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UNIVERSITÀ DI ROMA

gamificationlab
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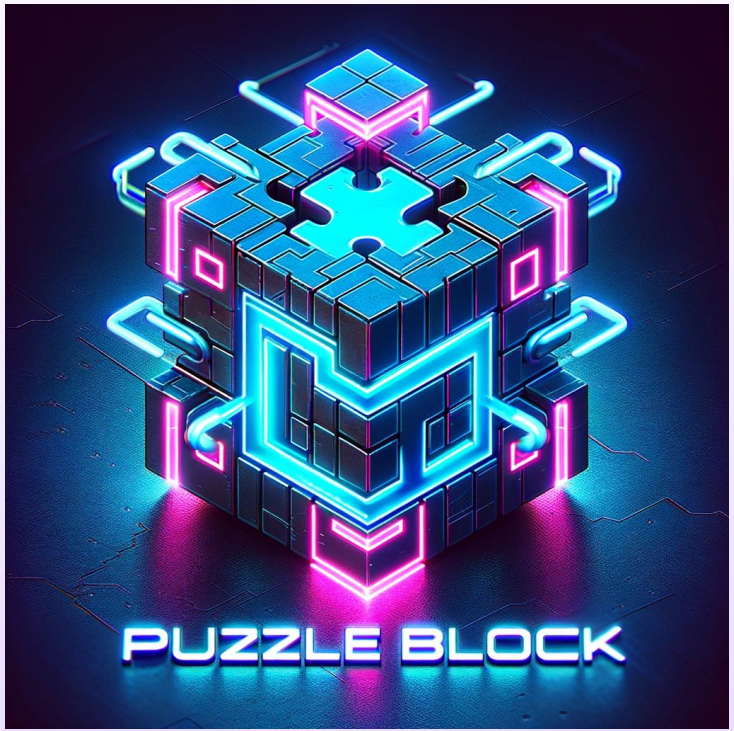
PuzzleBlock

What if Blockchain was a game itself?



What is Blockchain and how does it work?

Blockchain is a distributed digital ledger that allows transactions to be recorded in a secure, permanent and easily verifiable manner, providing efficiency and transparency.

Decentralization: relies on a distributed network of computers to maintain and verify transactions.

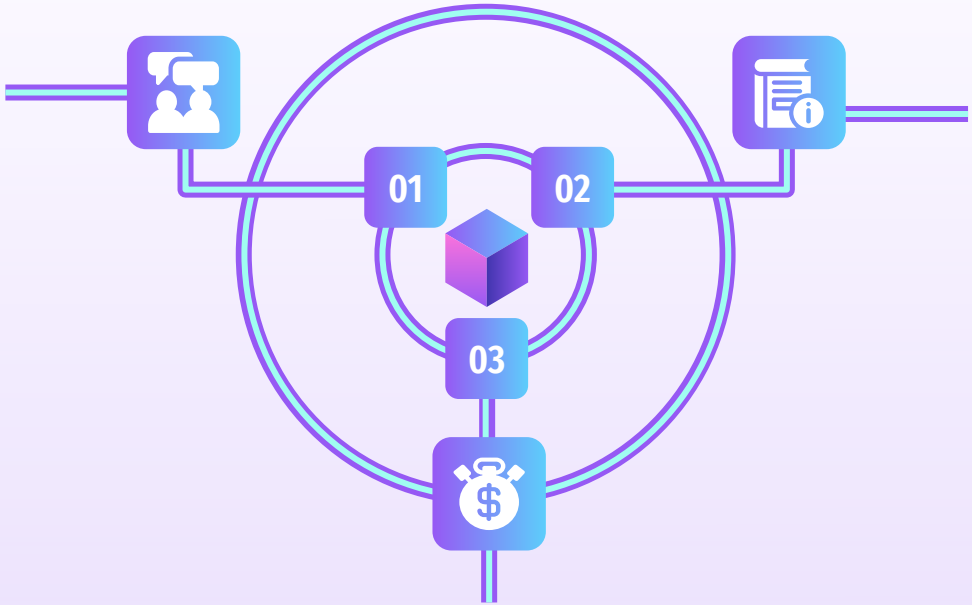
Security and Transparency: each transaction is encrypted and added to a "block," which is then linked to previous blocks, forming a chain.

