

Entangled.

A game based on: Quantum 3, 128 (2019). A Game of Surface Codes: Large-Scale Quantum Computing with Lattice Surgery

Entangled

The Game of Quantum Surface Code
Democratizing Quantum Programming

Entangled

The Game of Quantum Surface Code

Timesteps ▶ 0

OPERATIONS

- Rotate Patch 3 steps
- Extend Patch 1 step
- Shrink Patch 1 step
- Merge Patches

Edge Types

- Smooth**
Blue solid edges can only merge with other smooth edges
- Rough**
Red dashed edges can only merge with other rough edges

Patch States

- Normal
- Selected
- Measuring

The Game of Surface Code

Meet The Team

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Democratizing Surface Code

Democratizing Quantum Computing

The inaccessibility of quantum computing and error correction ultimately lies within its language and abstract visualizations.

How can we introduce these complex concepts to a wider audience? To new demographics to make it more inclusive while expanding the interest in quantum computing and Surface Code?

Our solution: To create an interactive game to help people visualize Surface Code.

Purpose

The Game of Surface Code teaches you how to manipulate multiple qubits to create logical qubits: robust, complex quantum units.

Your goal is to perform quantum operations by manipulating patches in time and space.

This game places these complex functions and deduces it into into a logic based game to help assist in players understand complex problems we are facing in surface code.

