

Minimal vs. Elaborate, Simple vs. Complex, and the Space Between

andy nealen
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rutgers university / hemisphere games

What and how I think
about game design.

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rutgers university / hemisphere games

“Not everything that
can be counted counts,
and not everything
that counts can be counted.”

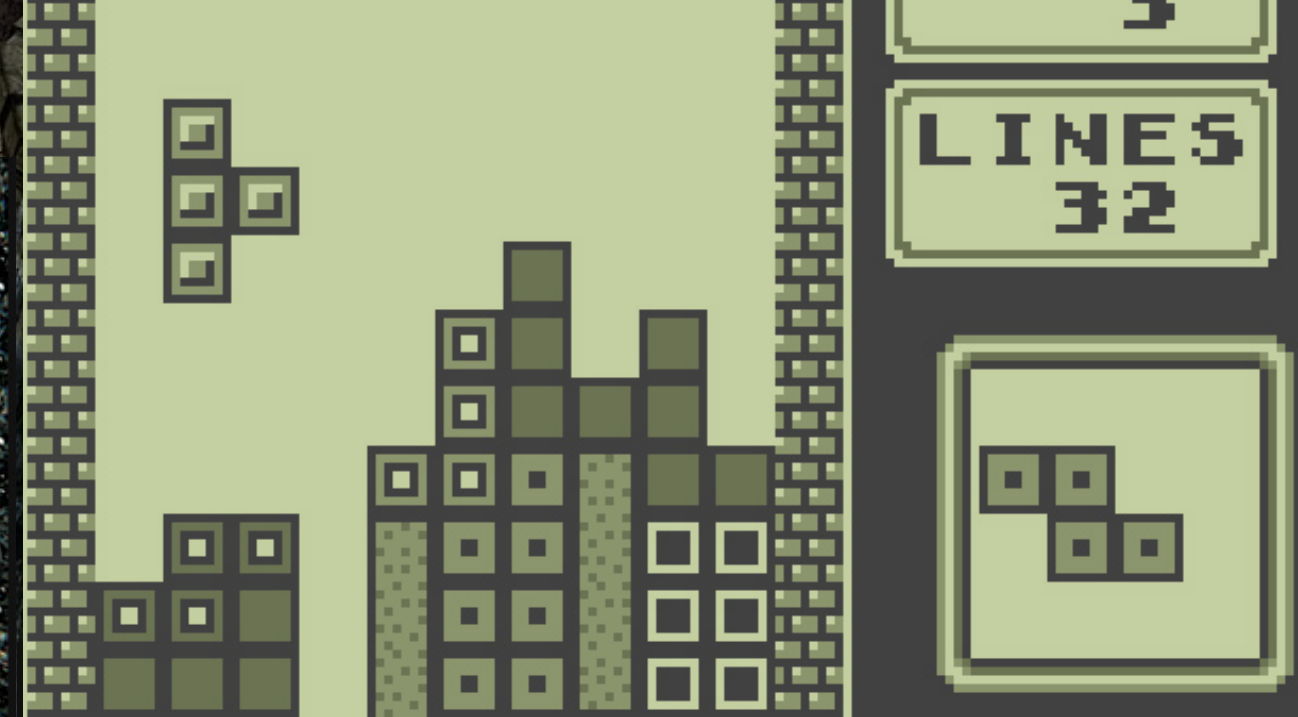
Albert Einstein

who am i ?

osmos

Hemisphere
games





part I
measuring and influencing
complexity

part II
design example: grow 21

part I

complexity.

complexity

what is it?

how to measure complexity?

where does “complex” start and end?

complexity

why complexity?

emergence

surprise

depth

complexity

size of state space?

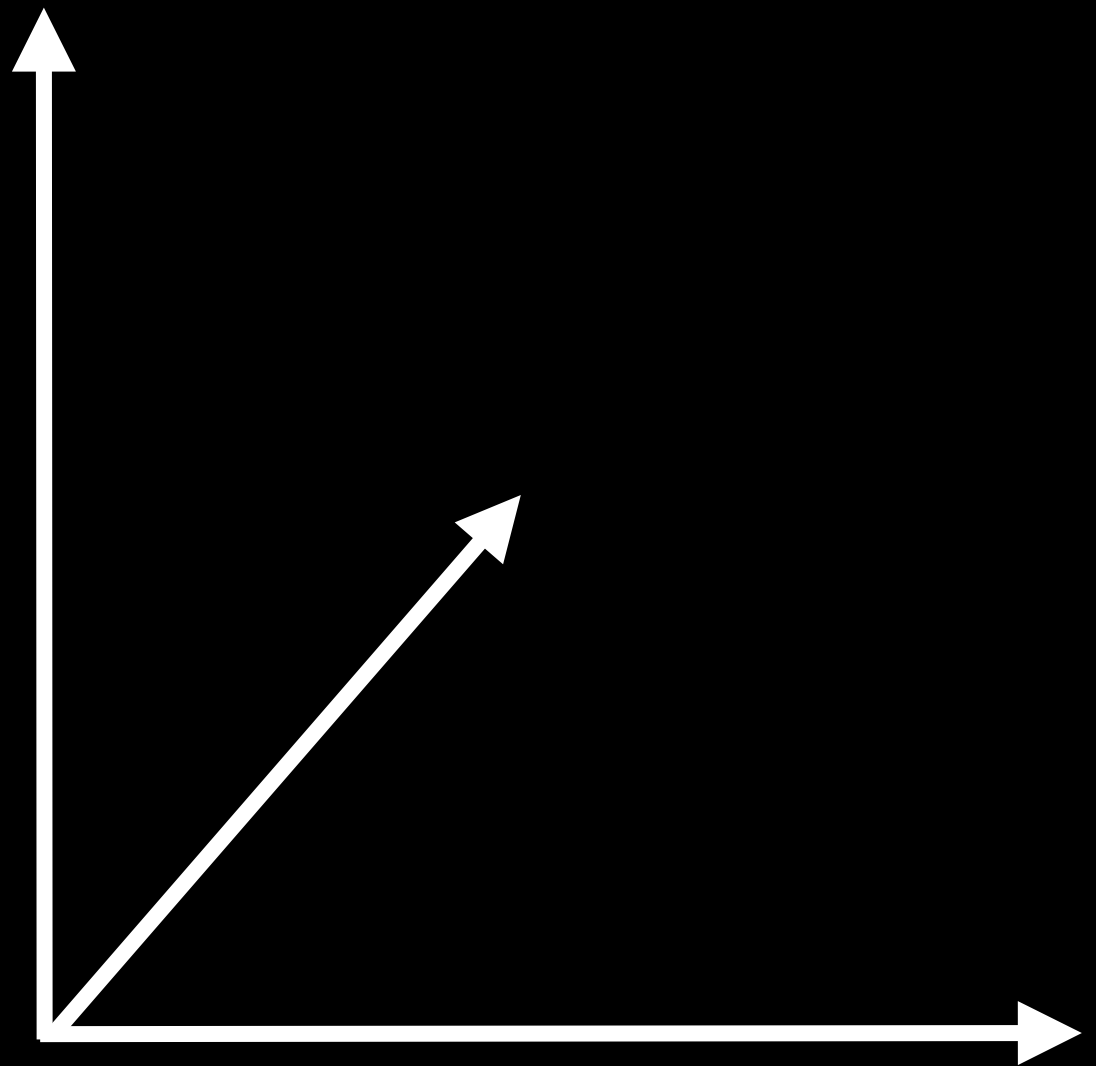
number of choices per second?

pieces of information that influence
these choices?

number of links between elements?

state space/decision tree size?