Immutability: once recorded, the information in a block cannot be retroactively altered, ensuring data integrity.

Goals of PuzzleBlock

Social

Create an environment where players can compete with the ability to purchase assets within the game and among users



Edutainment e Gamification

Use the game to teach players fundamental concepts of blockchain and cryptocurrency in a fun and engaging way

Tokenomics

Reward systems and leaderboards to keep players stimulated and motivated

Target

Young people between **20** and **30 years old**, as the topic aligns well with issues a young person in that age group might encounter in the technology or education sector.

As an emerging concept in recent years, it offers multiple opportunities and is widely used but rarely taught.

Gamification

Theme game levels

Each level addresses and explains a fundamental technical aspect of Blockchain operation, such as Proof of Work, Transactions, and Consent.

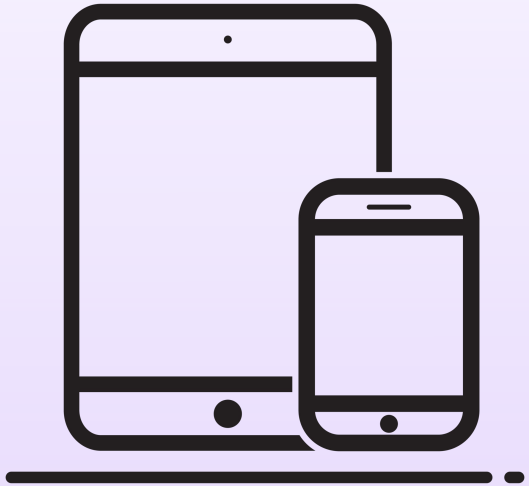
Global ranking with rewards

To stimulate users to compete and to conceptually simulate Proof of Work.

Blockchain user's guide

The user will be immersed in a reality representative of the blockchain.

Device



The game was developed specifically for mobile devices, as this medium is adapted to the habits of the target audience.

In addition, the game dynamics are particularly suited to typical touchscreen interactions, such as tap and drag.

Application Flow

The player can decide whether to return to Home at the end of each level. In this case, the run will continue from the current level.

Levels

The player starts at level 1 and can unlock other levels and earn tokens.

Next levels...

Home

The user has an overview of all accessible features.

