

Expressivity Analysis

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I created a generator, now what?

- * Is your generator creative?
- * How often it generates interesting output?
- * How much control do you have over the generated content?
- * How is your generator different from other generators?

I created a generator, now what?

- * What is your generator good/bad at generating?
- * How easy is it to alter the generator output?
- * Does your generator generates what you created it for?

Expressivity Analysis

- How can we evaluate a content generator?
- How can we visualize the generated content space?
- How can we analyze a generator's expressive range?
- How can we compare different content generators?

SMB Generators

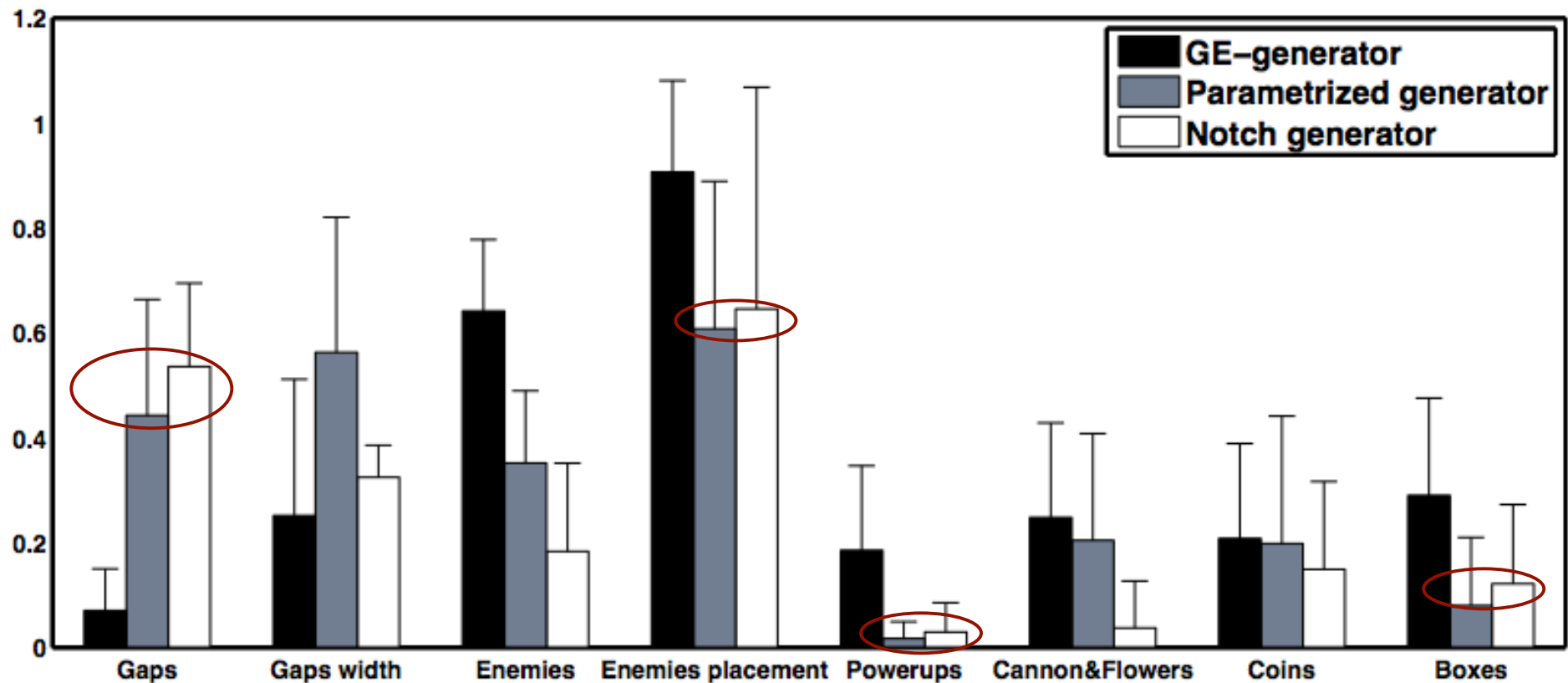
- Notch Level Generator
 - Generates infinite variations of content
 - Incrementally placing chunks according to certain heuristics
- Parameterized Level Generator
 - Modified version of Notch
 - Six content features (#gaps, gaps width, #enemies, enemies placement, #blocks, #powerups)