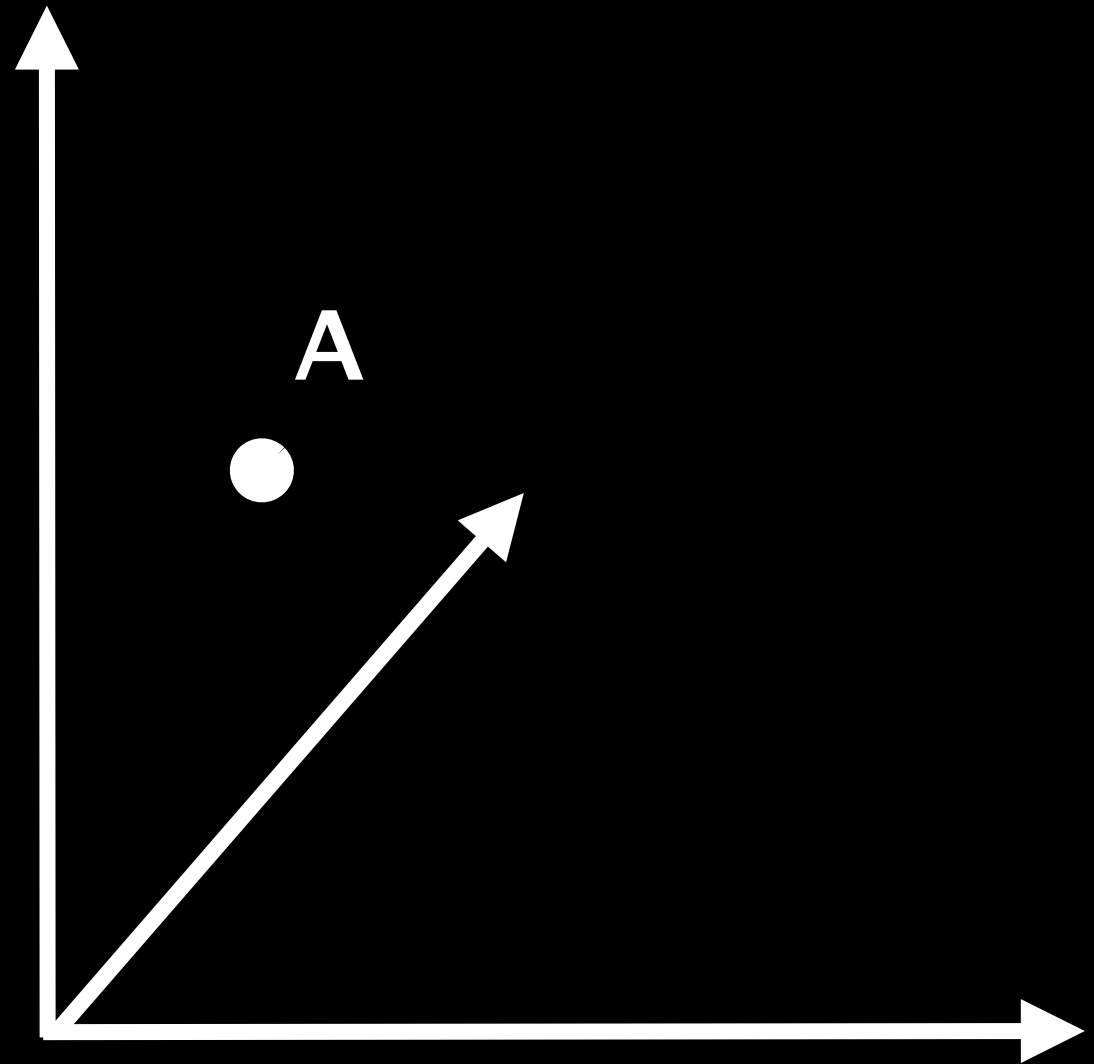
state space



state space



A



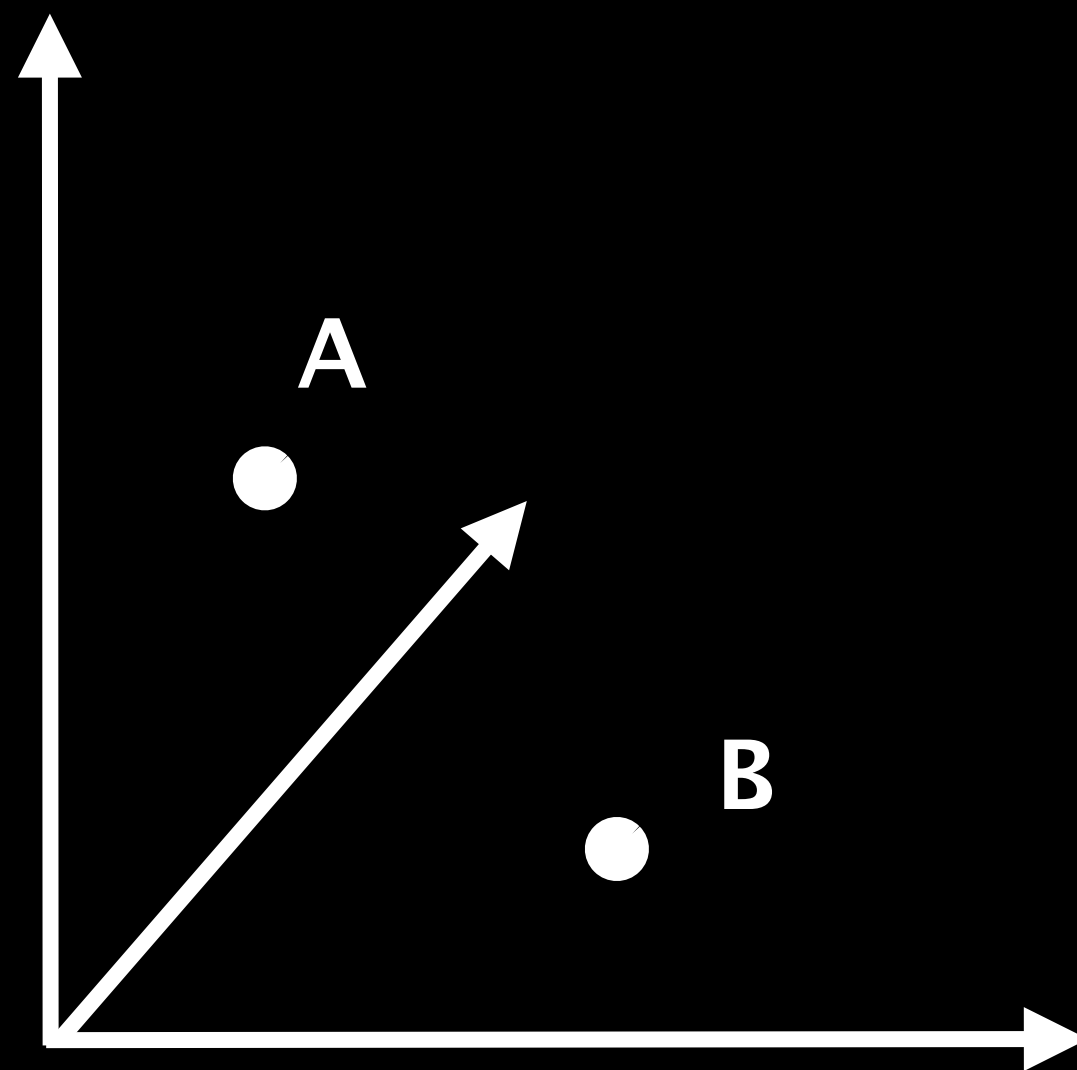
state space



A



B



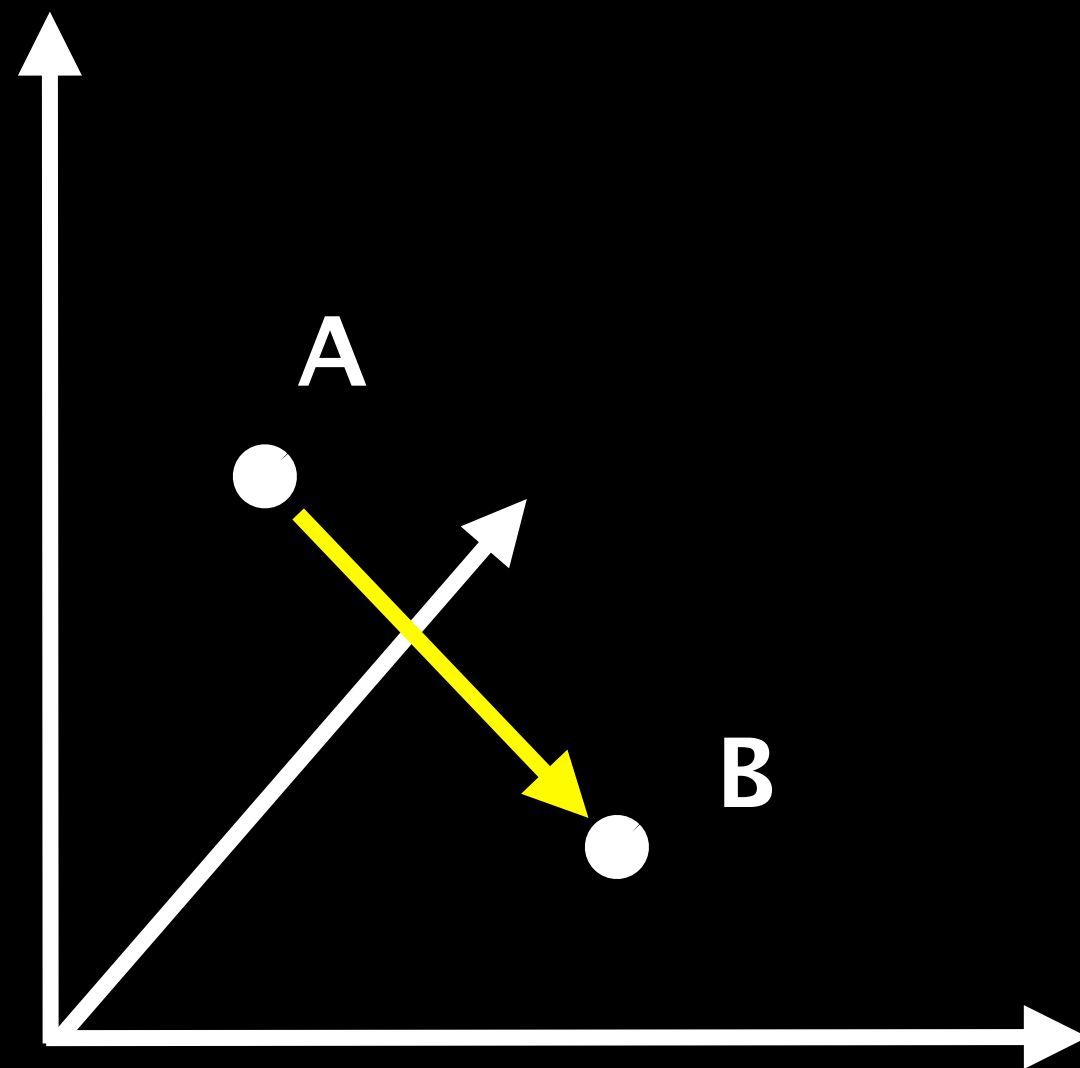
state space



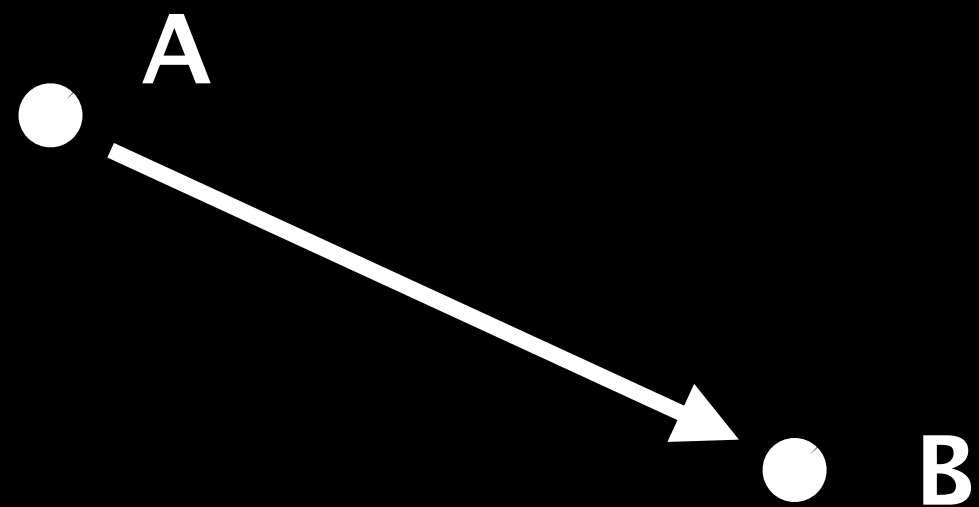
A



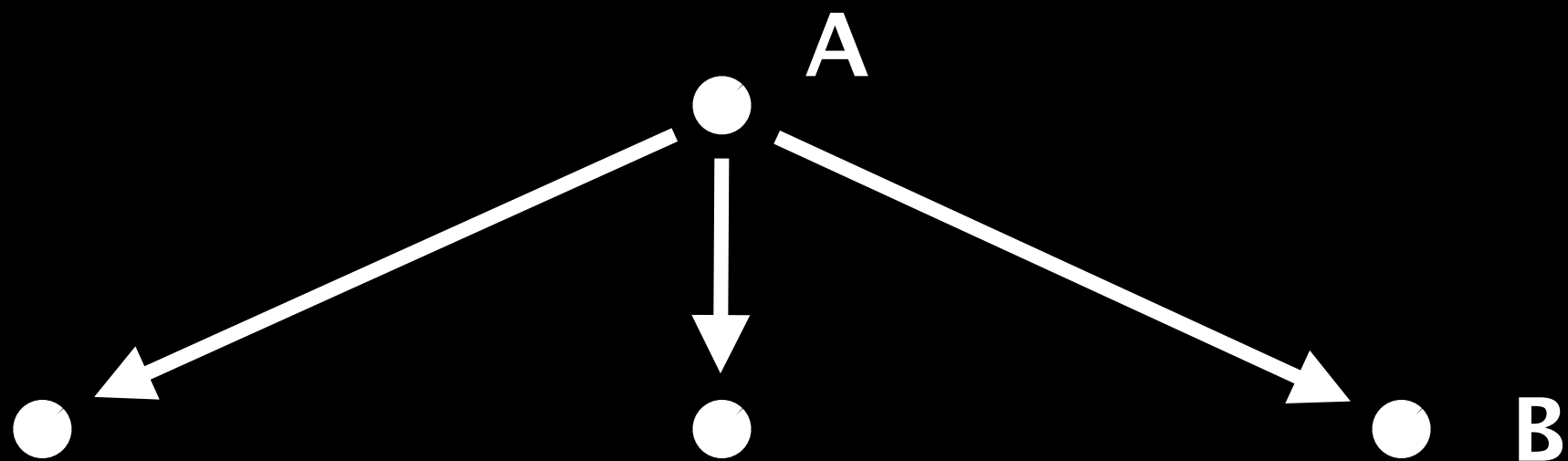
B



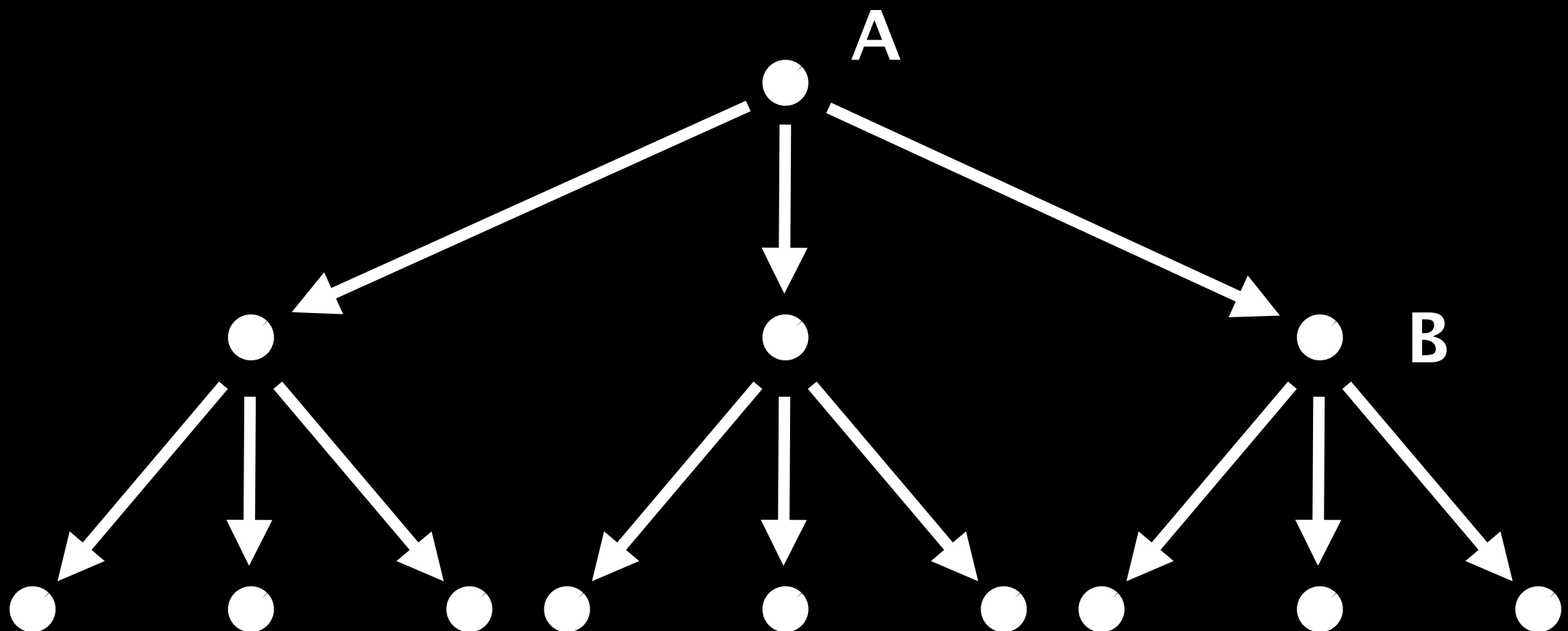
decision tree



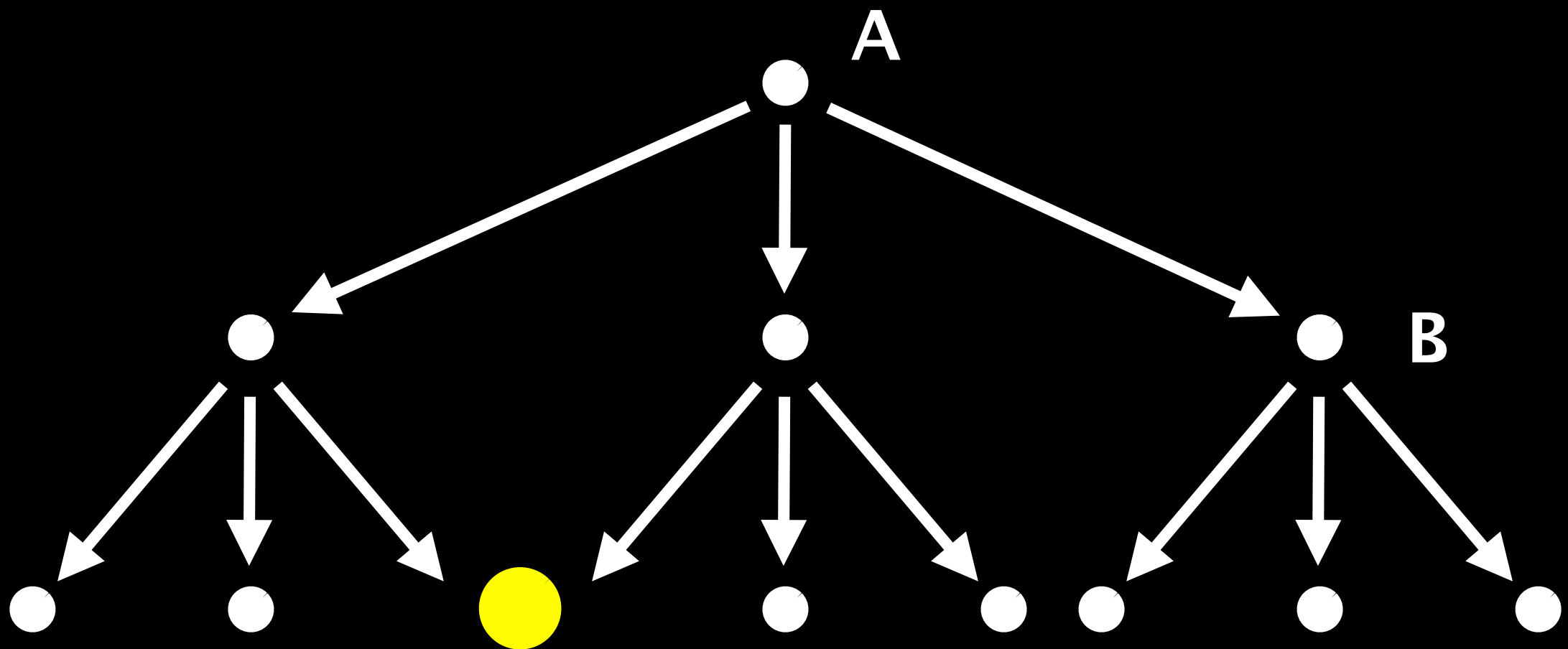
decision tree



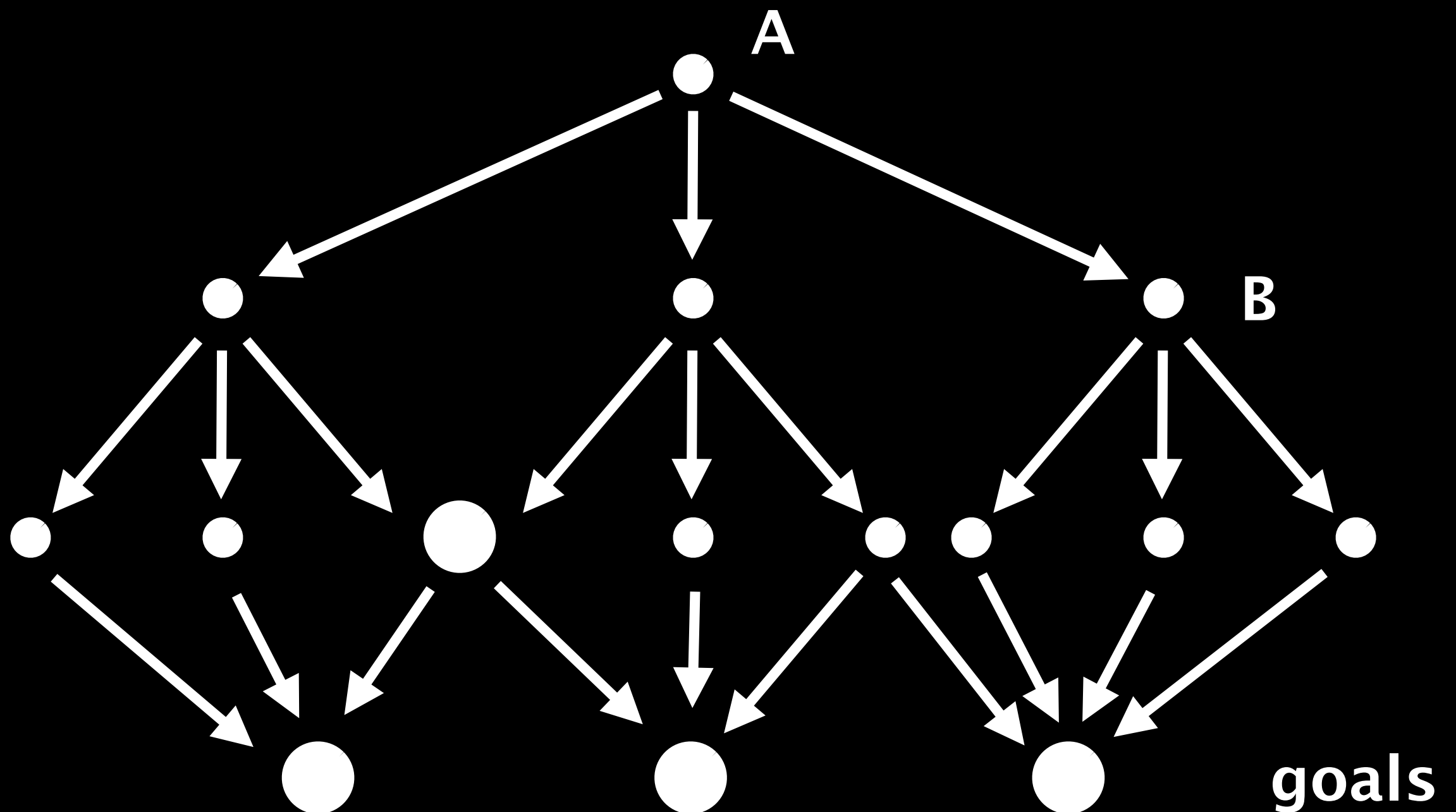
decision tree



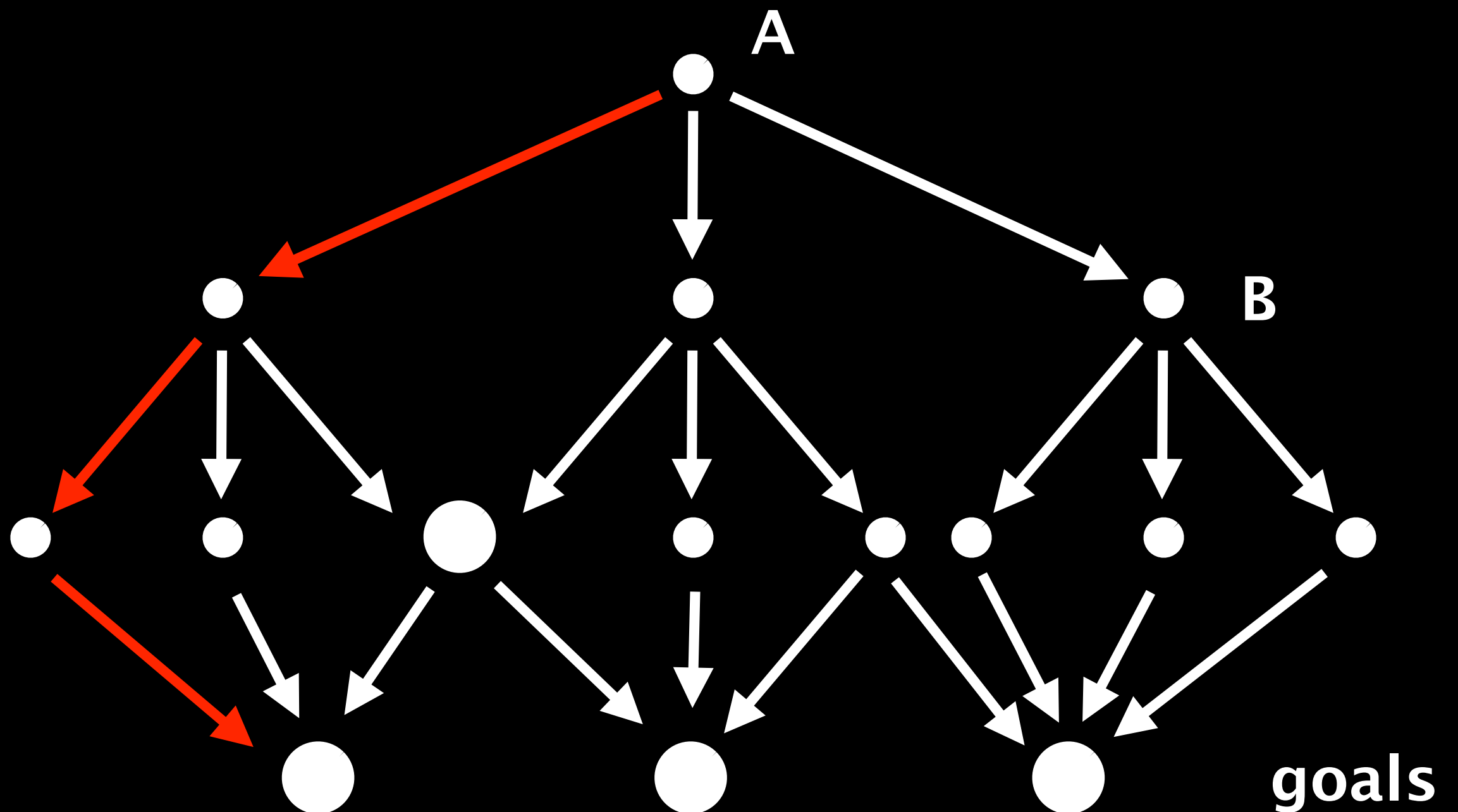