Start

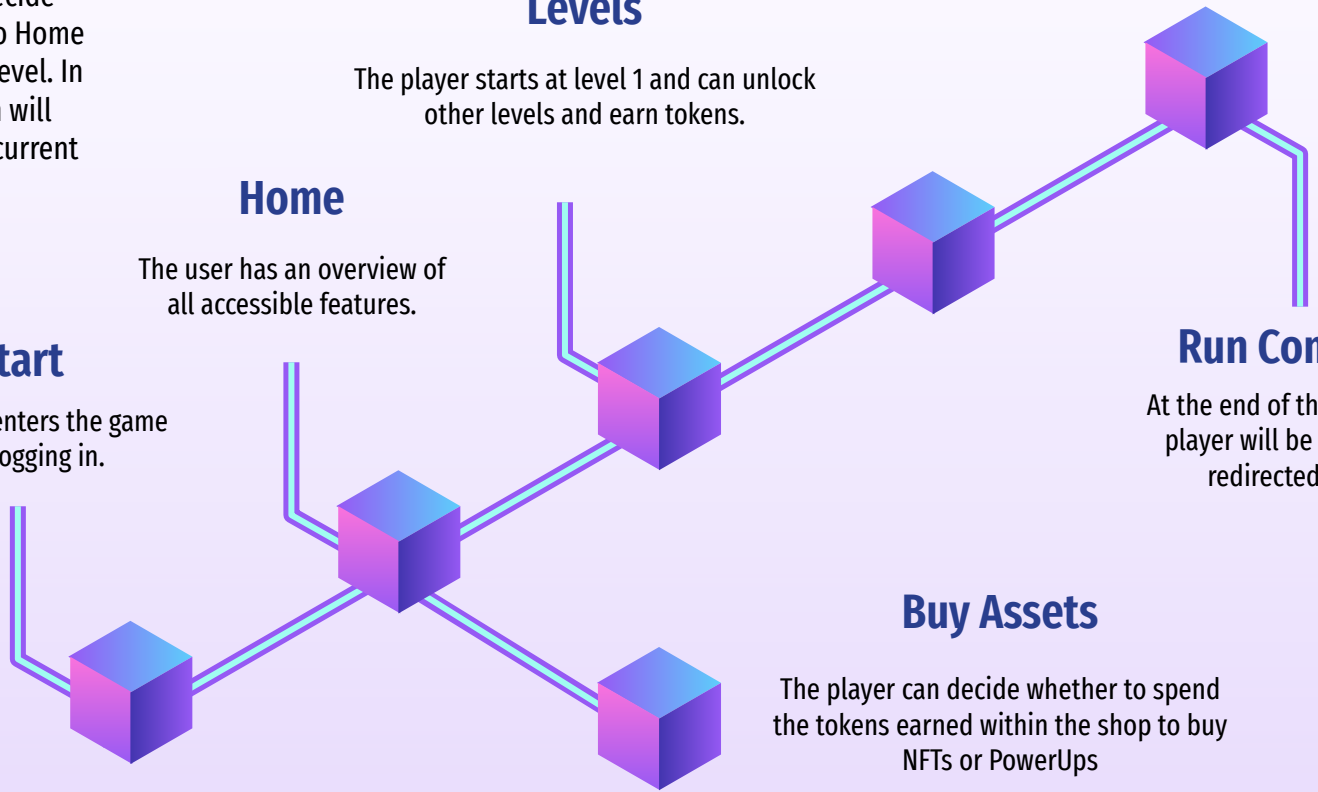
The player enters the game after logging in.

Run Completed

At the end of the last level, the player will be automatically redirected to Home.

Buy Assets

The player can decide whether to spend the tokens earned within the shop to buy NFTs or PowerUps



Reward System

At the end of each level and in the event of a win, the player will be rewarded with an amount of tokens equal to the sum of the remaining tokens obtained up to that level and the product of the score by a multiplier.

The current level's reward is credited to a secondary balance.
After completing a level, the player can choose whether to move on to the next level or to credit the accumulated reward into the primary balance, thus emptying the secondary balance.

R1 = S1 × M1
where:
- R1 = 1° Level reward
- S1 = 1° Level score
- M1 = 1° Level score multiplier

R2 = R1 + (S2 × M2)
where:
- R2 = 2° Level reward
- S2 = 2° Level score
- M2 = 2° Level score multiplier

Rf = Rf-1 + (Sf × Mf)
where:
- Rf = Final level reward
- Sf = Final level score
- Rf-1 = Previous level reward
- Mf = Final level score multiplier

