

Celeste

NP

(Given a level), We can create a witness, that is the path leading from the start to the end.

The first level of the game as an example:



## NP-complete

→ Reducing from 3SAT

Level has sequence of frames which are connected through tunnels.

Types of frames :

- Frame for variable
- Frame for clause
- Connecting frames

### Tools/Items



recharge



launcher



spring



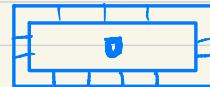
space



monsters



Door lock



Token door



platform



Moving block



Unstable platform



Button door

[more not included]

# Frames

## Variable frame

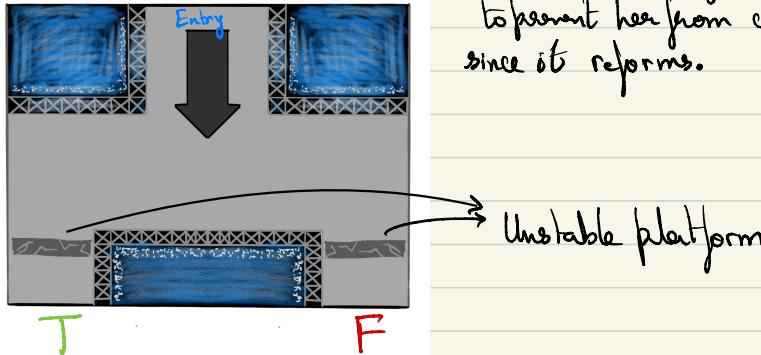
- It has an entry point which will be connected to a tunnel
- 2 1 way exits (maps) which represent the value set for the variable. (1 & 0).

Tools used → Unstable platform

Unstable platform → breaks when stood upon. can't be broken from the bottom. making it 1 way.

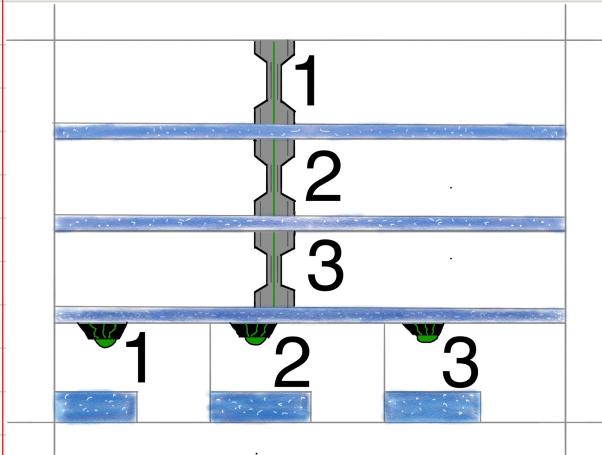
Why unstable platform?

Madeleine has wall grab so we need a map to prevent her from climbing back since it reforms.



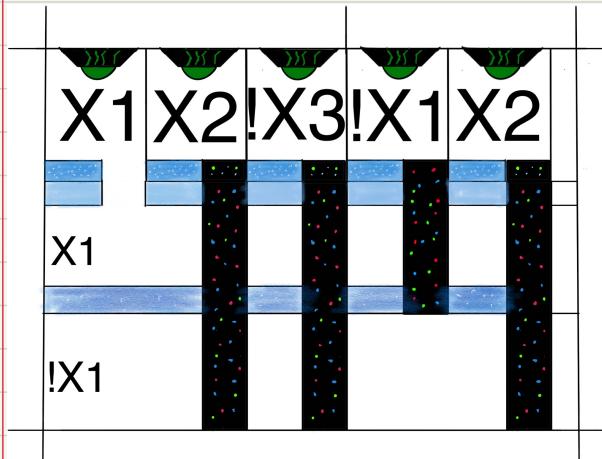
## Clause home

- In total has 3 entries, each representing a variable. Has 3 separate chambers



• Refer full map to understand why opening one of the doors is sufficient.