decision tree



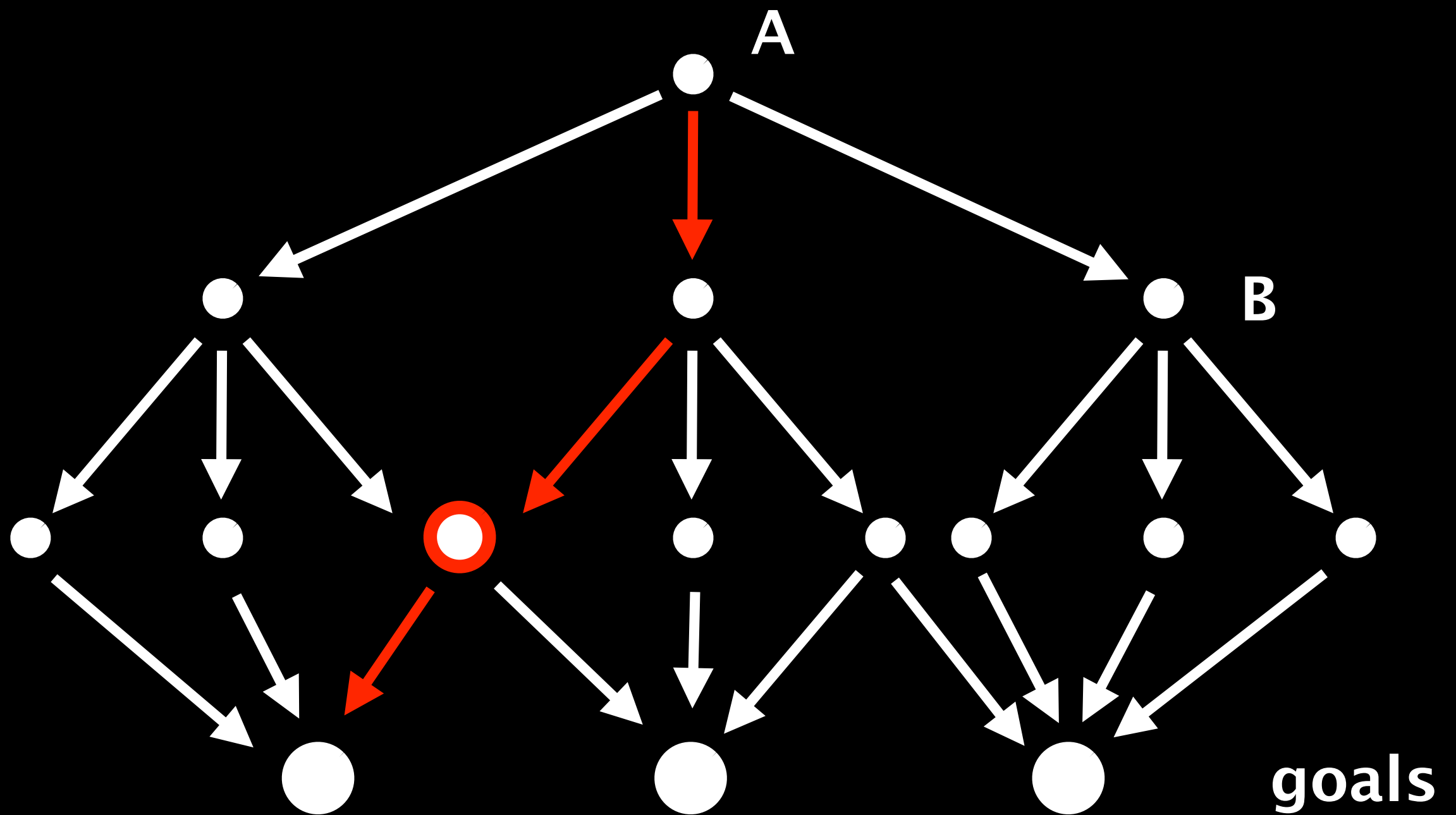
decision tree



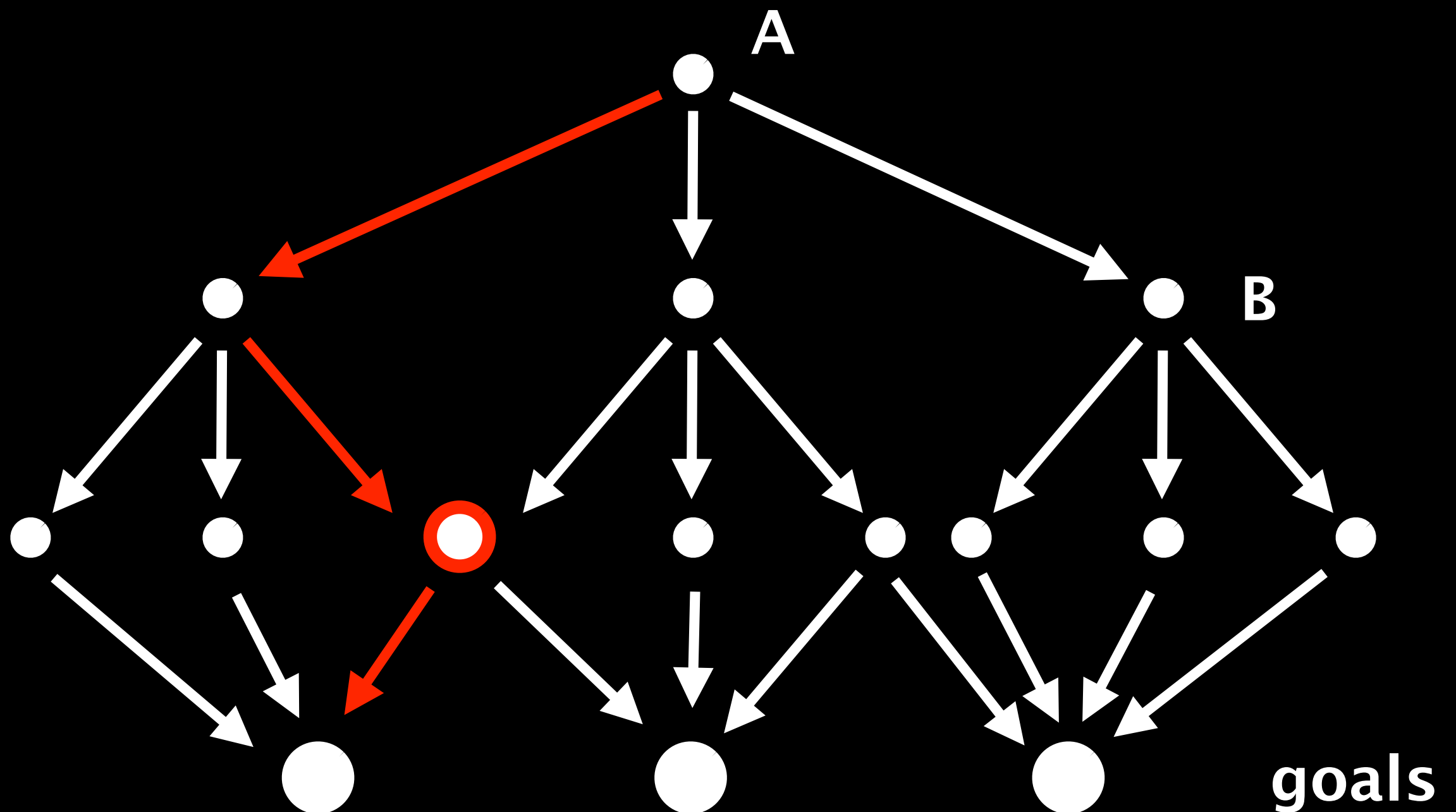
traversal



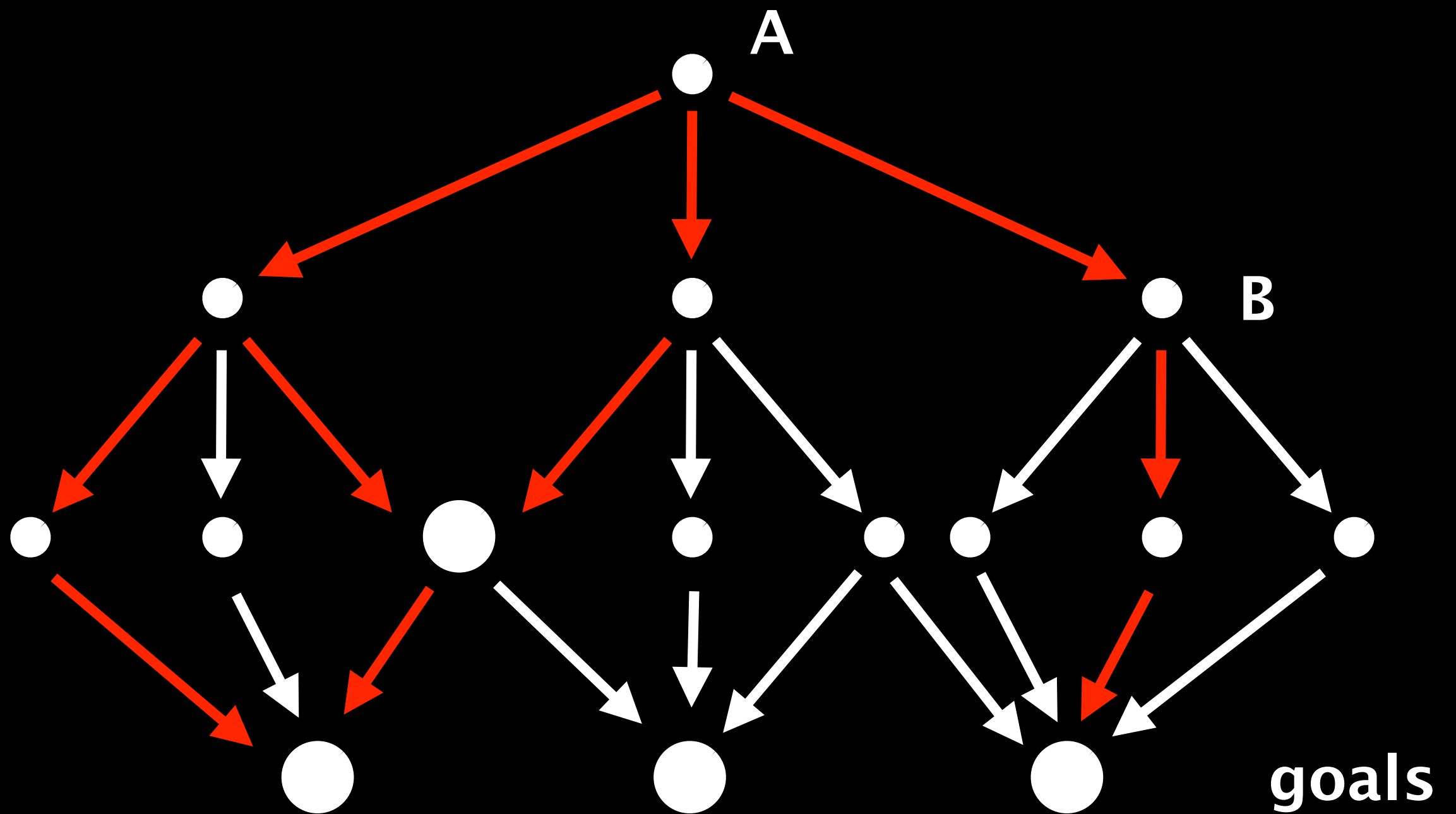
traversal



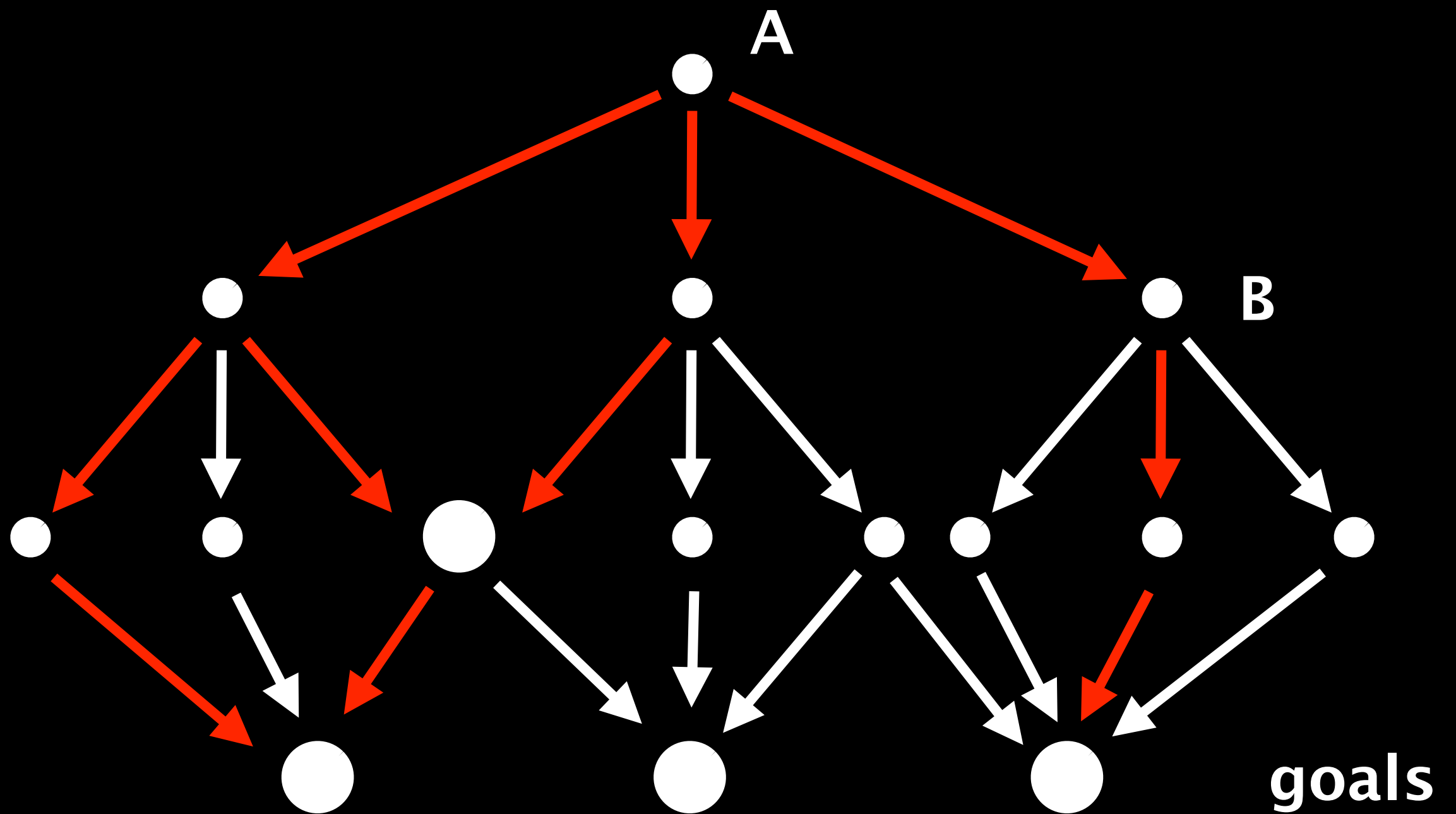
traversal

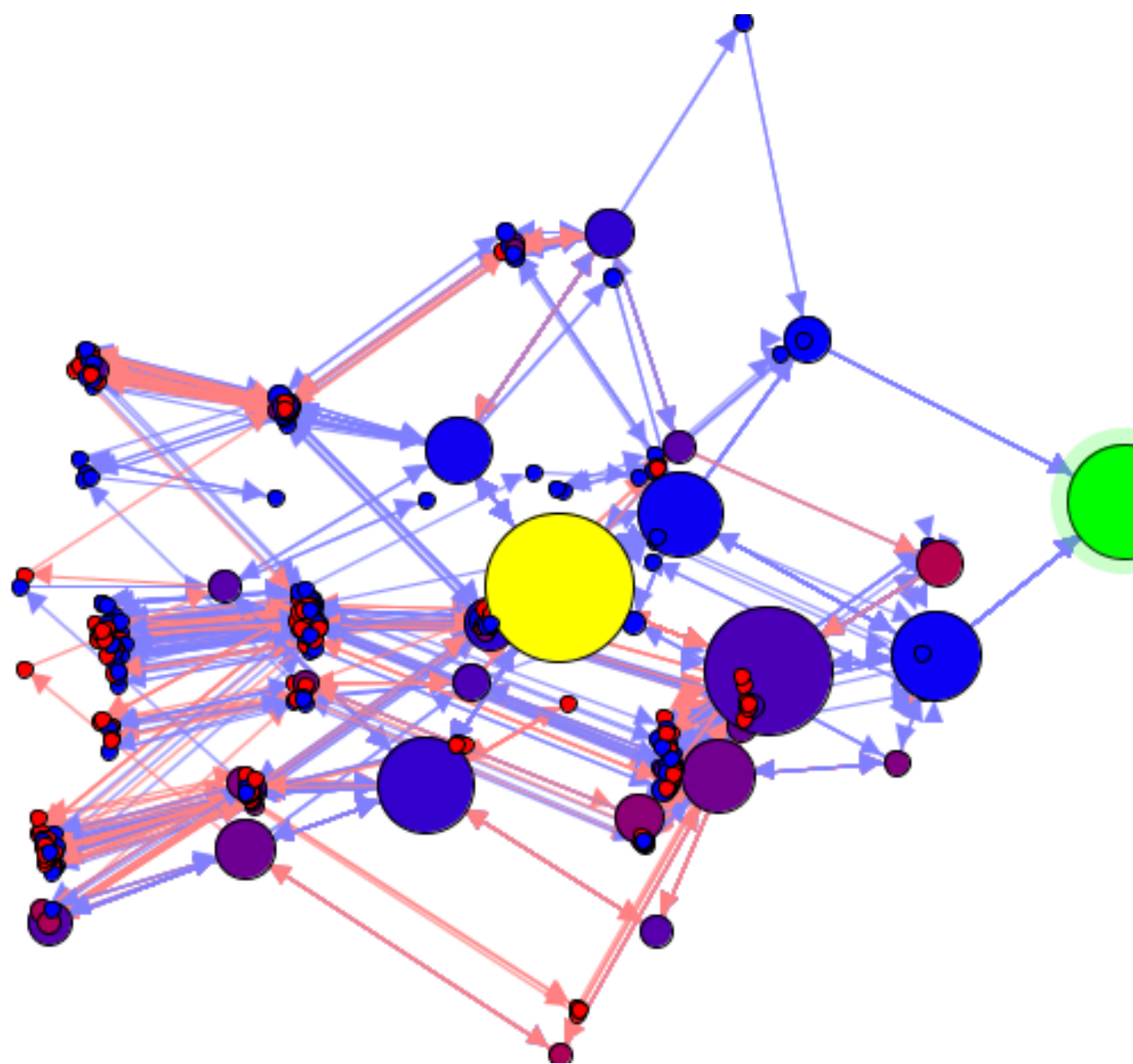


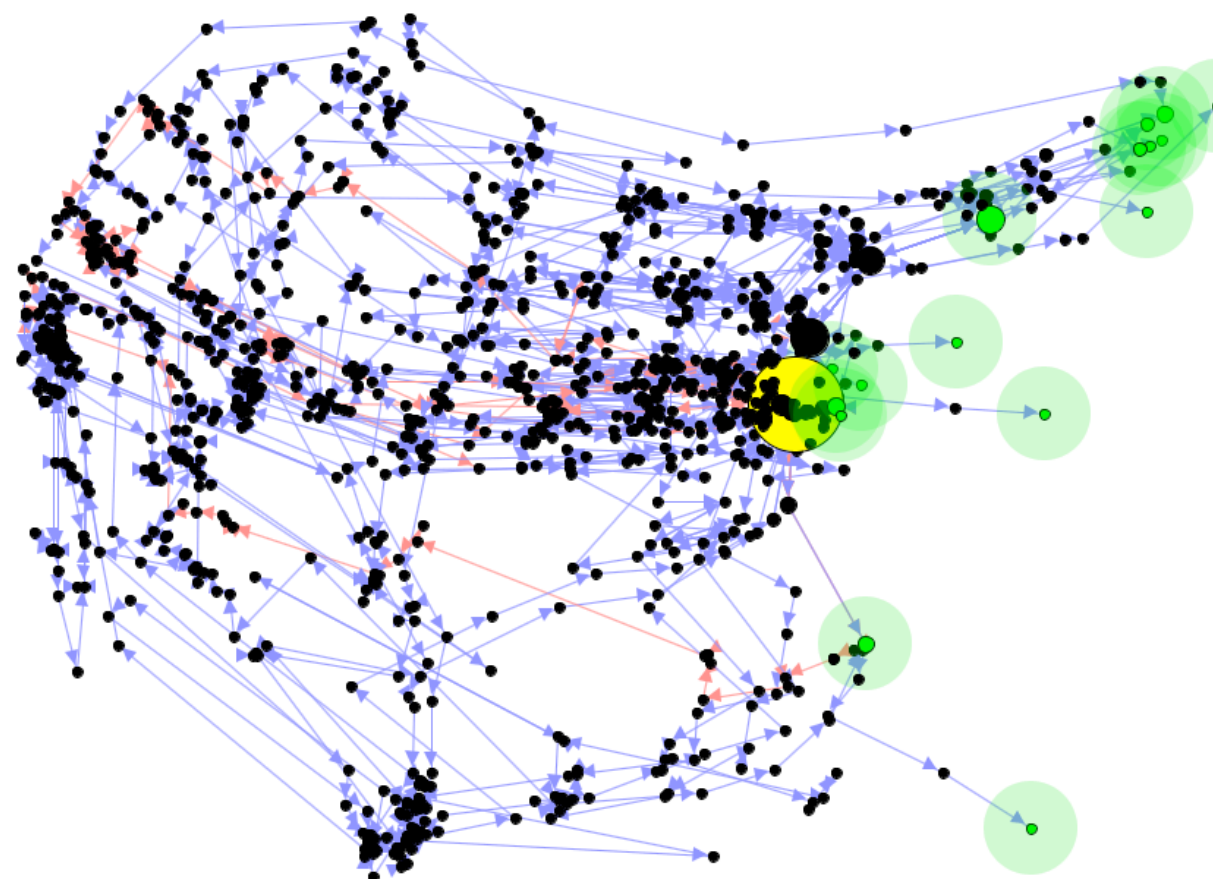
traversal



depth









complexity

stuff.

stuff

1

things we can count

entities, connections, choices (mechanics),
render states, state space, decision trees, etc.