Temporary Balance

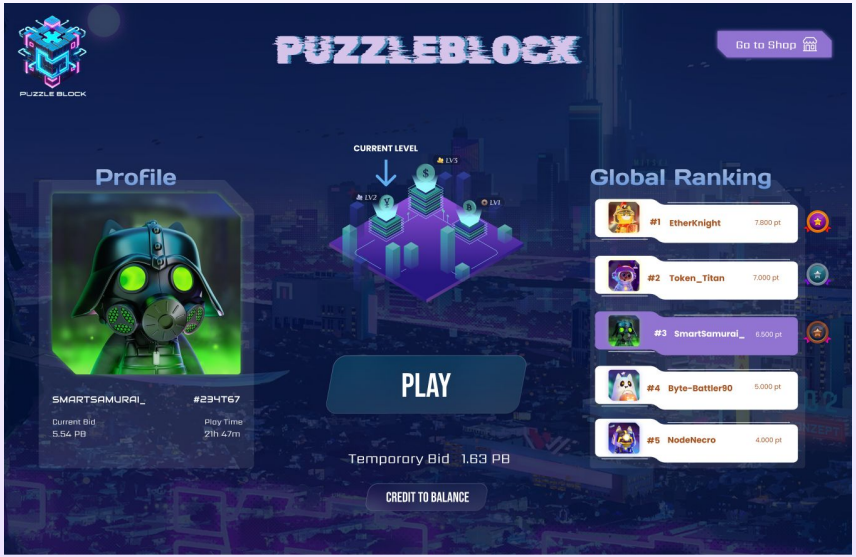
Primary Balance

Each level has a different score multiplier characterized by an increasing trend.

When a game over occurs, the secondary balance empties.
After crediting the final reward to the primary balance, the secondary balance empties.
At the end of a run, the secondary balance is automatically credited to the primary balance.

GUI and Style

Login



Home

Setting and aesthetics

The chosen setting is characterized by a cyberpunk and futuristic aesthetic. It pairs very well with the mystery of the mechanisms behind the Blockchain, yet it is not tied to the game mechanics.

Market Analysis

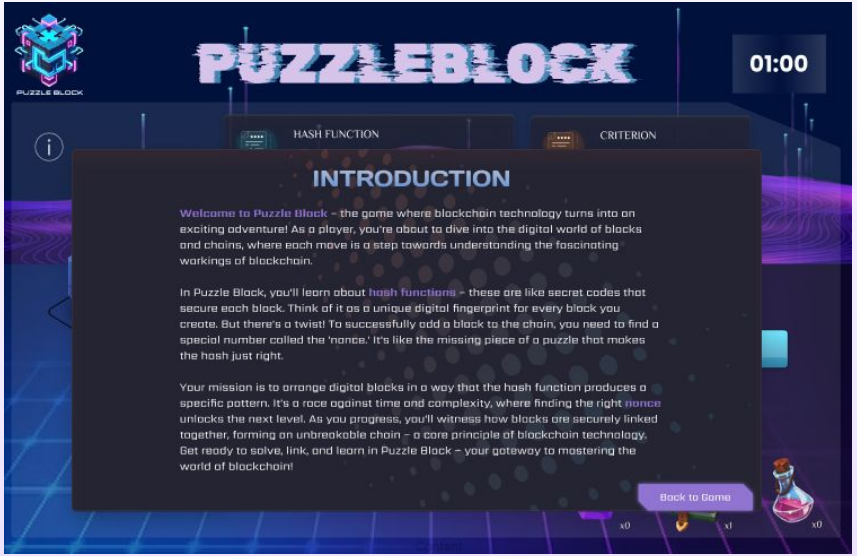
Currently there are no games on the market that deal with blockchain as the main topic at the educational level through a structure similar to PuzzleBlock, however, there are numerous games (even quite famous ones) that are developed on blockchain with different genres and objectives:

Gameplay

The player will face a number of puzzles and riddles that he or she must solve within a time limit.

Each level is preceded by a description of the component of the blockchain that the user can access at any time during the level, at the cost of time.
This description is useful in understanding the rules of the layer.

Each layer represents a key component of the blockchain.