SMB Generators

- Grammatical evolution generator
 - Evolve content according to a design grammar
 - Impose less constraints

Expressivity Analysis

- Generate 1000 levels for each generator
- Calculate statistics of key features



Expressivity Analysis

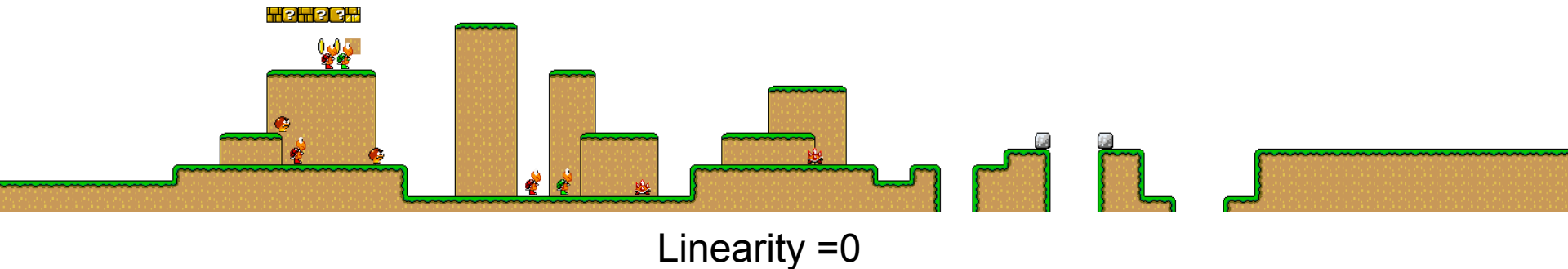
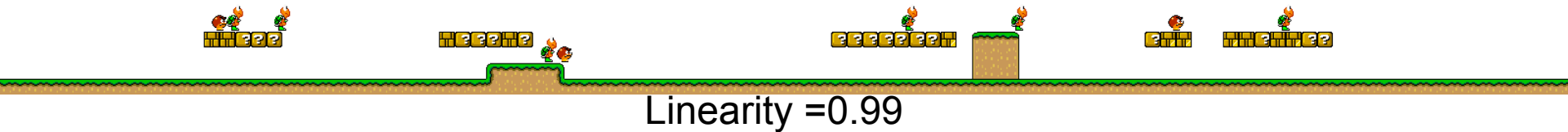
- What is the range of content a generator covers?
- What is the density of levels along expressivity measures?

Expressivity Analysis

- Generate a large number of representative samples of the generator's capabilities
- Define expressivity measures
- Apply these measure on each generator's output
- Visualize the generative space

Expressivity Measures- linearity

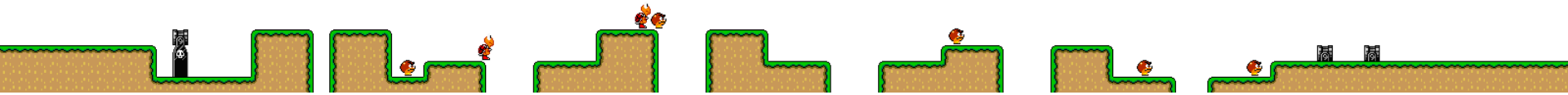
- Measures how flat a level is
- Affected by hills and changes in platform structure