2

things we can't (reliably) count

perception, cognition, (re)action, uncertainty



state 10^{47}
decision 10^{128}



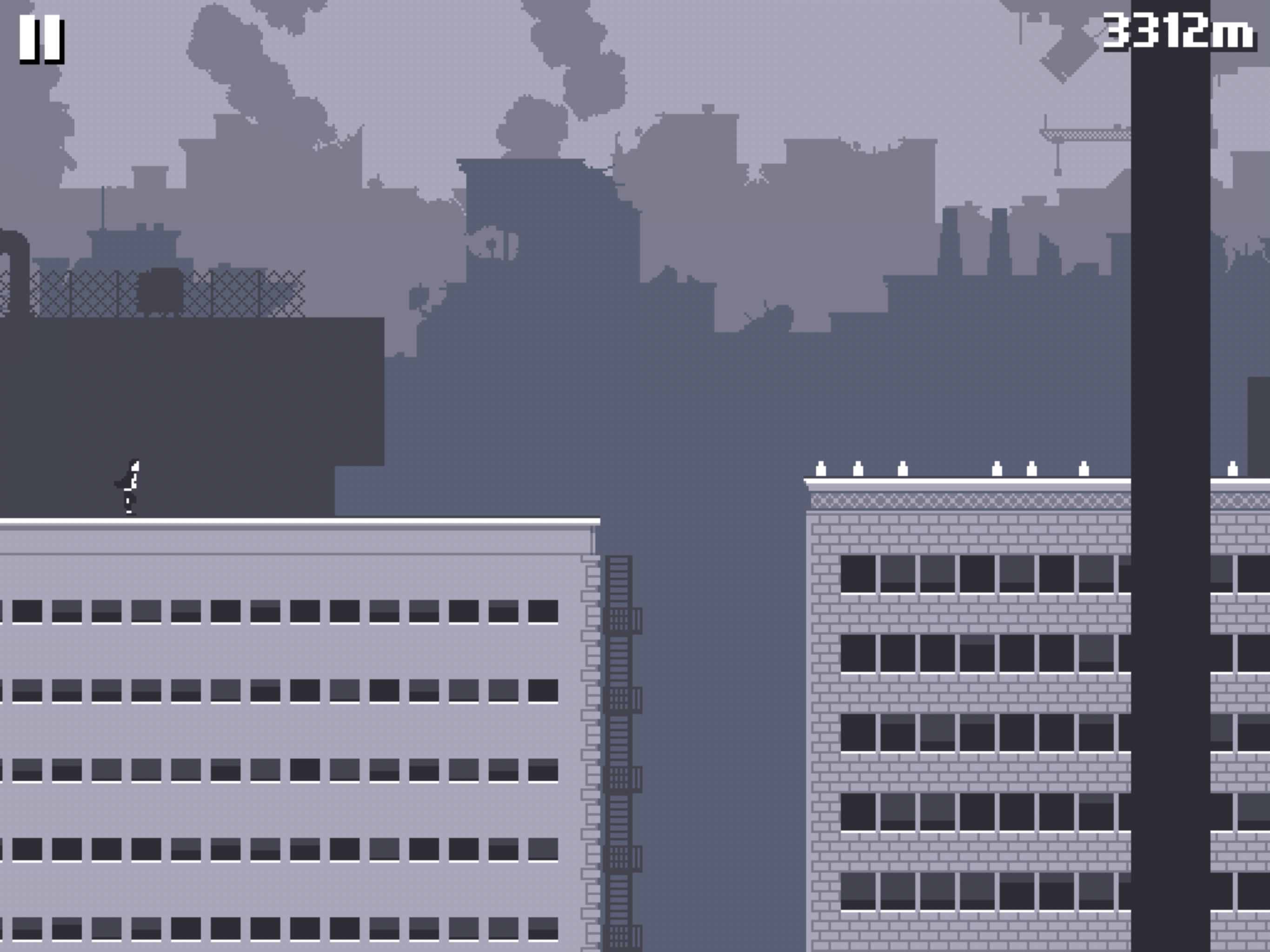
state 10^{171}
decision 10^{360}



[state $\sim 10^{73}$]
decision 10^{33}

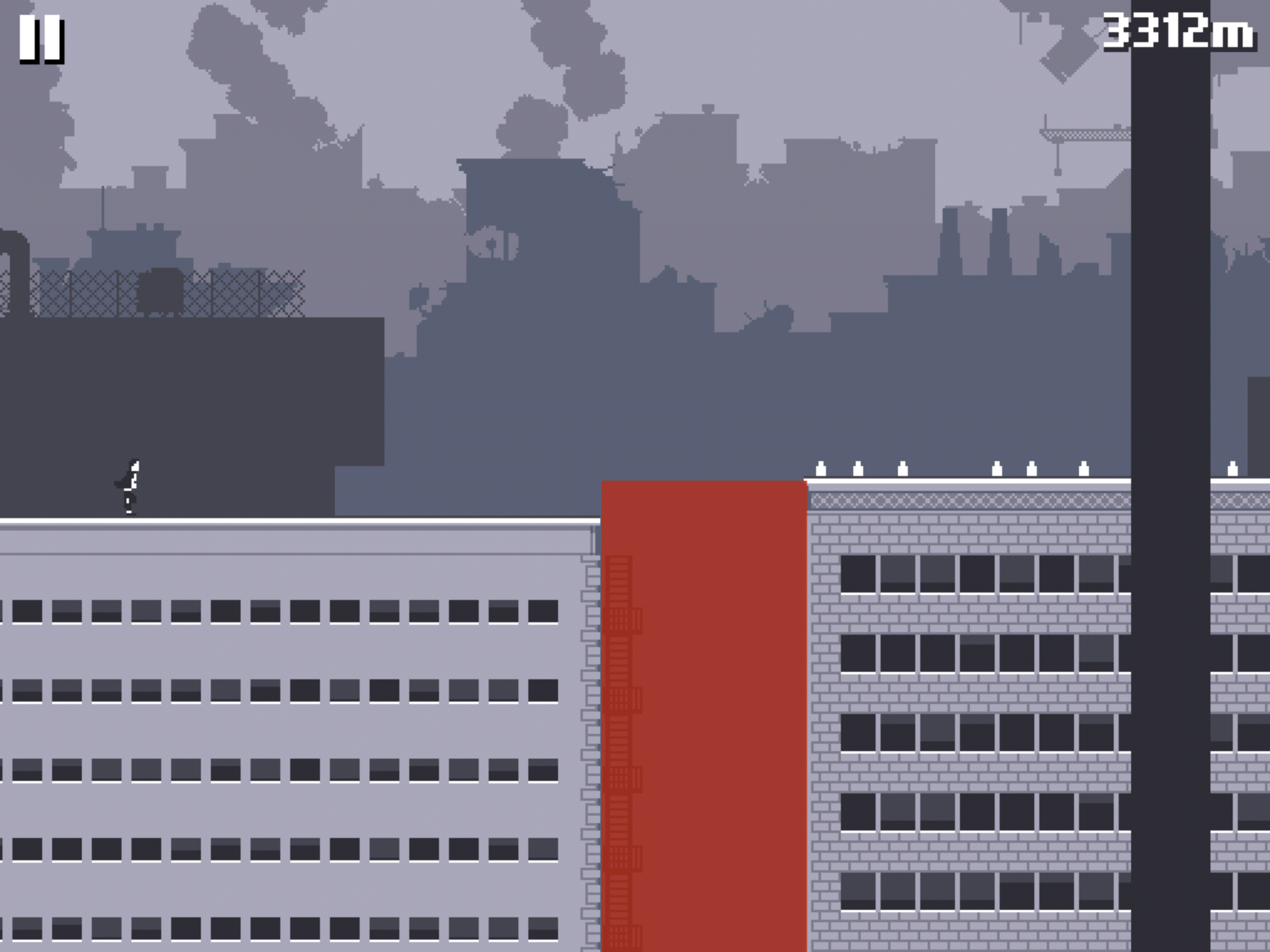


3312m



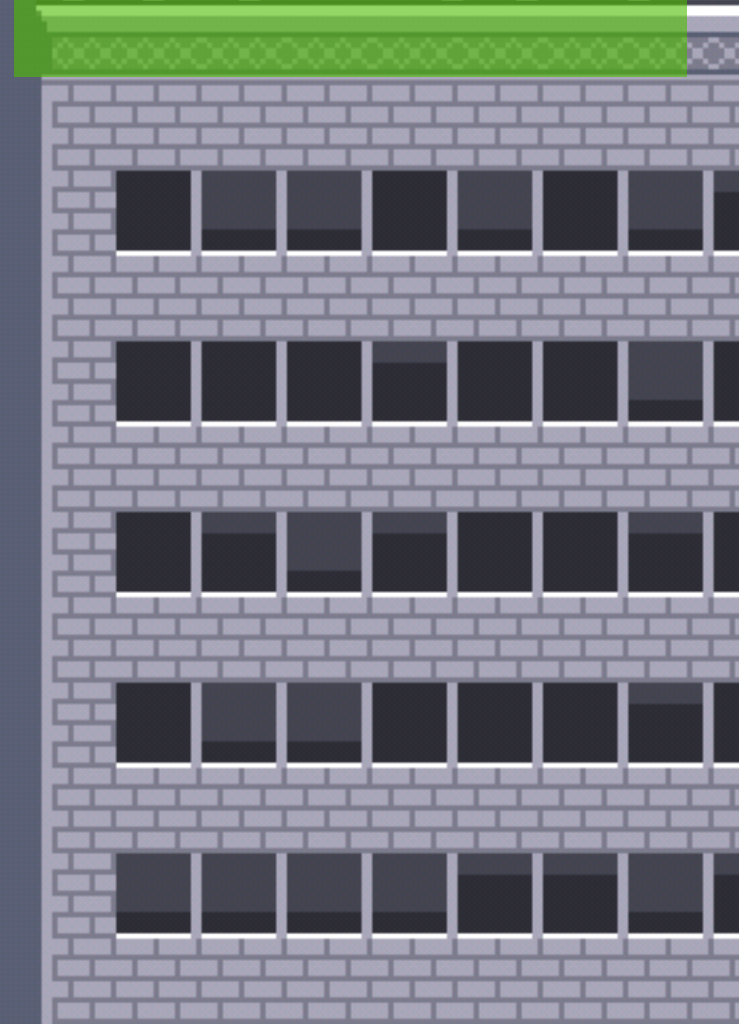
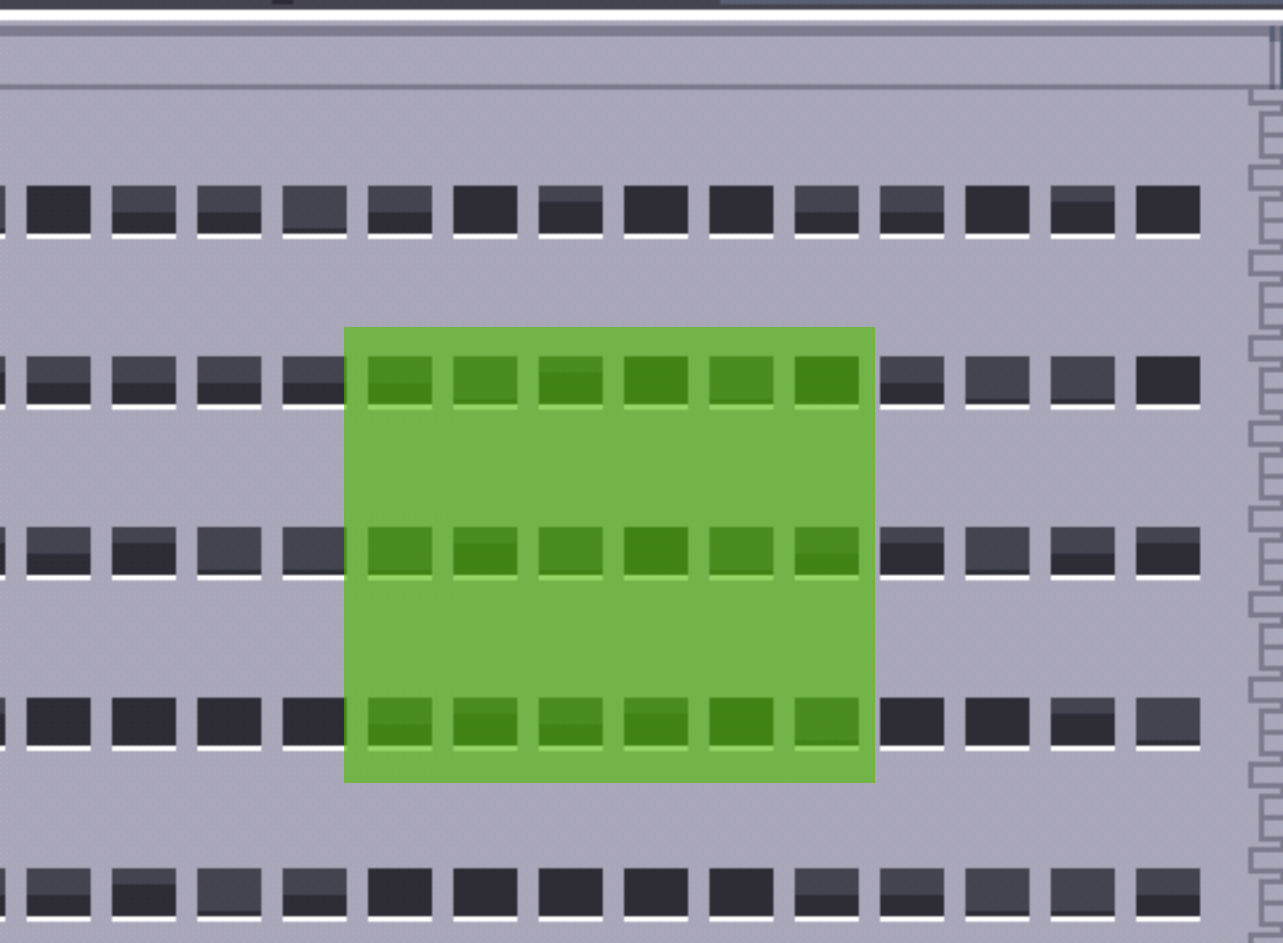
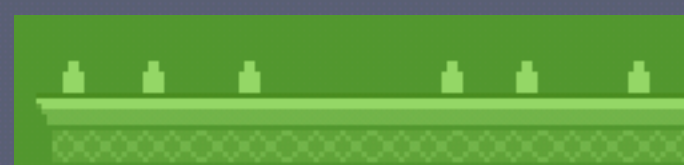
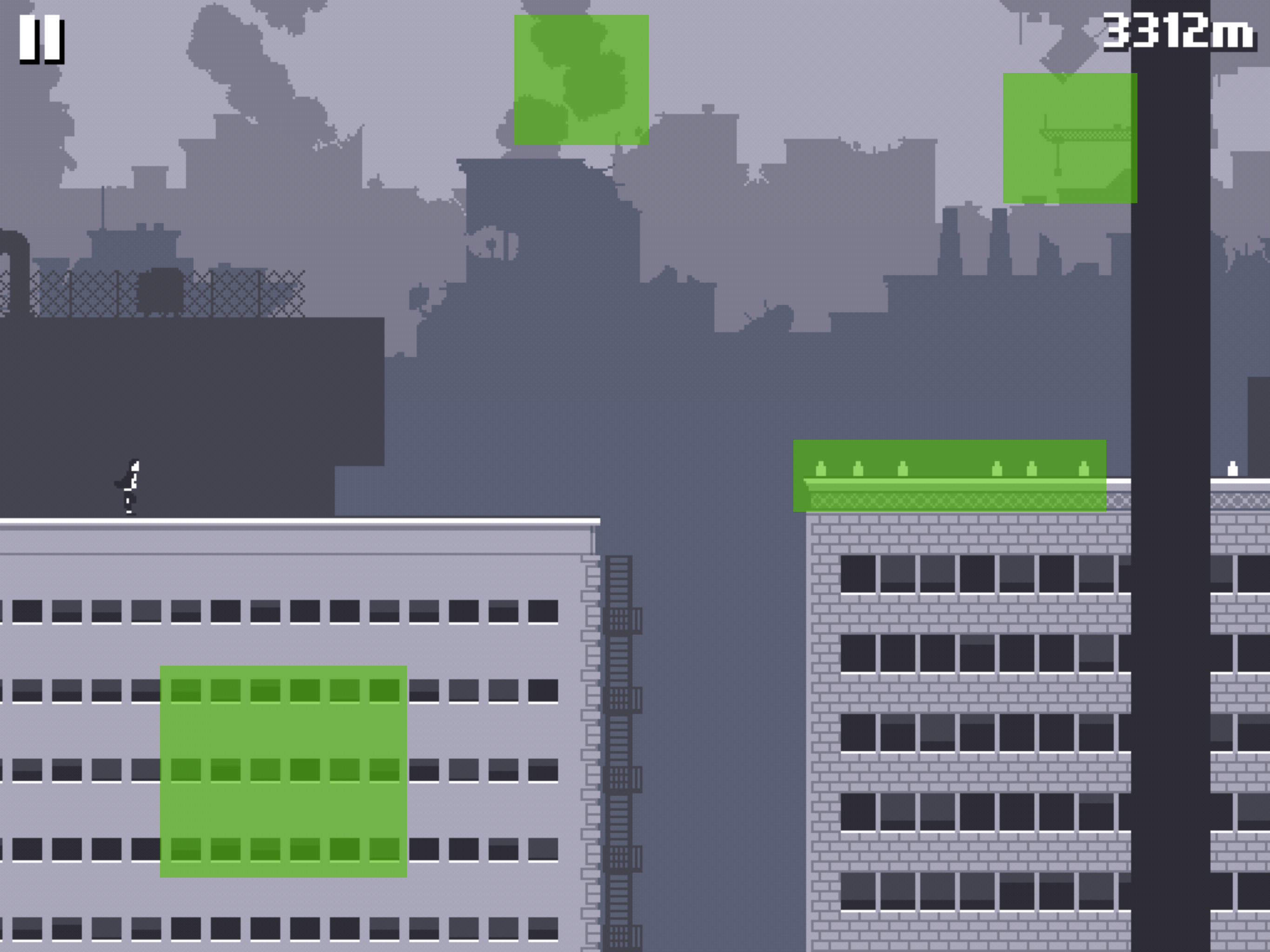
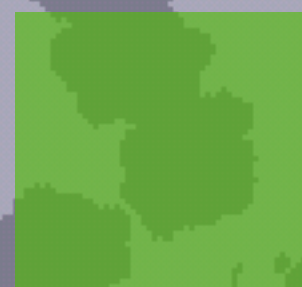