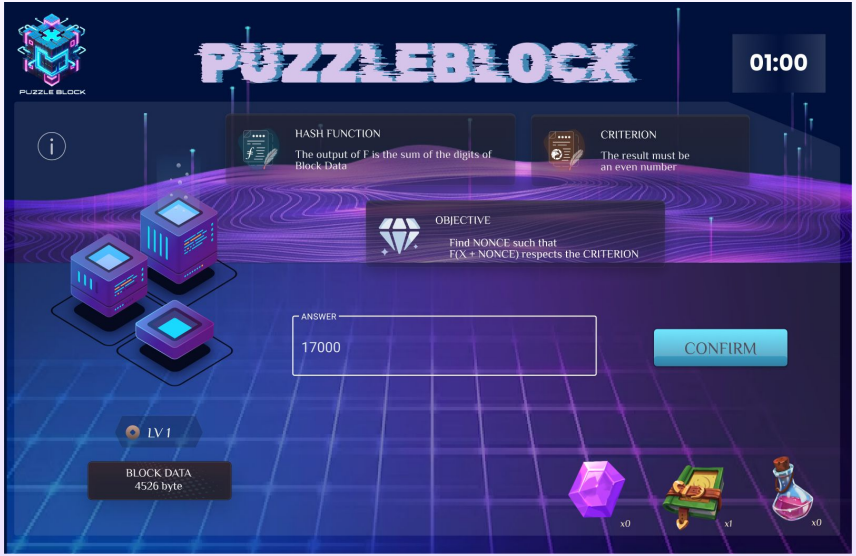
Game Mechanics

A diversified objective is found in each level.

The difficulty of the game is variable and proportional to the players' average winnings over time.

For example, as the average value increases, so does the difficulty: you will have less time to play.

The stopwatch is present to stimulate players to take as little time as possible, and running out of time or wrong answers causes game over and the respective loss of tokens accumulated within the run.



Tools: Power-Up

Between levels, the player can choose whether to spend the tokens obtained in the current run to purchase power-ups.
These power-ups can be used to act on the stopwatch, the puzzle, or the point multiplier.

The amount that can be purchased is limited to 3 for each type of power-up. At the end of a run, unused power-ups are saved for the next run.

Time Amethyst

When activated, the Time Amethyst stops the flow of time around the player, allowing an extra 10 seconds to react.

Hints Grimoire

When used, the Grimoire of Clues reveals subtle hints and tips that help solve puzzles that seem insurmountable.
Its effect varies with level.

Potion x5

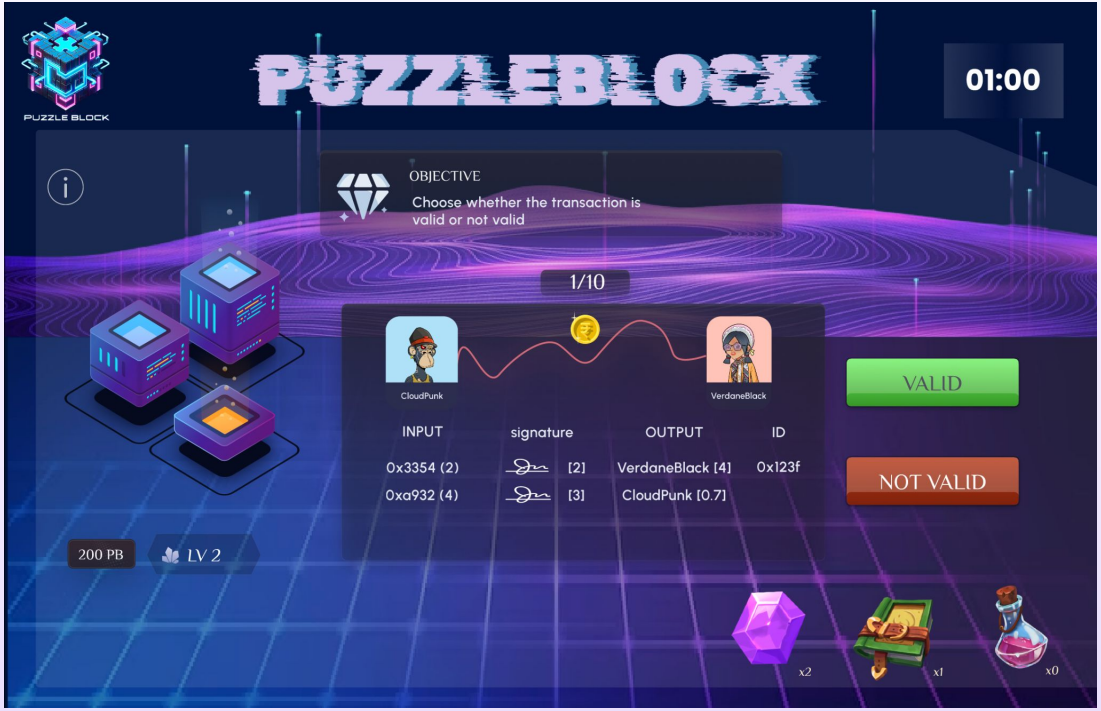
When consumed, Potion X5 multiplies the current score by five for a limited time. In case of gameover its effect does not apply, so be careful not to waste it!