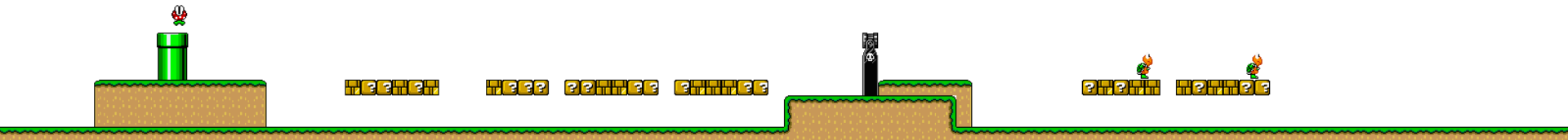
Expressivity Measures- leniency

- Measures how tolerant a level is
- Affected by gaps, enemies and powerups
- Calculation:
 - Gaps: -0.5
 - Average gap width: -1
 - Enemies (goombas and koopas): -1
 - Bill blasters and piranha plants: -0.5
 - Powerups: 1

Expressivity Measures- leniency

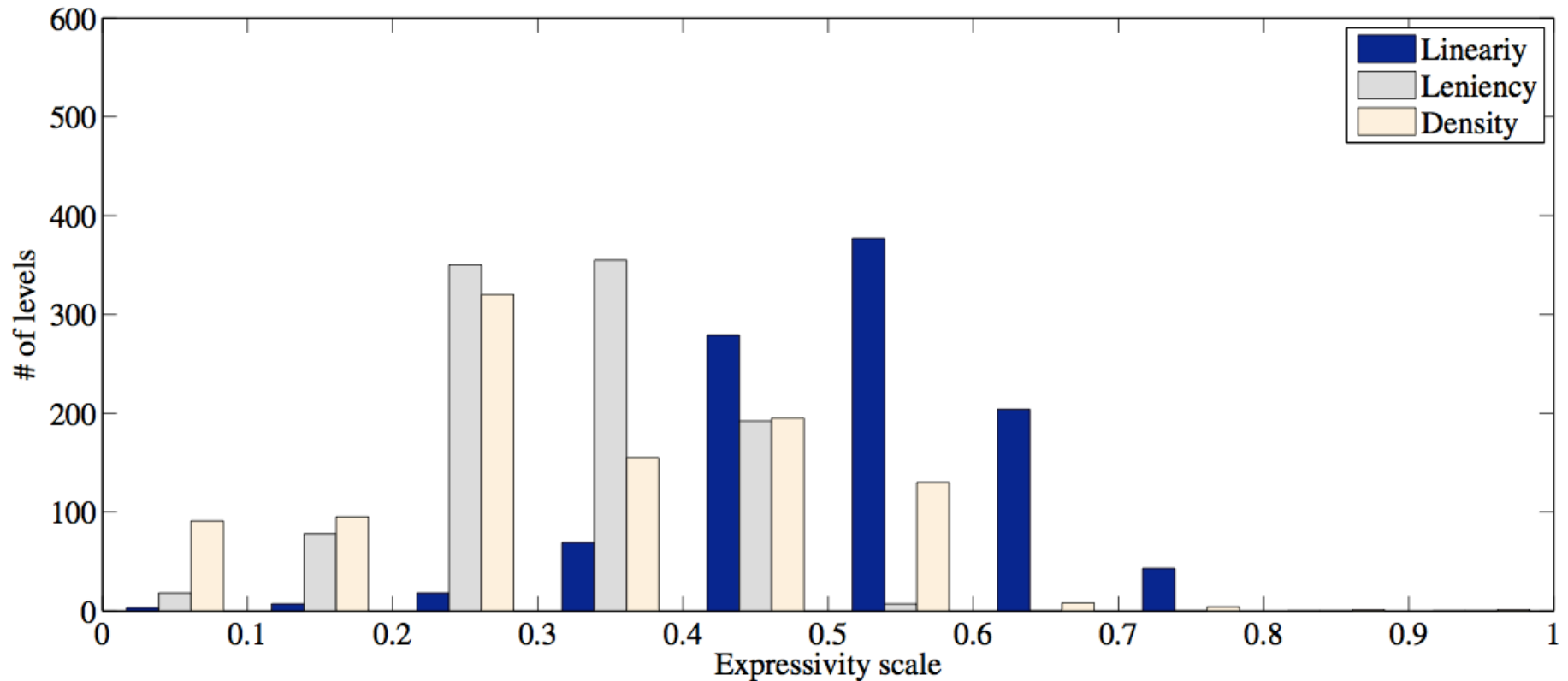


