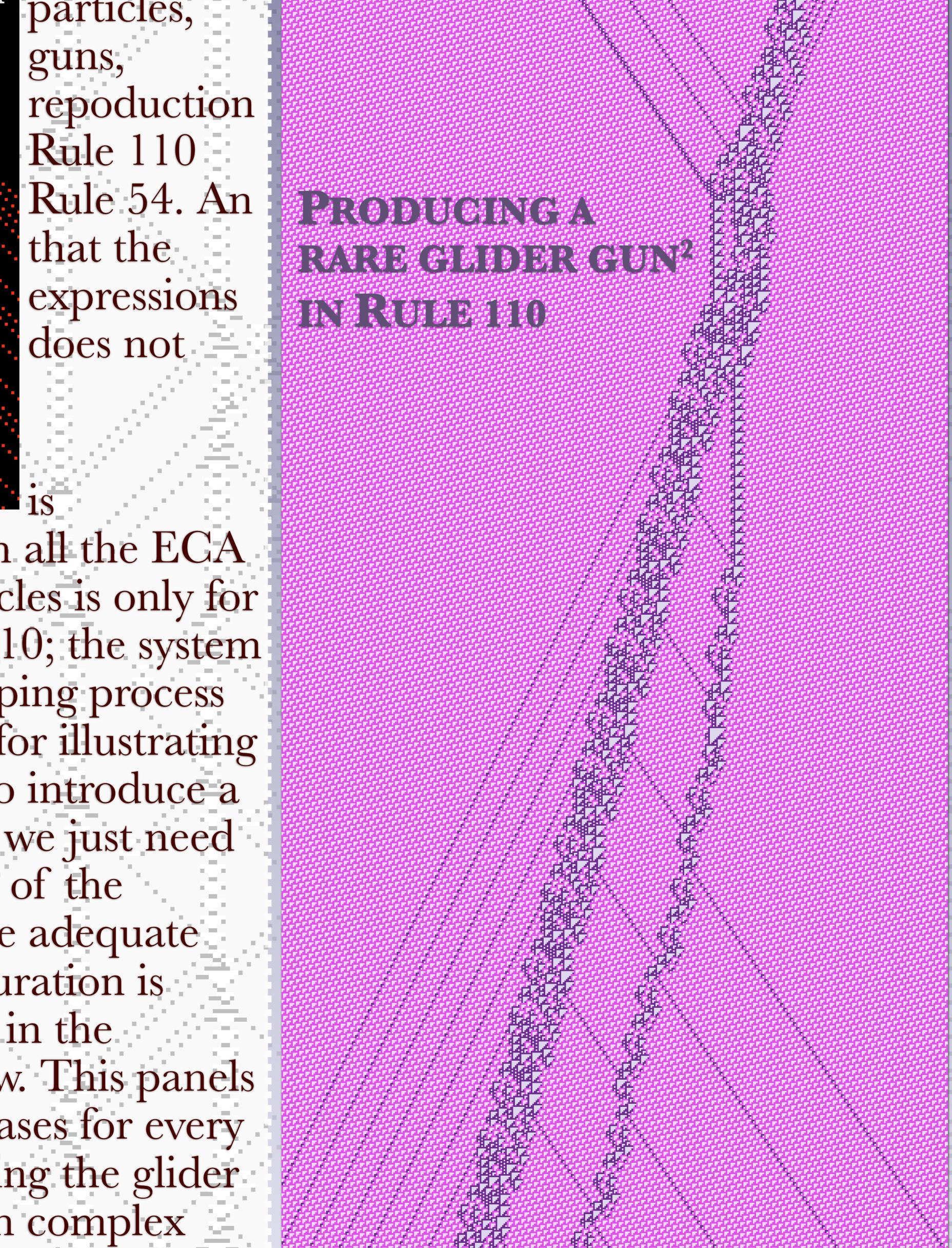
Rule 110; the system developing process works for illustrating want to introduce a phase, we just need button of the and the adequate configuration is drawn in the window. This panels the phases for every including the glider both complex

PHASES OF PARTICLES 110 and we apply the tool to we solve some organization of particles dynamics, glider guns and logical operations.

present the existence of a regular language to ECA: L_{R54} and L_{R110}. We use de Bruijn and tiles to determine the base of the subset of regular expressions that identify each well-known particle of Rule 54 and Rule 110.

> procedure to handle collisions between gliders OSXLCAU21 system. In this way, we have solve





 $A^{2}(f_{2}_{1})-e-A(f_{3}_{1})-e-A(f_{1}_{1})-6e-G(A,f_{1}_{1})-3B(f_{4}_{1})$

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