Level Design: Level 1

- **Theme:** Proof of Work
- **Components:**
  - Criterion
  - Hash function
  - Timer
  - Power-Up
- **Objective:** The player must find a value named "Nonce" such that, when added to the "Byte" value and given as input to the hashing function, it meets a given criterion.
- **Actions:**
  - Entry of a numerical value.
  - Choice by tapping the "Confirm" button to confirm the "Nonce" entered previously.
- **Game Over:**
  - Timer exhausted
  - After confirming, the "Nonce" does not meet the criterion.
- **Grimoire's effect:** The solving procedure for the entered "Nonce" is shown. This allows the player to visually verify the correctness of the criterion before confirming.

Level Design: Level 2

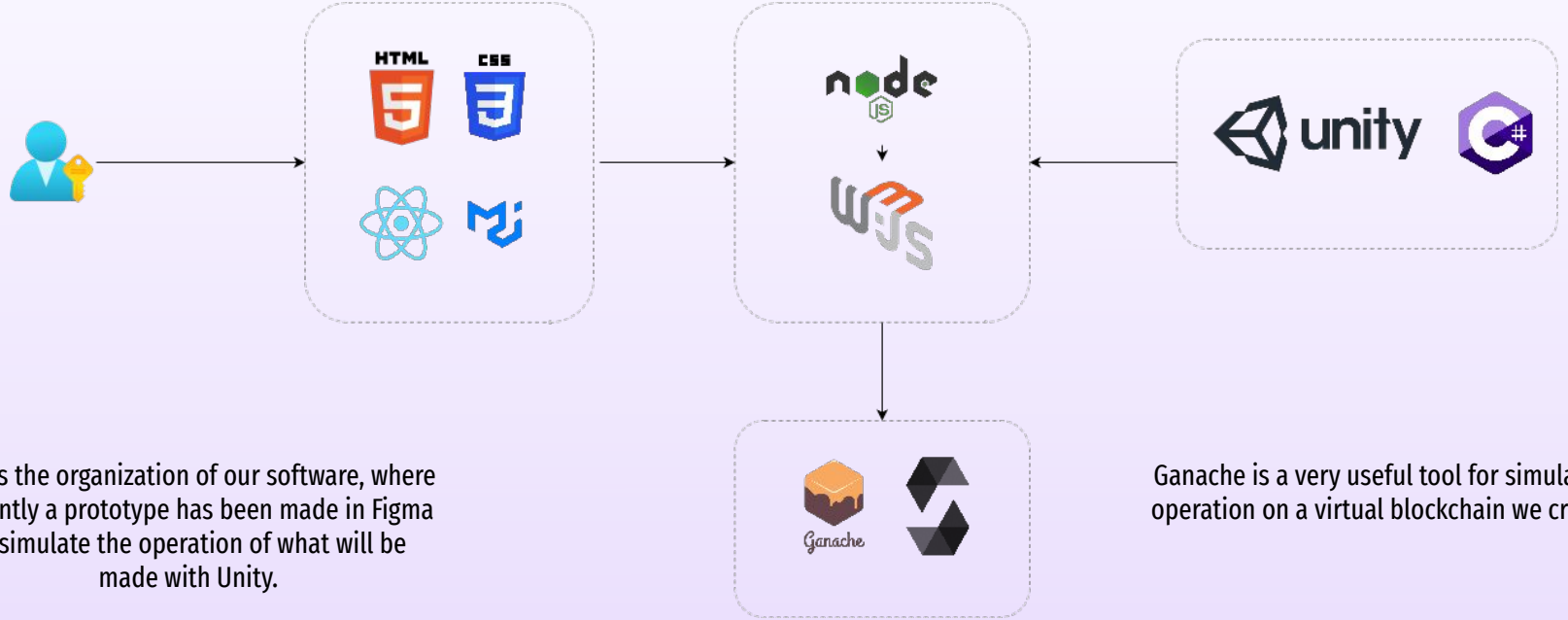
- **Theme**:
  - Transactions and Double Spending
  - The player impersonates a miner who must validate a transaction
- **Components**:
  - Input Coin
  - Output Coin
  - Signature
  - Id
  - Timer
  - Power-Up
- **Objective**: The player must validate 10 transactions between two users of the blockchain. To do this, he must verify the correctness and consistency of all components of the transaction
- **Actions**: Choice via tap to make the transaction valid or invalid via the respective buttons.
- **Game Over**:
  - Timer exhausted
  - Any of the 10 transactions, if invalid, is validated and vice versa
- **Grimoire's effect**: Any error in the current transaction is highlighted