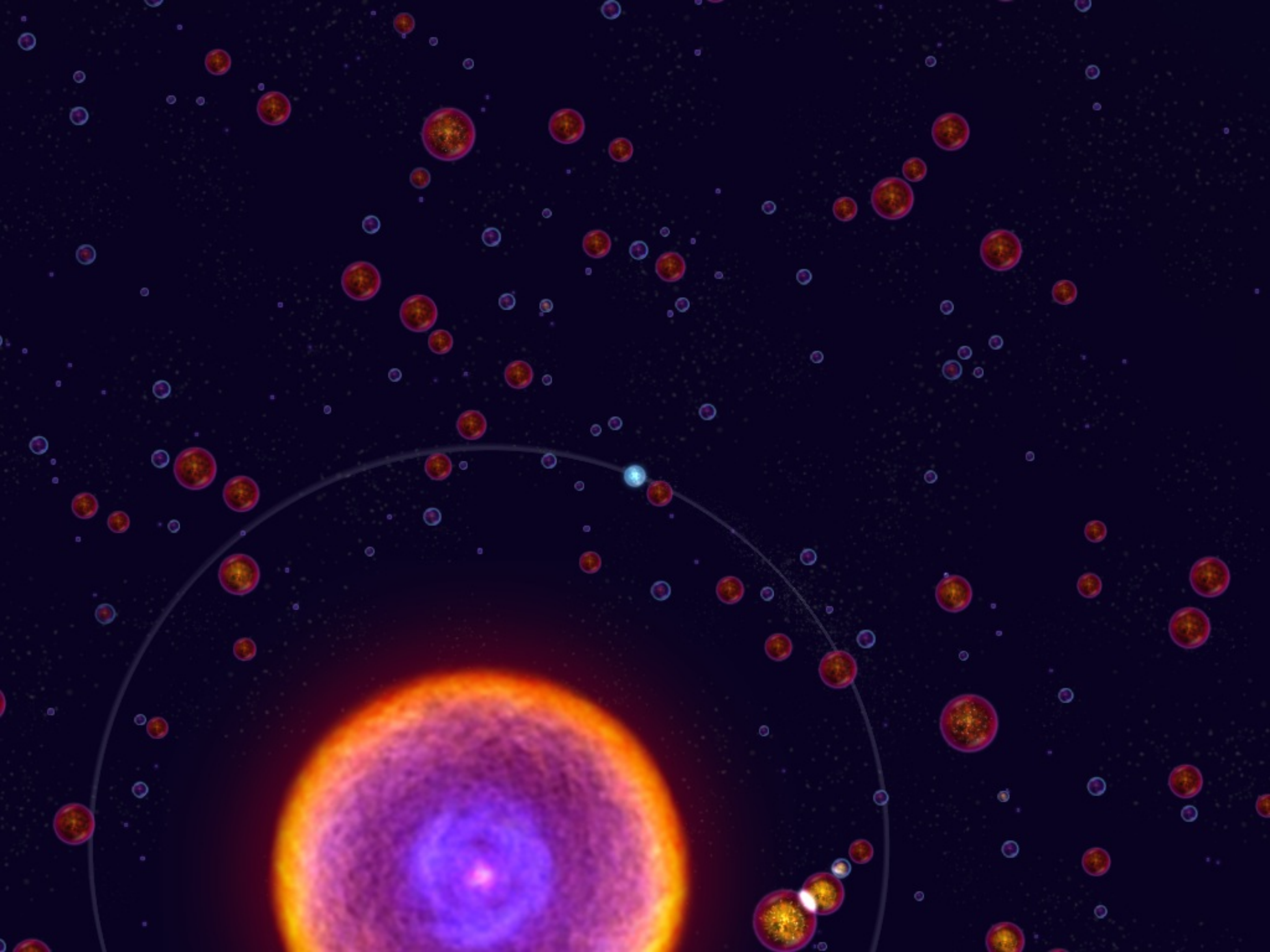
3312m

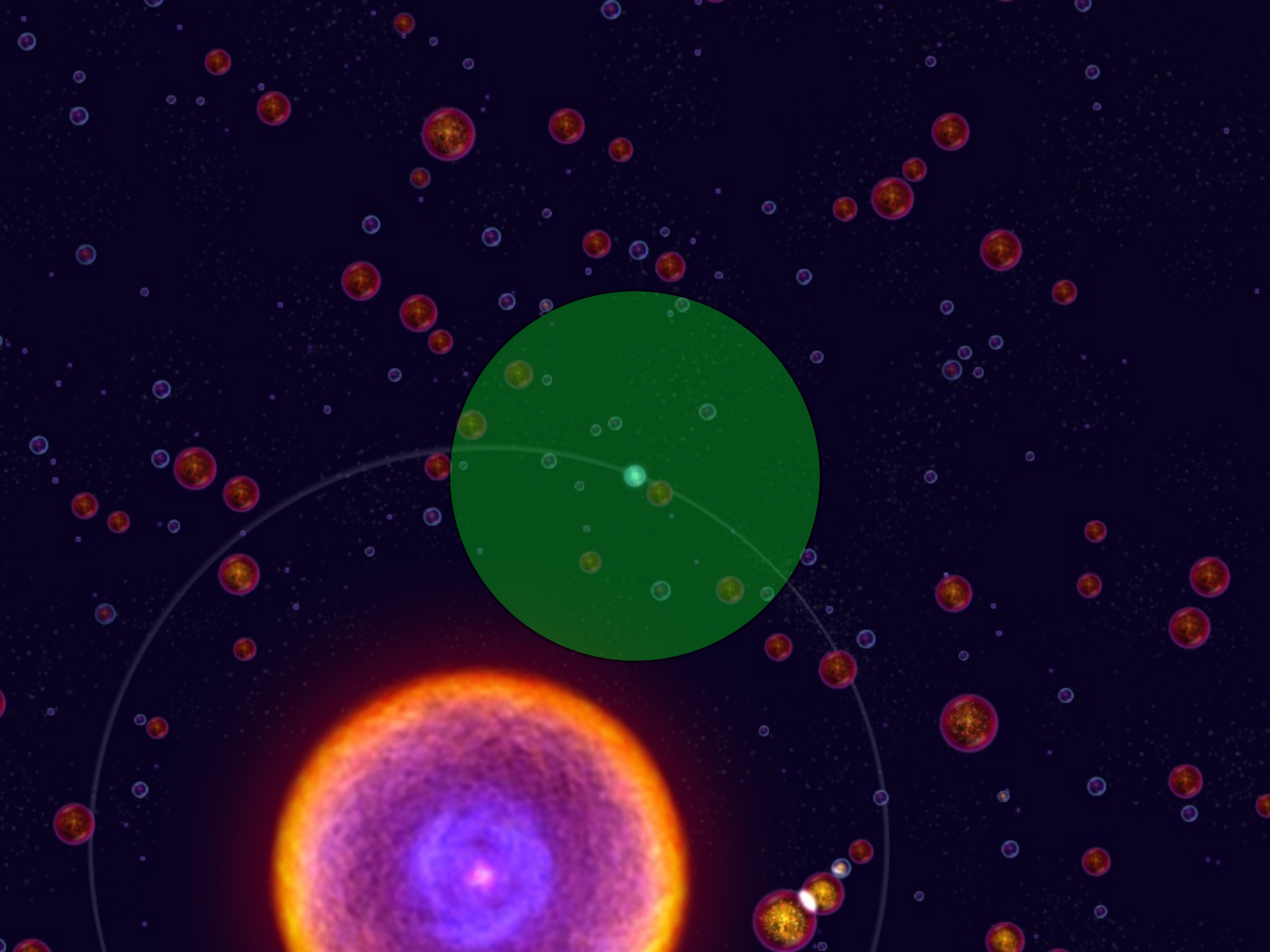


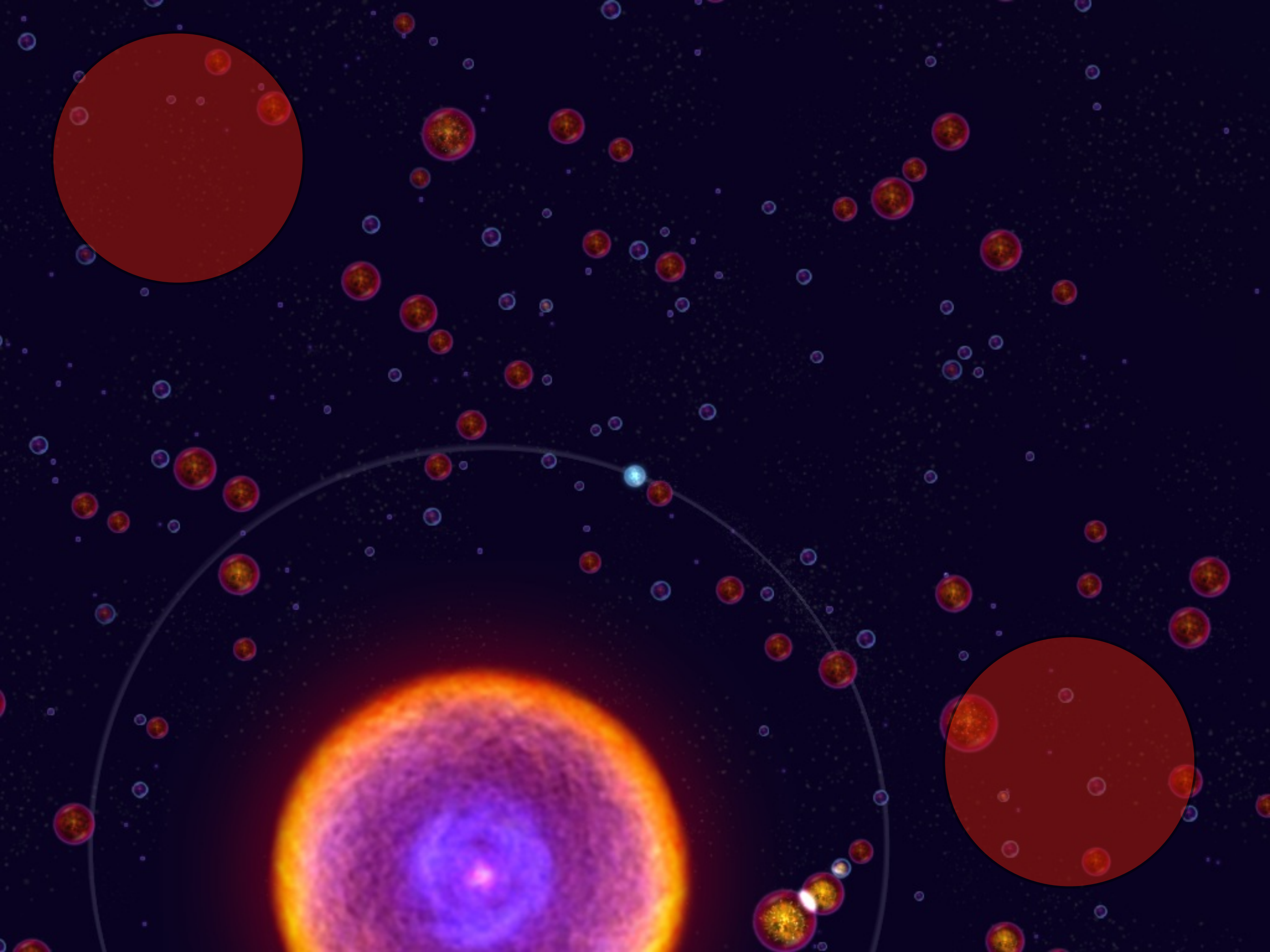


3312m









we perceive complexity
different than it is
formally measured

perceived
complexity

perceived complexity

function of the number of
game entities/elements
player choices/mechanics
visual representations
controls

influencing
perceived
complexity

creation

reduction

addition

procedural generation

simplification

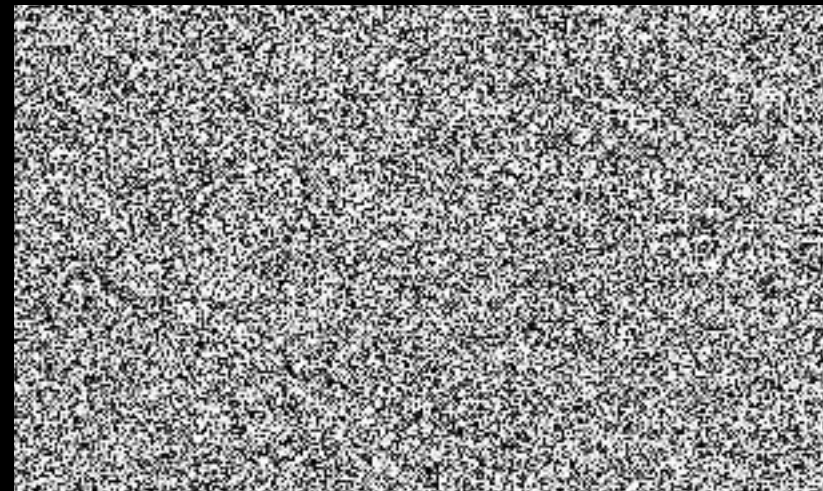
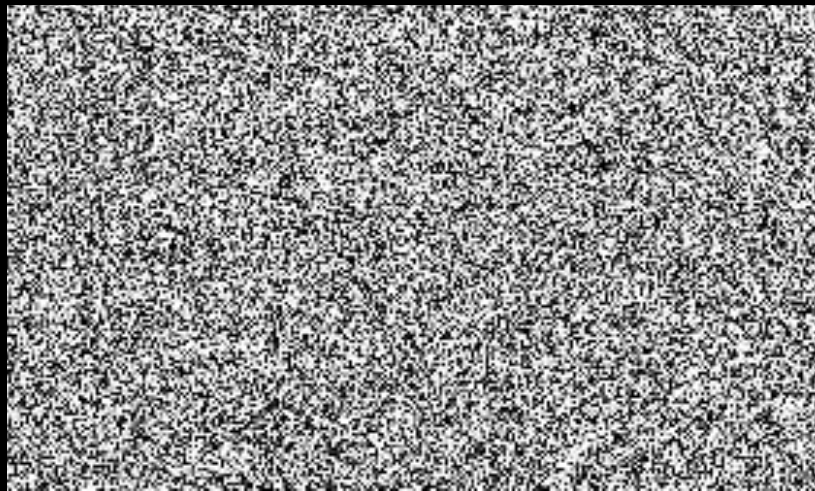
coupling

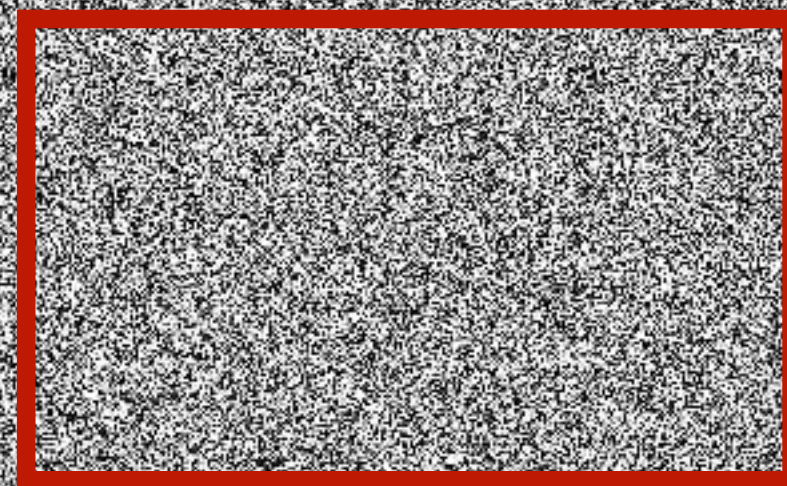
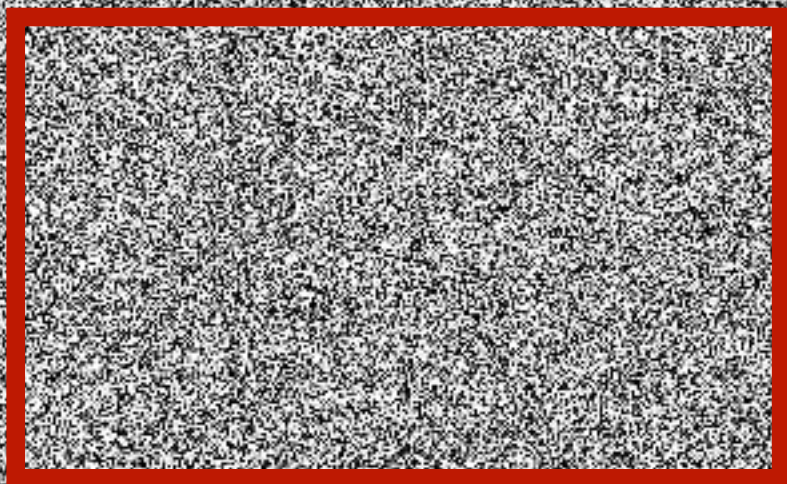
procedural generation