Leniency =1

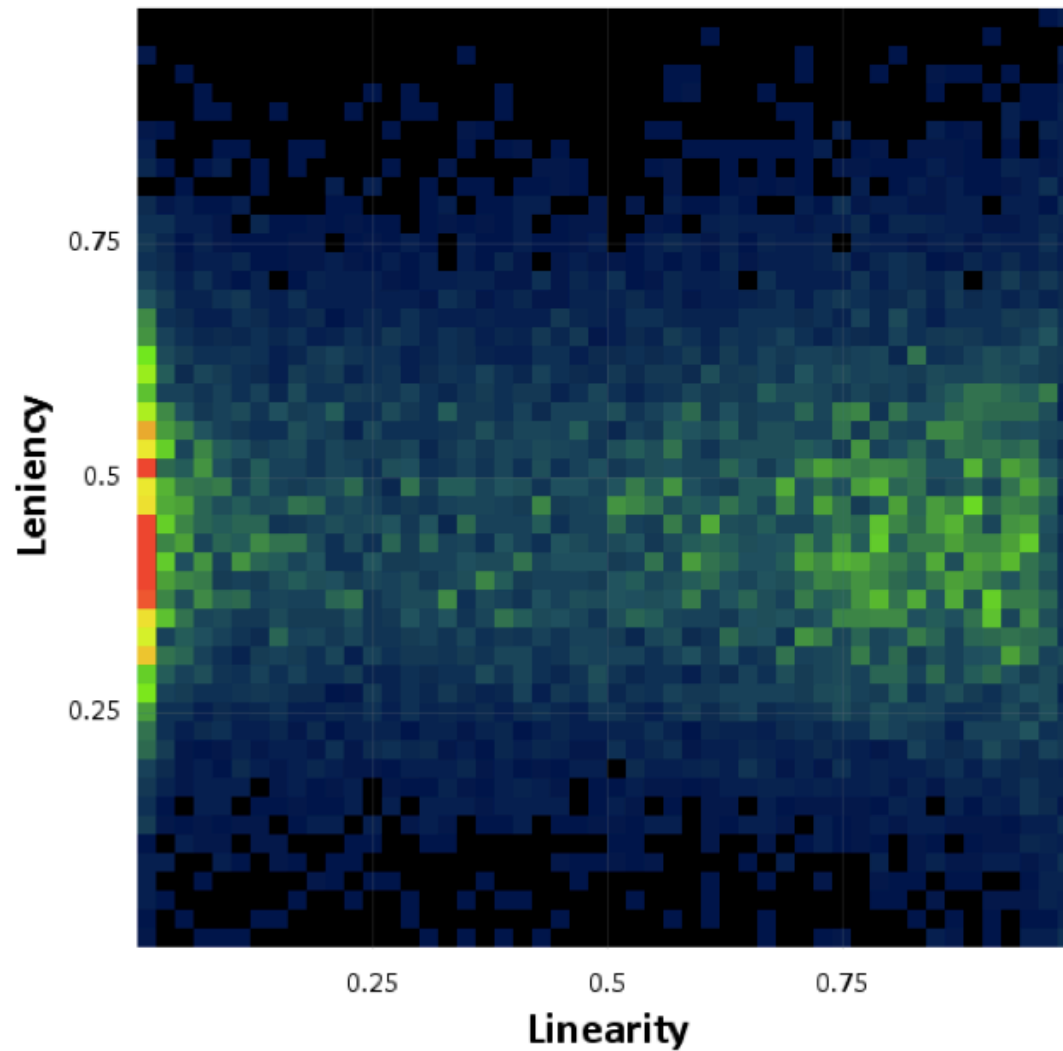


Leniency =0

Expressivity Measures- histogram comparison



Tanagra



Controllability

- * How well the generator can be controlled?
- * Can the generator produce different kinds of output?
- * How small changes in the input alerts the output?
- * How small changes to the system alters the expressive range