Level Design: Level 3

- **Theme:** Branching and Consensus
- **Components:**
  - Blocks to be inserted
  - Blocks already inserted, not movable
  - Blockchain tree
  - "Attestations", relevance of a block
  - Timer
  - Power-Up
- **Objective:** The player must arrange all the blocks so that they follow the path in yellow. The criterion by which the tree is traversed is: starting from the root, the block with greater "Attestations" is chosen
- **Actions:**
  - Dragging and dropping blocks to the free slots in the tree
  - Choosing by tapping the "Confirm" button to confirm the arrangement of the inserted blocks
- **Game Over:**
  - Timer exhausted
  - Wrong path or not all slots are occupied by blocks
- **Grimoire's effect:** A block is inserted correctly

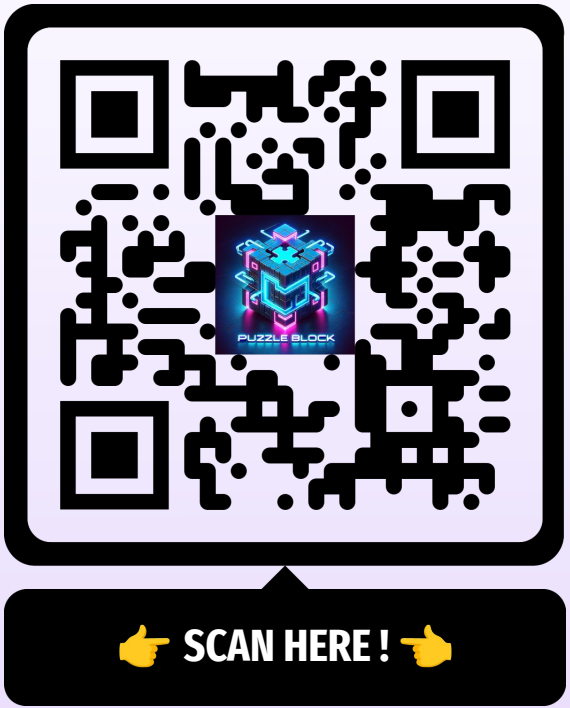
Software Design



This is the organization of our software, where currently a prototype has been made in Figma to simulate the operation of what will be made with Unity.

Ganache is a very useful tool for simulating operation on a virtual blockchain we create.

Live Mockup (Figma)



Are you ready to immerse yourself in a unique and immersive gaming experience? Do you want to be among the first to explore our fantasy world and put your skills to the test? Your adventure begins here and now!

Enter the World of PuzzleBlock, too!