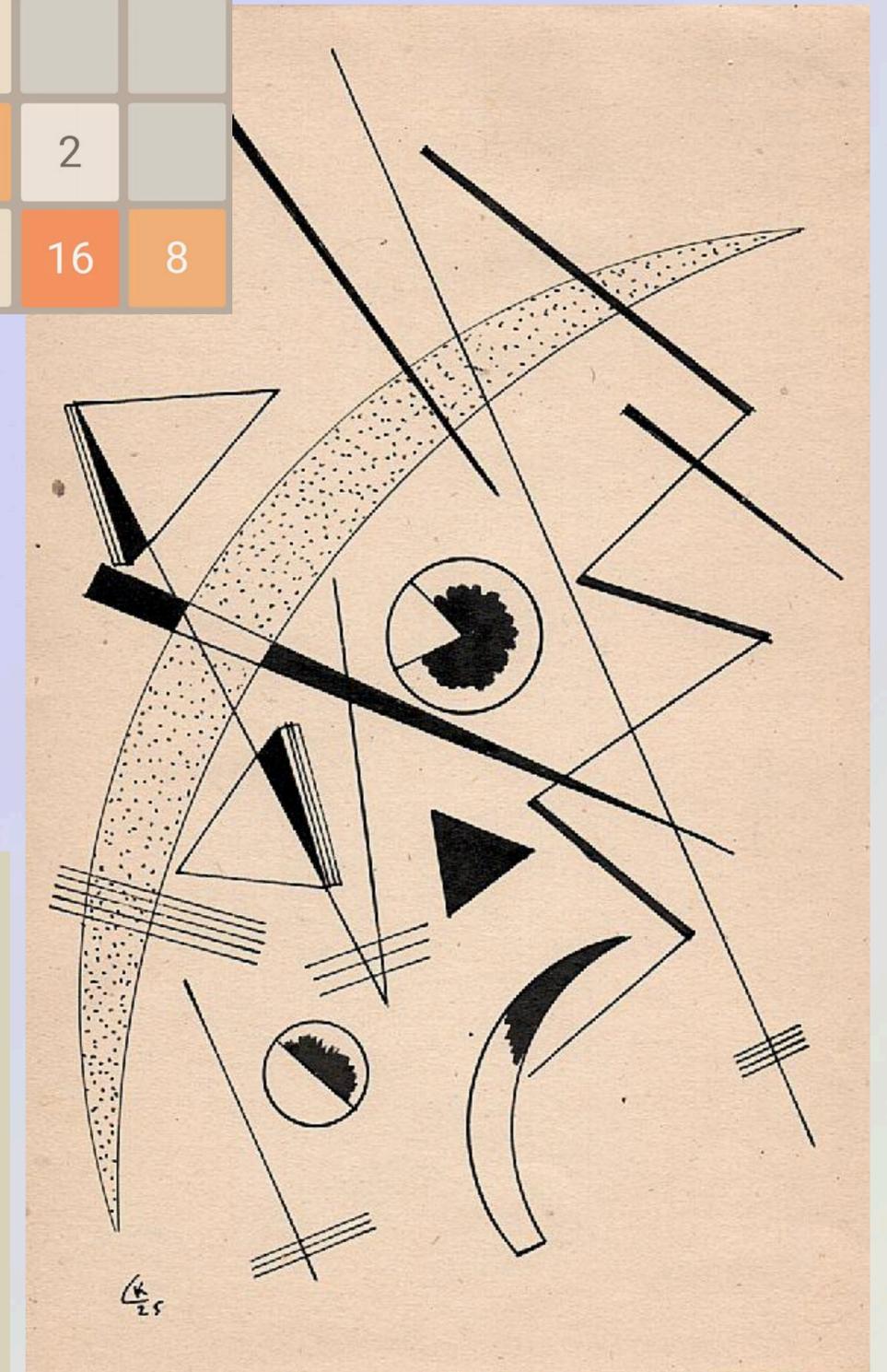
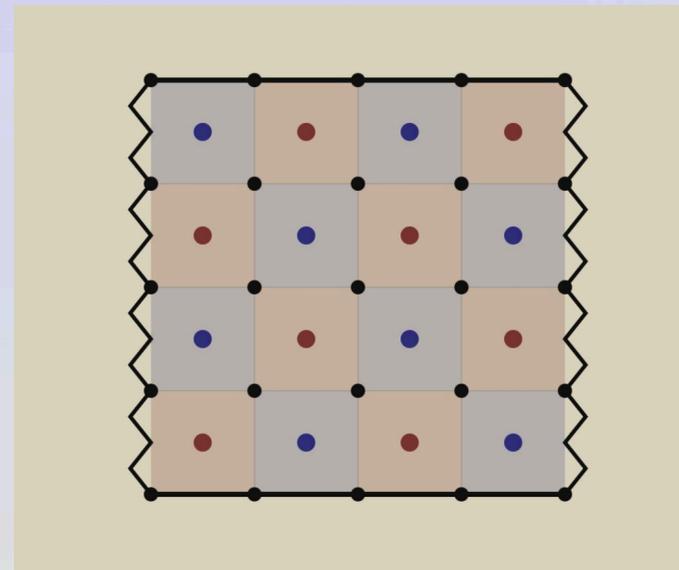
Visual Influences

Retention is crucial.

Games like 2048 have placed players in the position for a satisfying experience which increased public understanding of exponentials.

Entangled can do the same.

| | | | |
|----|---|----|---|
| 2 | | | |
| 32 | 4 | | |
| 4 | 8 | 2 | |
| 16 | 4 | 16 | 8 |



Kandinsky, 'Pen and Ink Drawing'

01

INITIALIZATING

You can place a patch of 1 or 2 qubits on the board in a known "basis state" to be used. This costs 0 time steps.

02

PATCH DEFORMATION

You can stretch (1 time step), shrink (0 time steps), or reshape (1 time step) a qubit tile to reposition which of its edges are accessible for future operations.