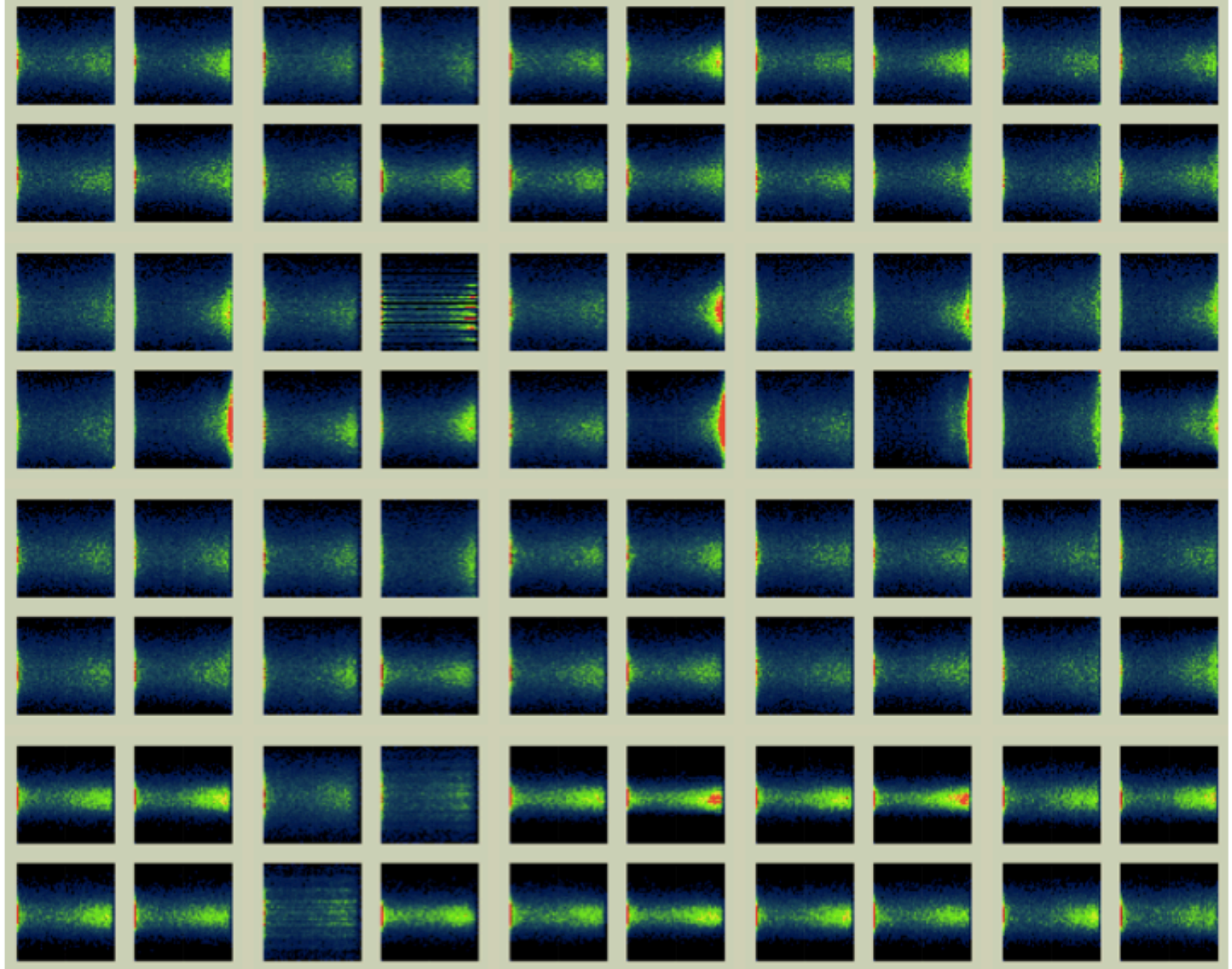


Fig. 11.3: The expressive range corresponding to different input parameters.