texture

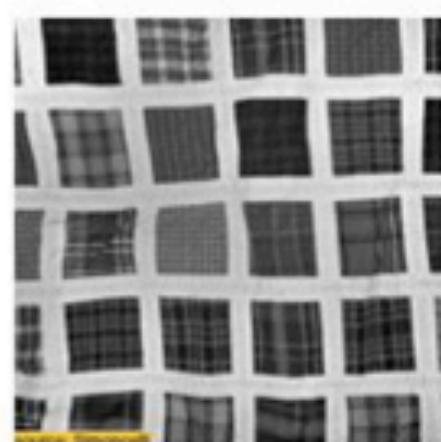
texture

stationary process

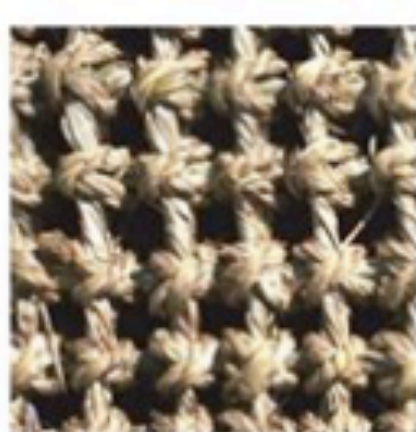




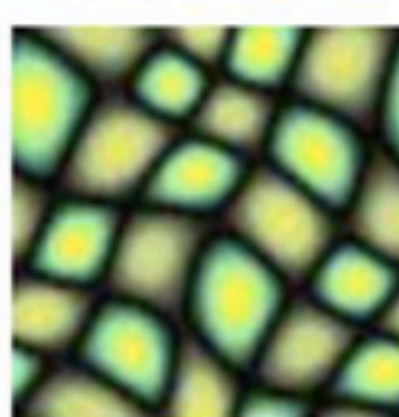




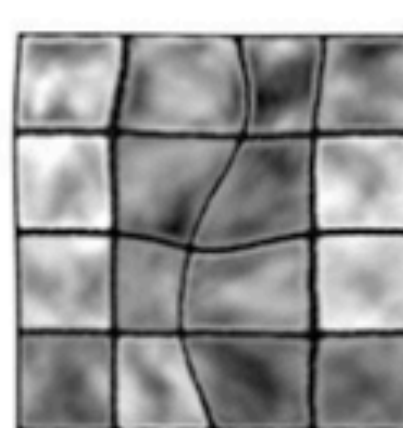
$g=0.65, a=0.09$



$g=1.08, a=0.17$



$g=2.08, a=0.09$



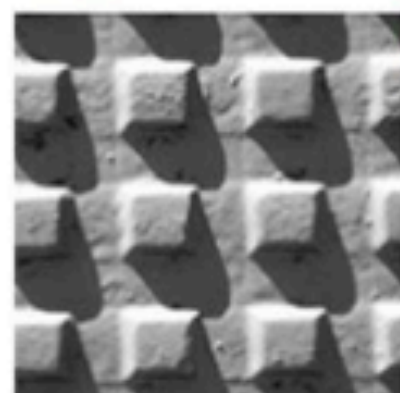
$g=3.97, a=0.19$



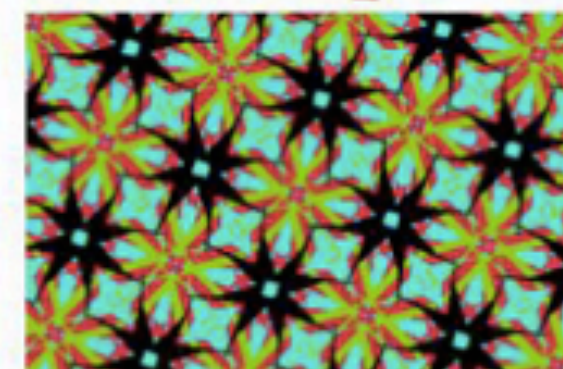
$g=4.58, a=0.31$



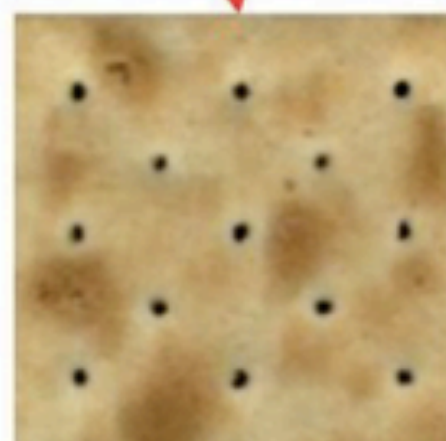
$g=0, a=0.09$



$g=0, a=0.04$



$g=0, a=0$



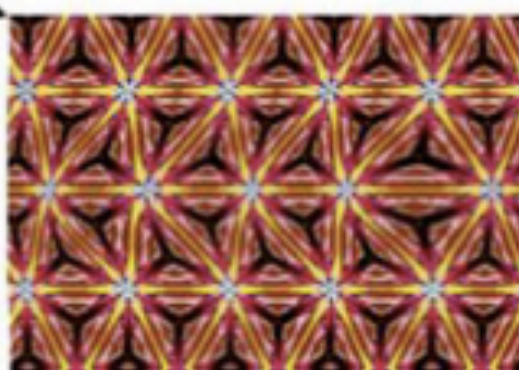
$g=0.25, a=0.07$



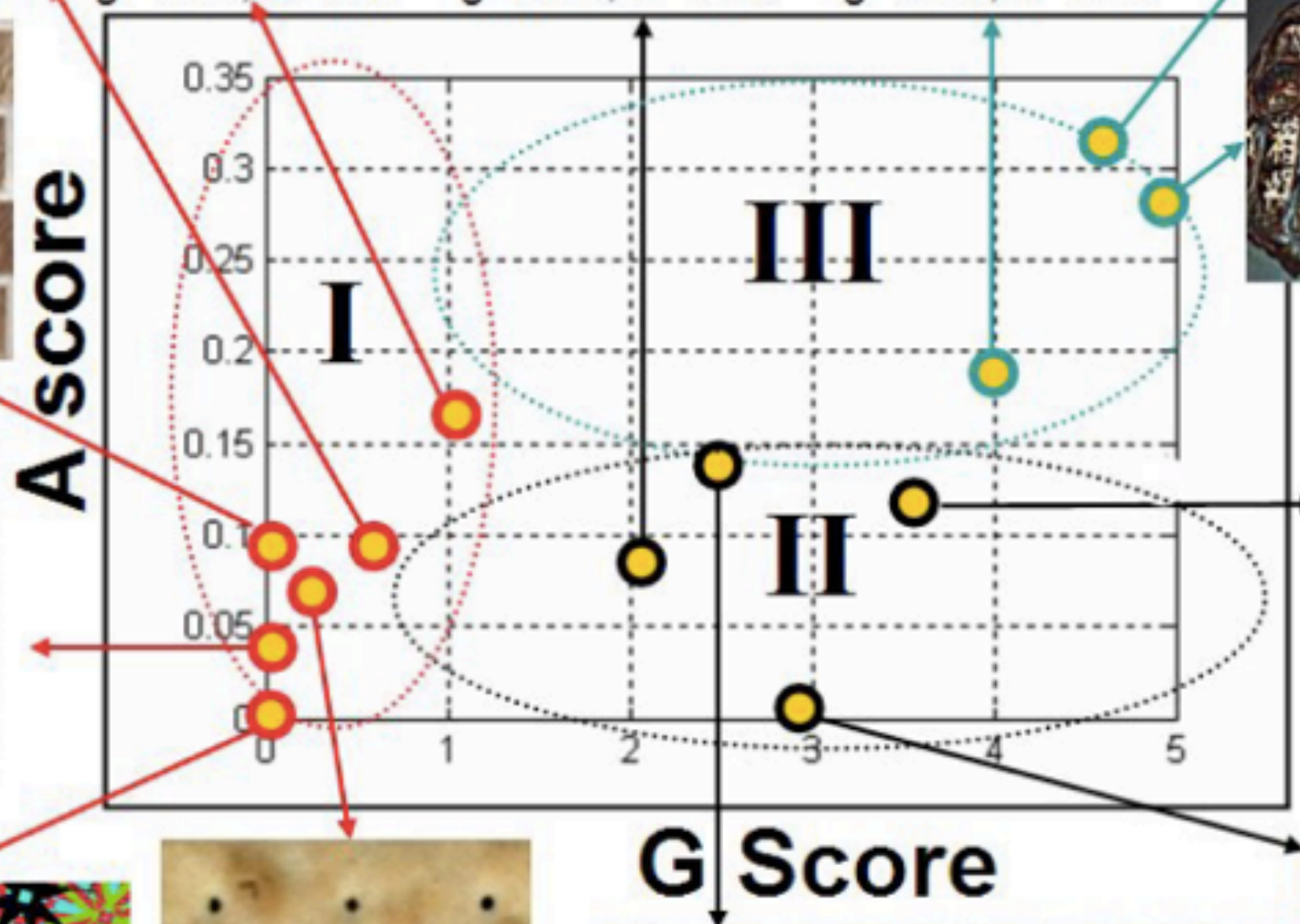
$g=2.50, a=0.14$



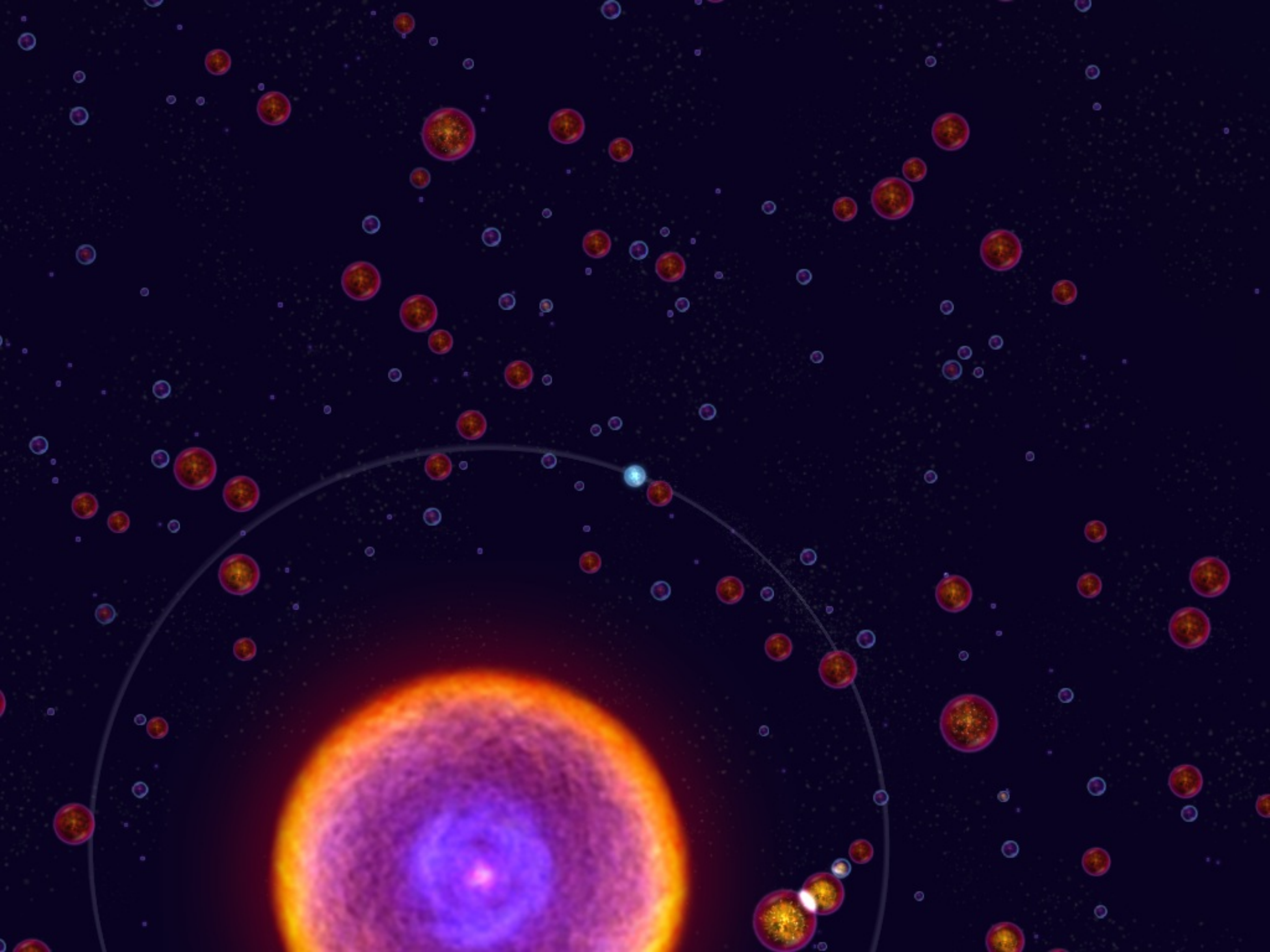
$g=3.55, a=0.12$



$g=2.9, a=0$

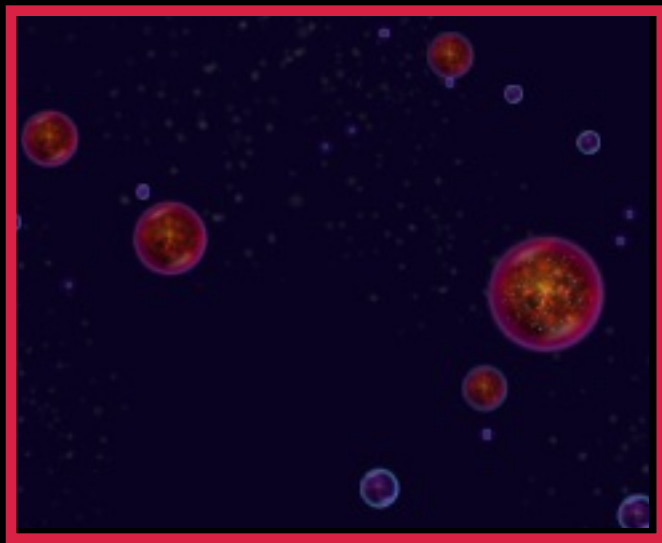


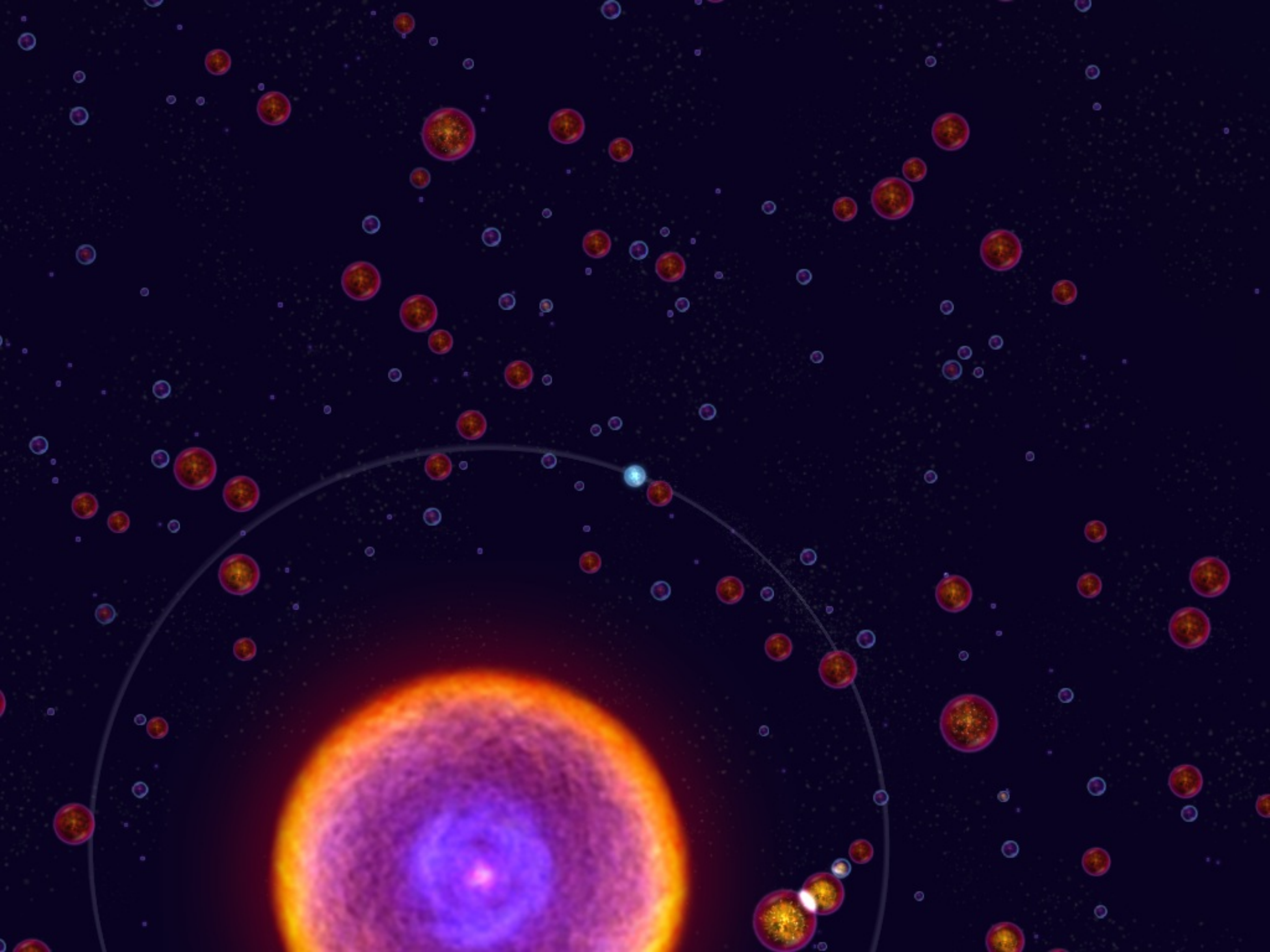
$g=4.97, a=0.28$

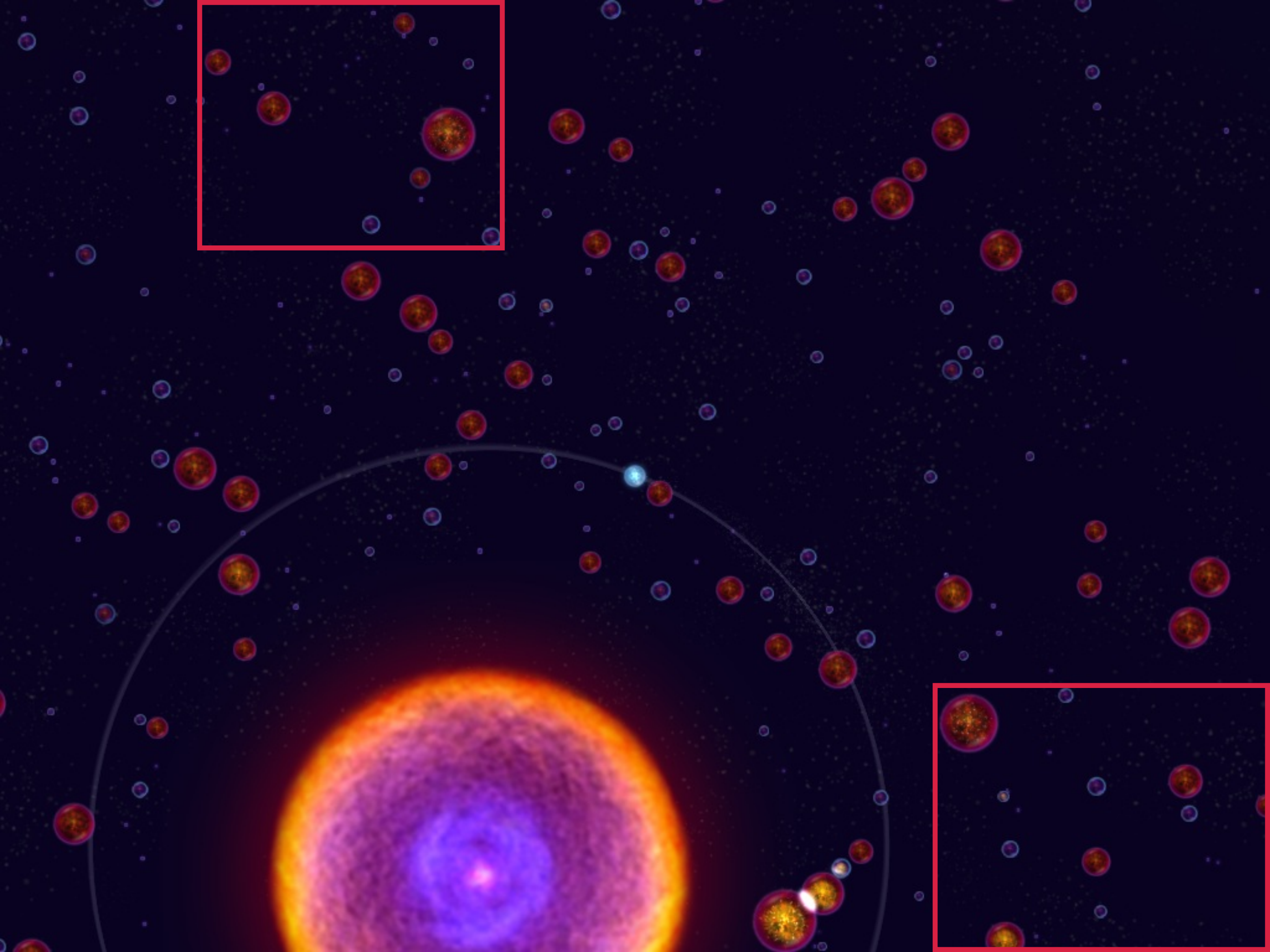


texture

stationary process







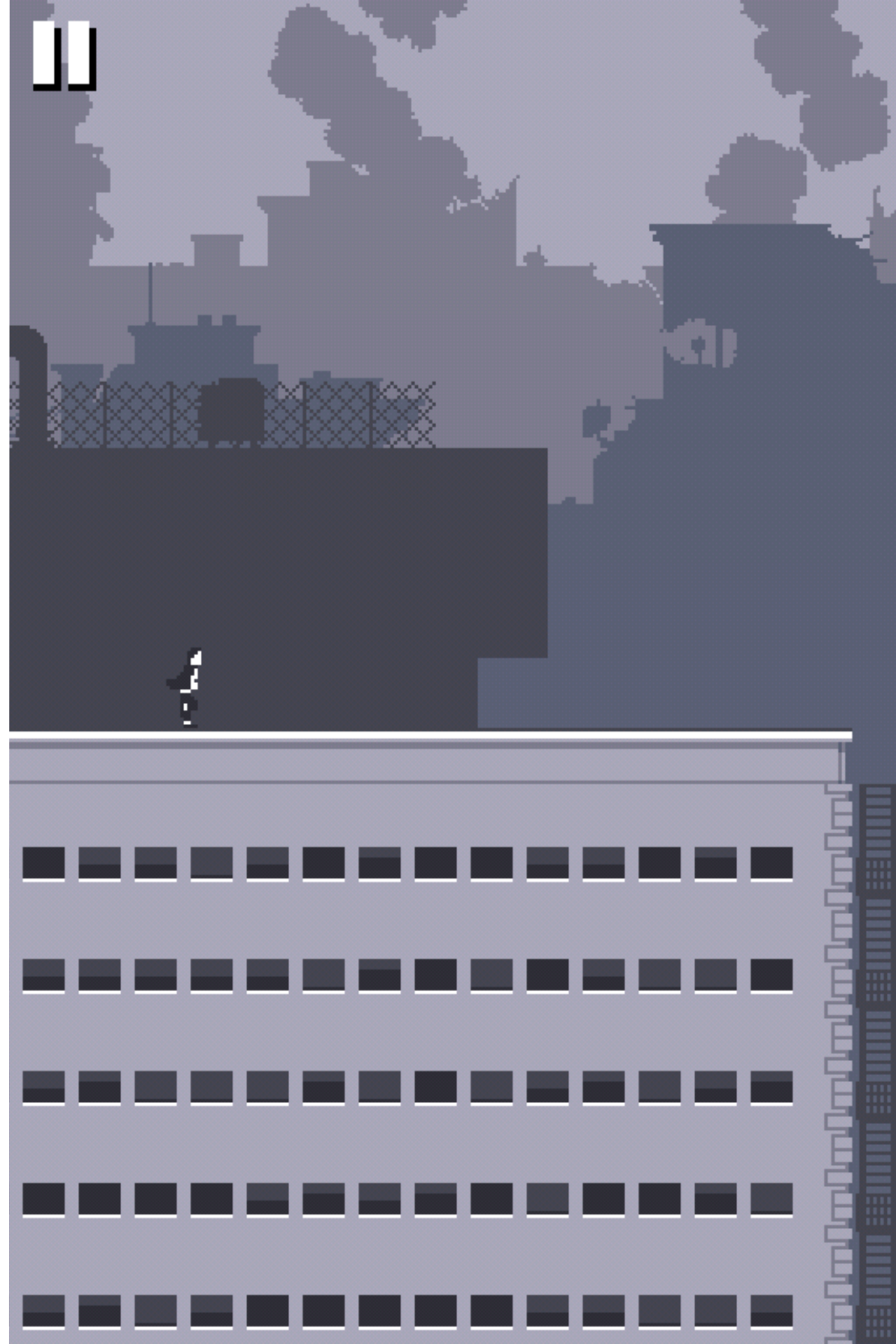
simplification

simplification

basis reduction

reduces degrees of freedom

creates a different game





coupling

coupling

link one entity to another

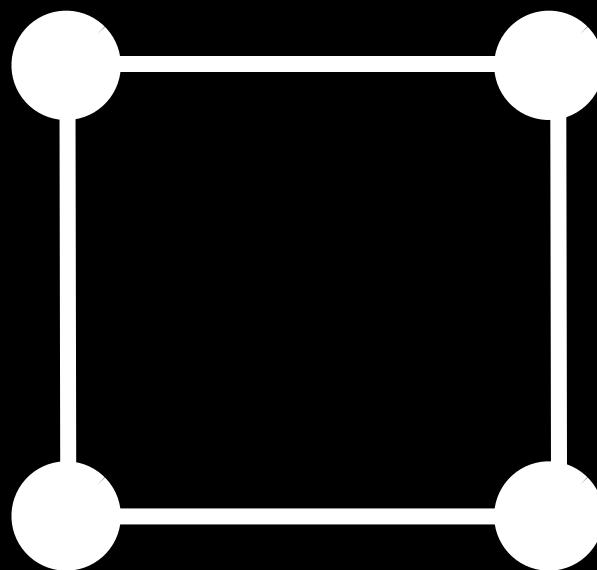
interpret a resource differently

doesn't add entities

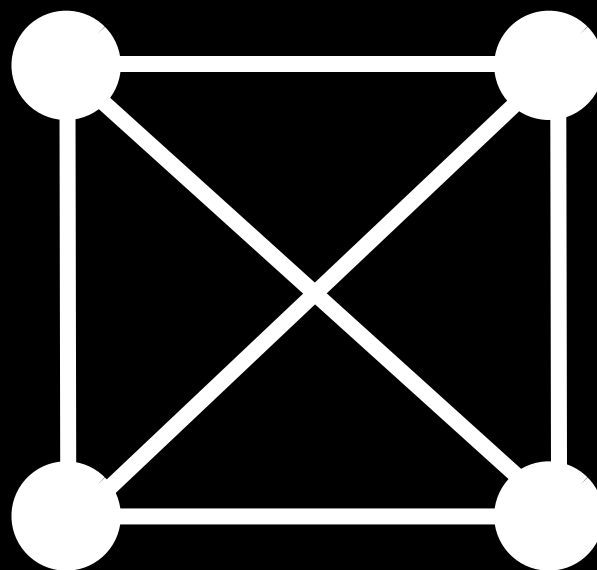
coupling



coupling

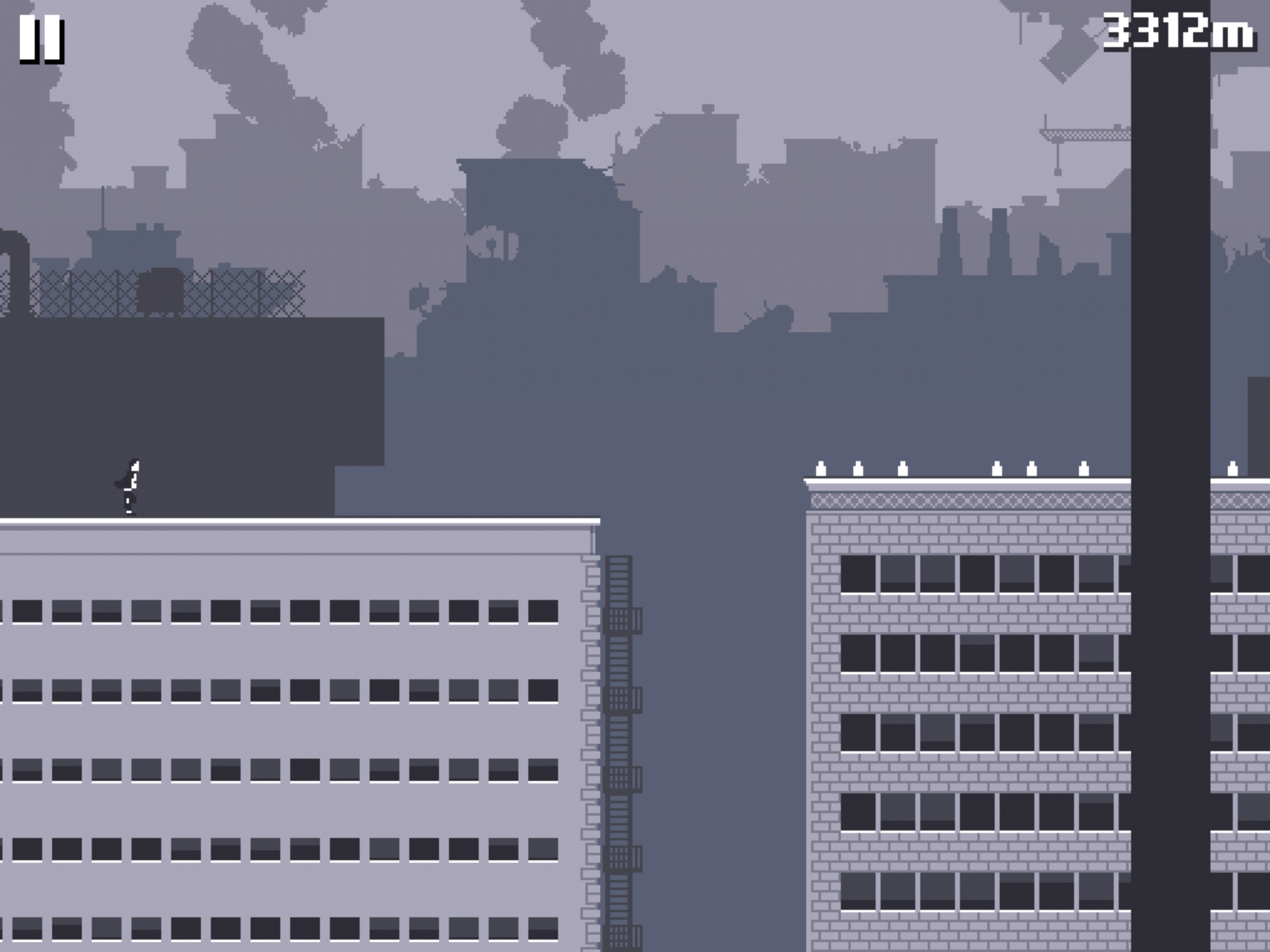