03

MEASUREMENT

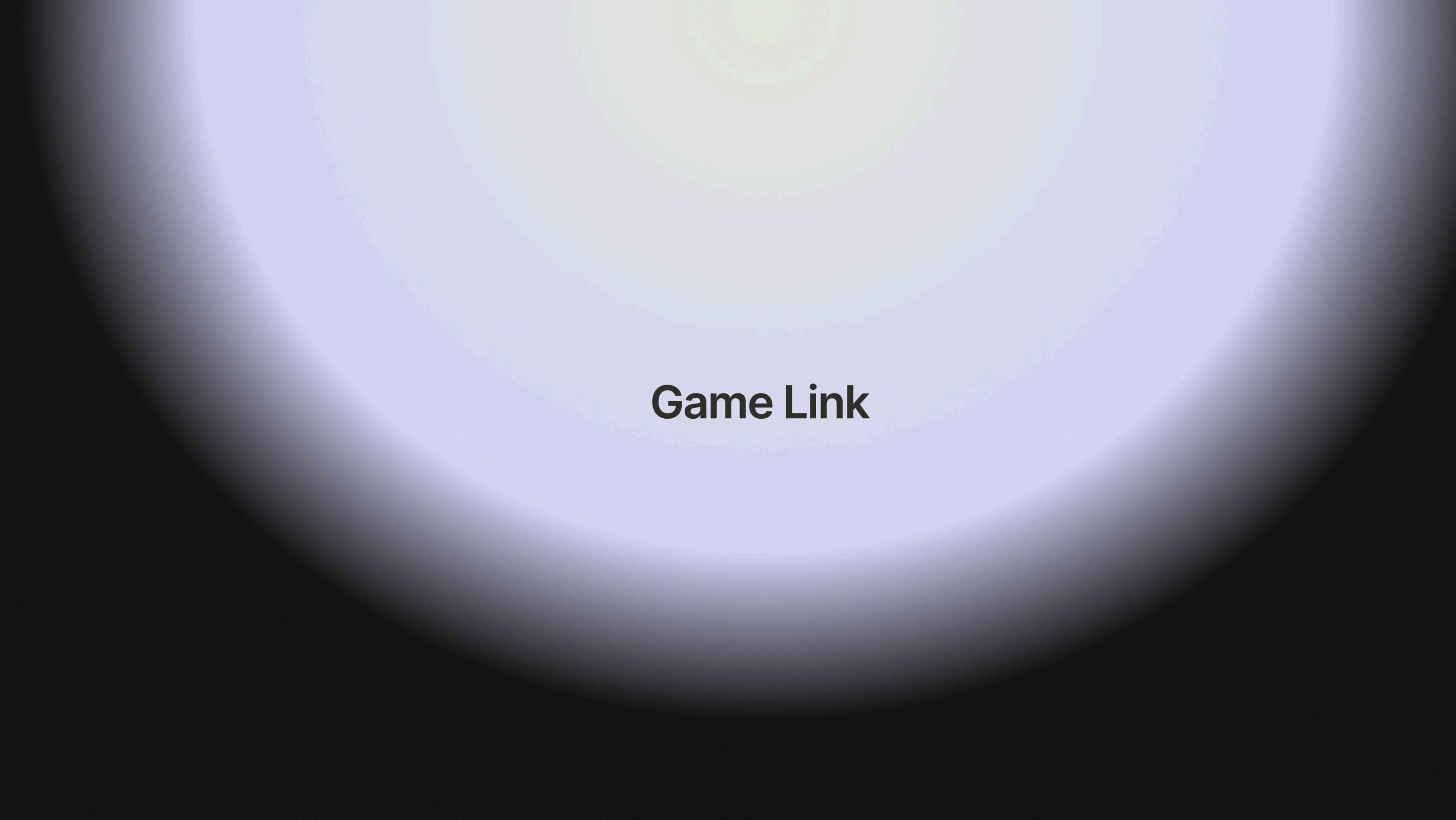
You can measure a single patch of qubits (0 time steps) or adjacent patches (1 time step) in a known basis. Measurement "deletes" these qubits and frees up space.

04

RULE OF EDGES

Two adjacent qubits can only be measured together if their adjacent edges are of the same type. If not, then one of them must first be rotated, costing 3 time steps.

Rules

A large, glowing blue sphere with a bright yellow-green center, set against a dark background. The sphere has a soft, ethereal glow and a subtle gradient from the center to the edges. The text "Game Link" is centered on the sphere.

Game Link

Thank you!