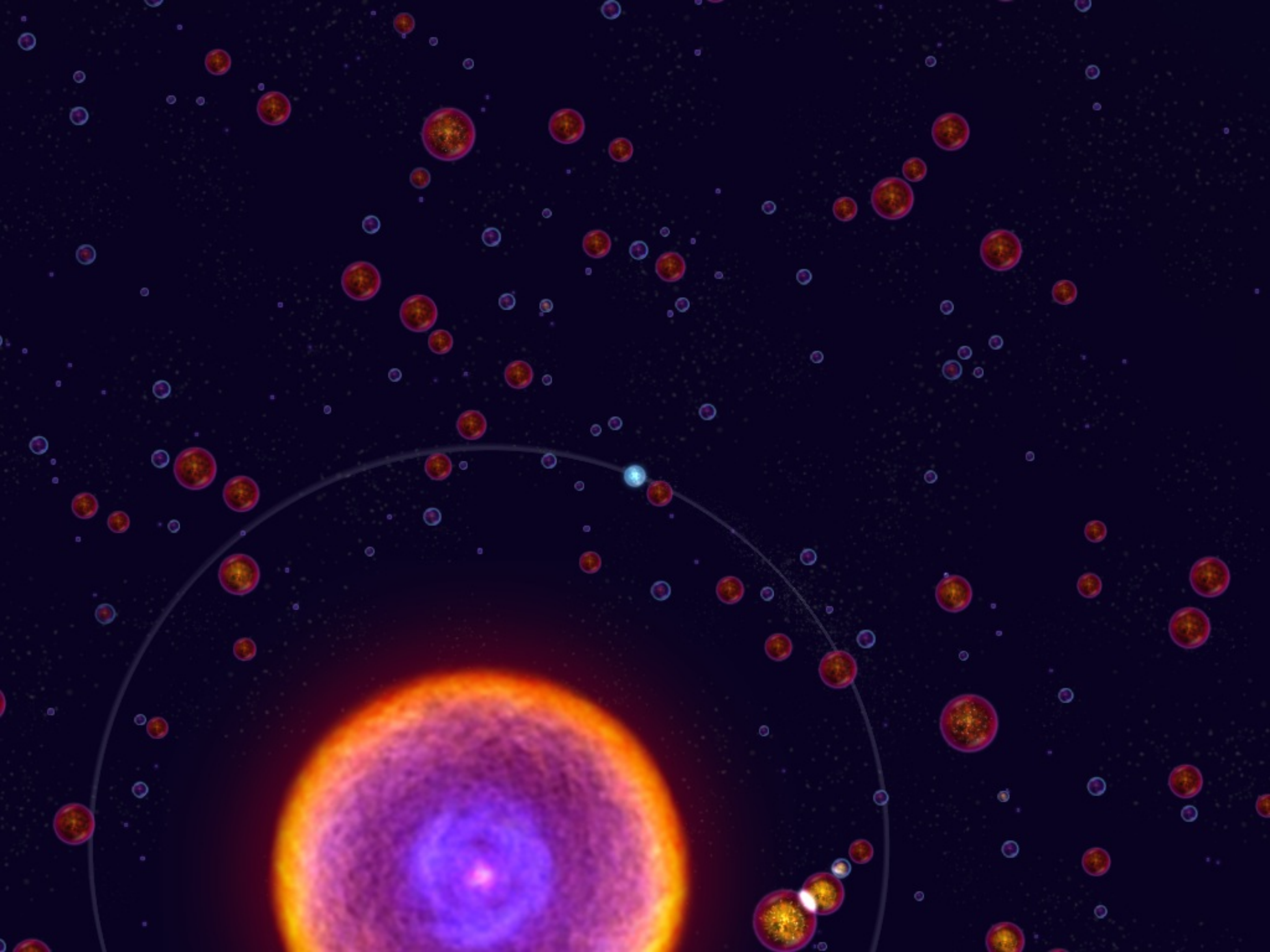
coupling

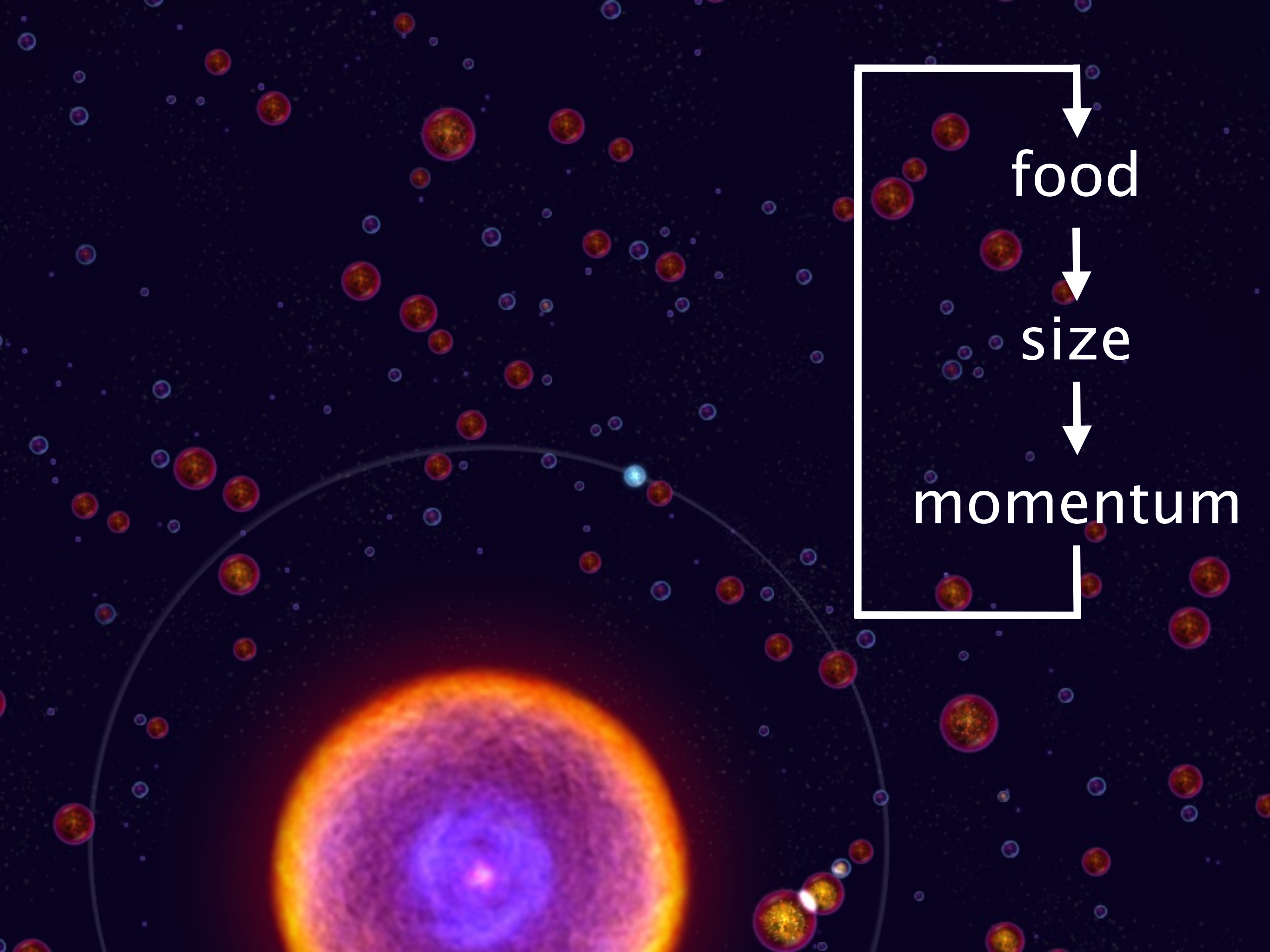




3312m







food

size

momentum



DEVELOPMENT #1



PRESS YOUR STICK BUTTON TO START

A CHARITY FROM YOUR

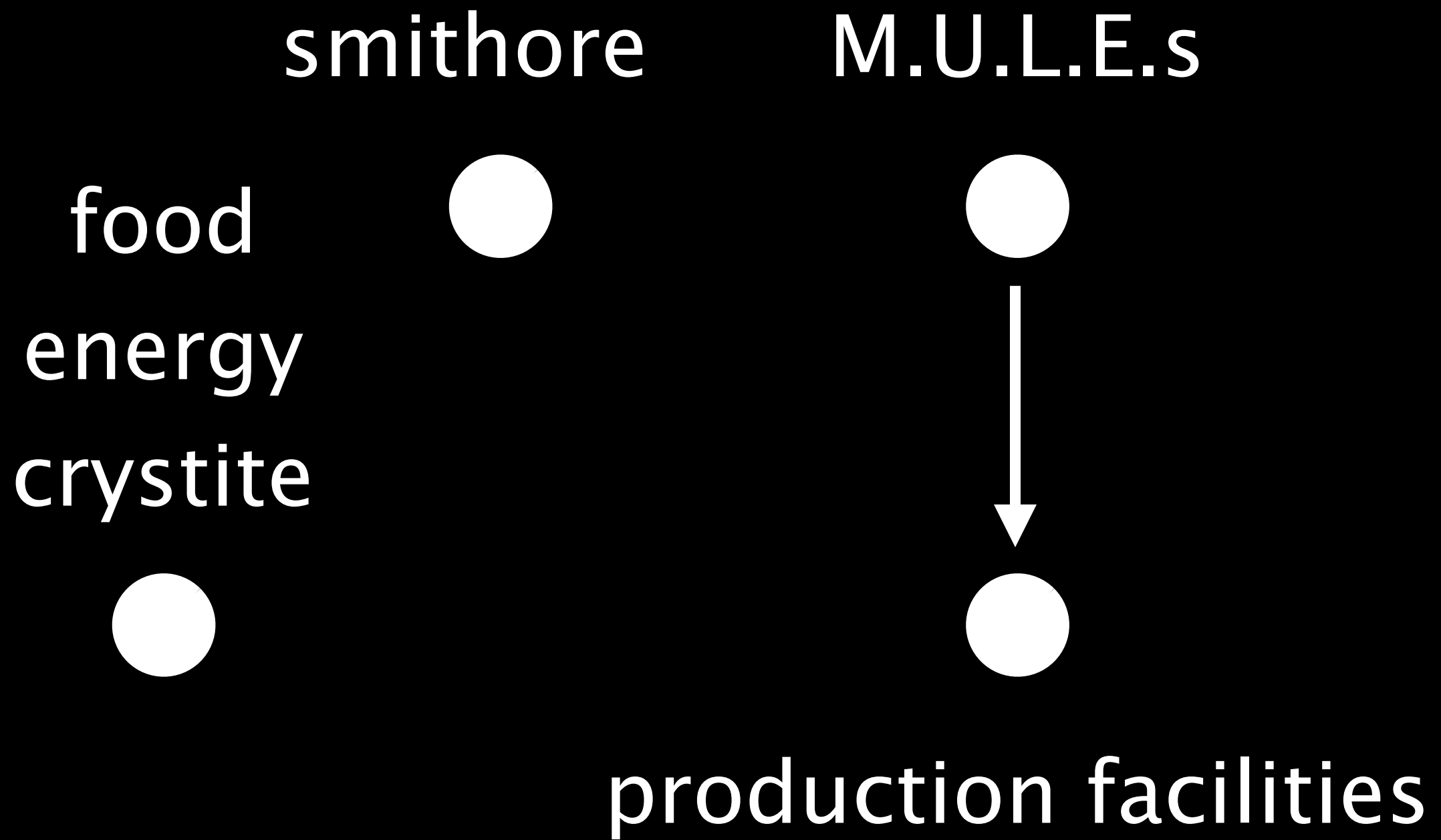
DEVELOPMENT #1

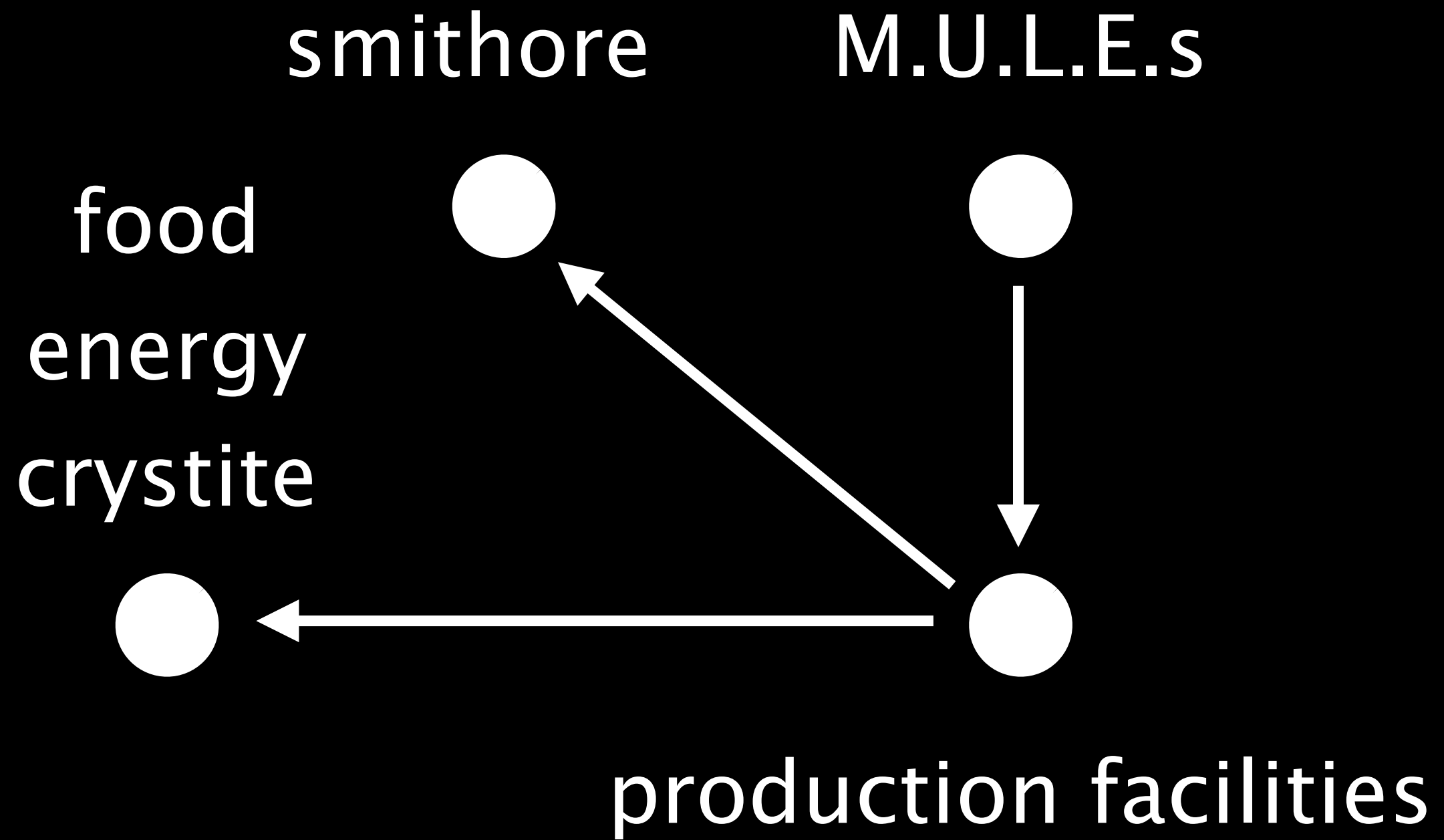


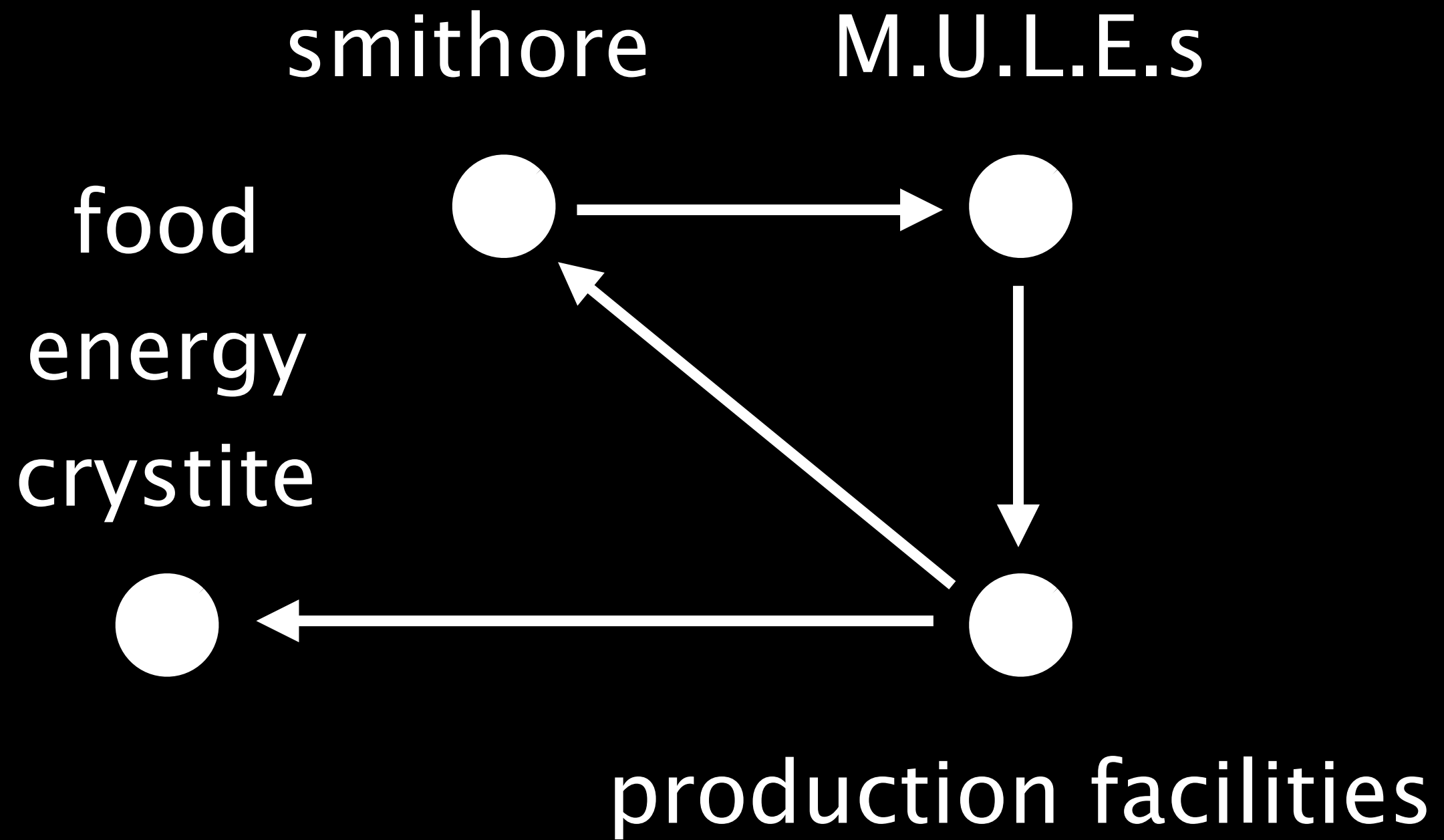
YOUR MONEY EQUALS \$1550
\$25 TO OUTFIT
MULE FOR FOOD

PRODUCTION #1











STATUS #1
SMITHORE



SELL SELL



PUSH STICK
TO DECLARE AS
BUYER OR SELLER



50



BUY
950
0

933
6

1056
4



BUY
1700
0

MONEY
UNITS

MONEY
UNITS

STORE HAS NO UNITS

part II

design example:
grow21

“Do not make the player feel smart. Make the player smart.”

– Jonathan Blow

“Do not make the player feel smart. Make the player smart.”

– Jonathan Blow

Make the player and the designer smart(er)

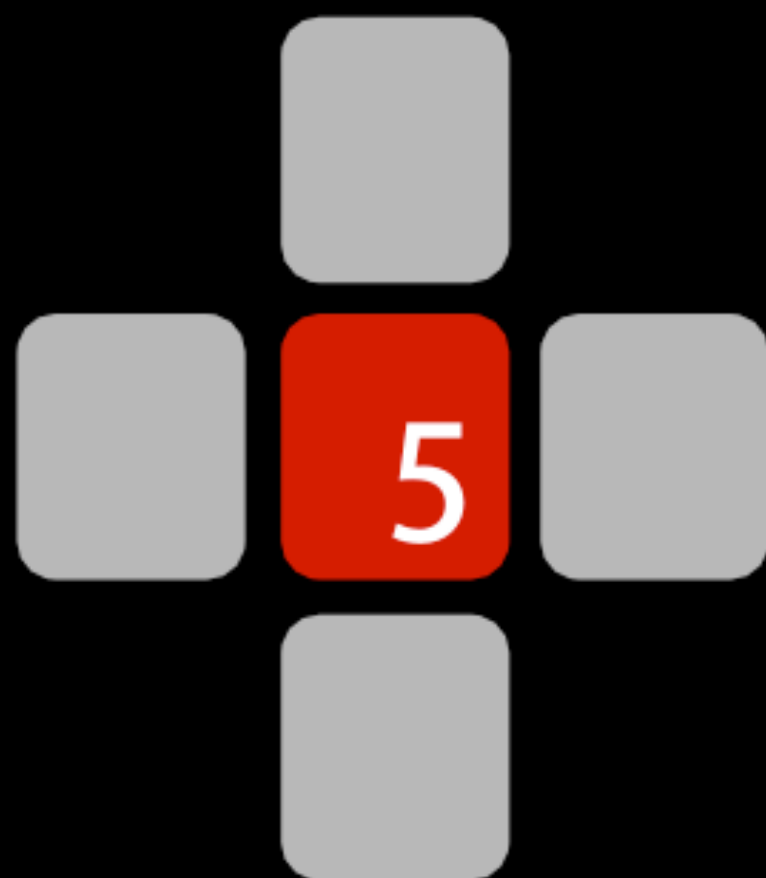
“Do not make the player feel smart. Make the player smart.”

– Jonathan Blow

Make everyone smart(er)

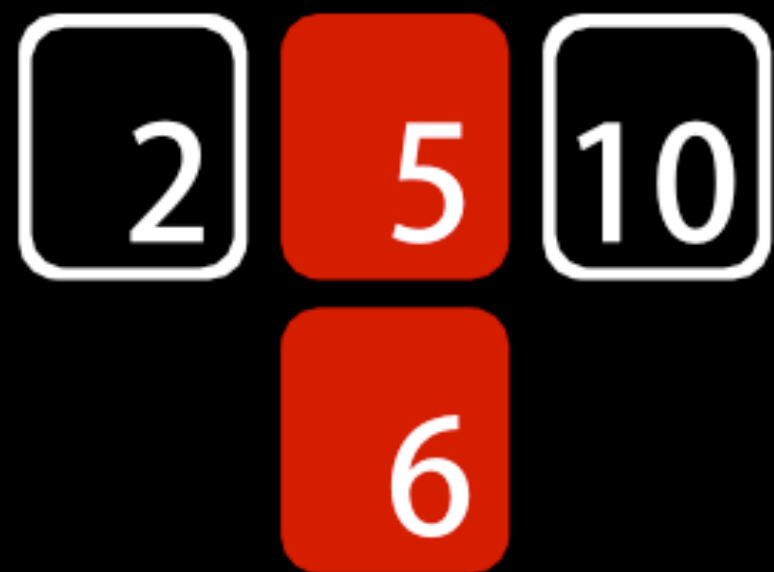
grow21





2 5







2

10

10



constraints

1

knowledge in the world

2

spatial, no board required

3

one simple mechanic, few choices

constraints

4

readable

5

compact

6

deep

solutions

knowledge in the world

two player card game, symmetric

spatial, no board required

adjacent card placement

one simple mechanic, few choices

draw one card, build stable groups

solutions

readable

all cards are hidden, no hand

compact

single connected component

deep

set packing is NP complete

“I mean, I’m pretty sure I saw the pattern of the universe laid out in front of me last night.”

– Sarah Elmaleh (twitter)

procedural generation

simplification

coupling



Chris Hecker @checker

30 Nov

Ratatouille looks great playing in VLC, which supports single-frame step. Except, if you do it, it renders all wrong. I hate computers.



Andy Nealen @nealen

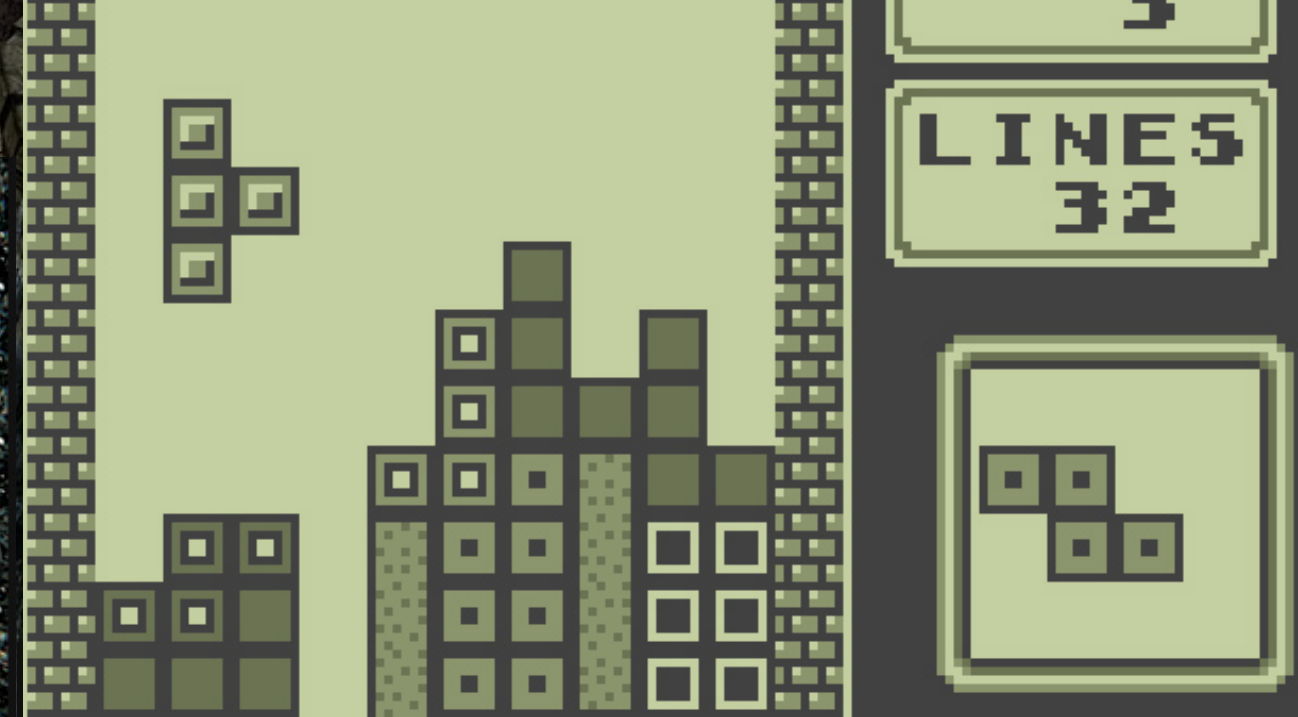
@checker can't wait for your first board game!

↩ Hide conversation



Chris Hecker @checker

@nealen if humans could just evaluate more rules per second, I'd be all over it





takeaways

designers can influence and direct
perceived complexity

but each version is a **different game**

takeaways

use generative procedures and
leverage texture similarity

simplify and reduce DOF

think of adding links, not entities

“the idea becomes the
machine that creates the
form.”

– sol lewitt

thanks

for your attention

to my collaborators

eddy boxerman. adam saltsman. rupert helbig.
dave burke. kun chang. aaron barsky.

@nealen