## Tunnel connection



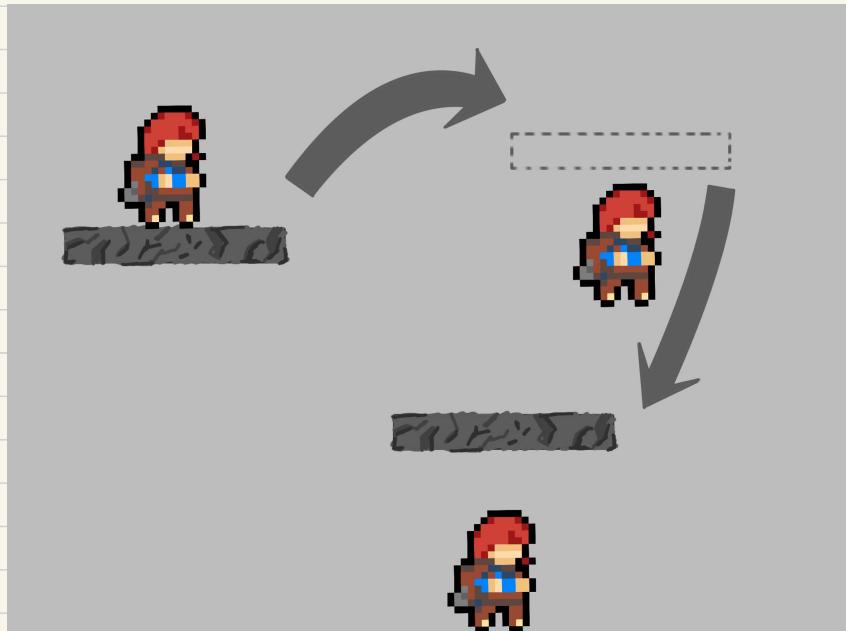
There are paths running below the buttons.

Each path is connected to the variable home exits.

## Creating 1 Way trap

- Madeline has the ability to climb walls [ till a certain extent ], also she has the ability to dash into the air.
- So to prevent the player from backtracking, we need to make traps.
- Unstable platform: It's a stone platform which breaks when stood upon for more than a second.

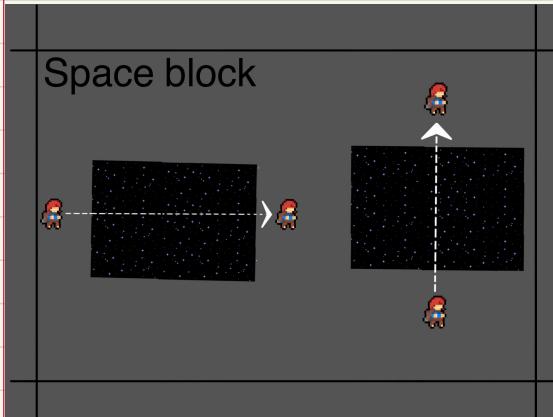
After Madeline falls through the platform reforms - and this platform can not be broken from the bottom.



## Crossing frame

Since Glest is a 2D game, paths from different frames can end up crossing each other.

We need to allow the player to cross the paths without the access of other paths. We use the **space block**.



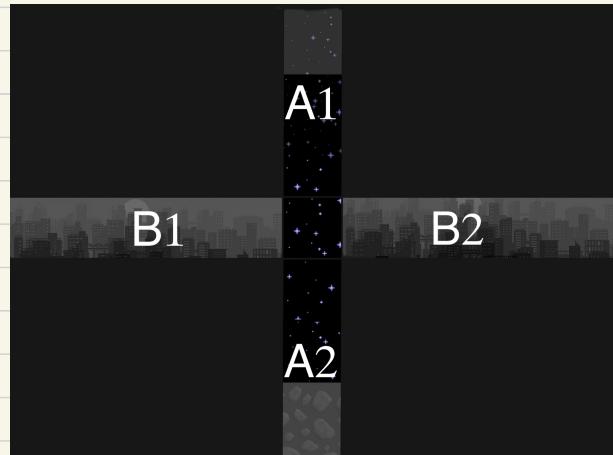
The space block moves Madeline from 1 end to the other in a straight line.

The player has no control when they are getting moved.

If a wall is encountered player dies.

The cross frame allows the player to travel from A1 to A2 or B1 to B2.

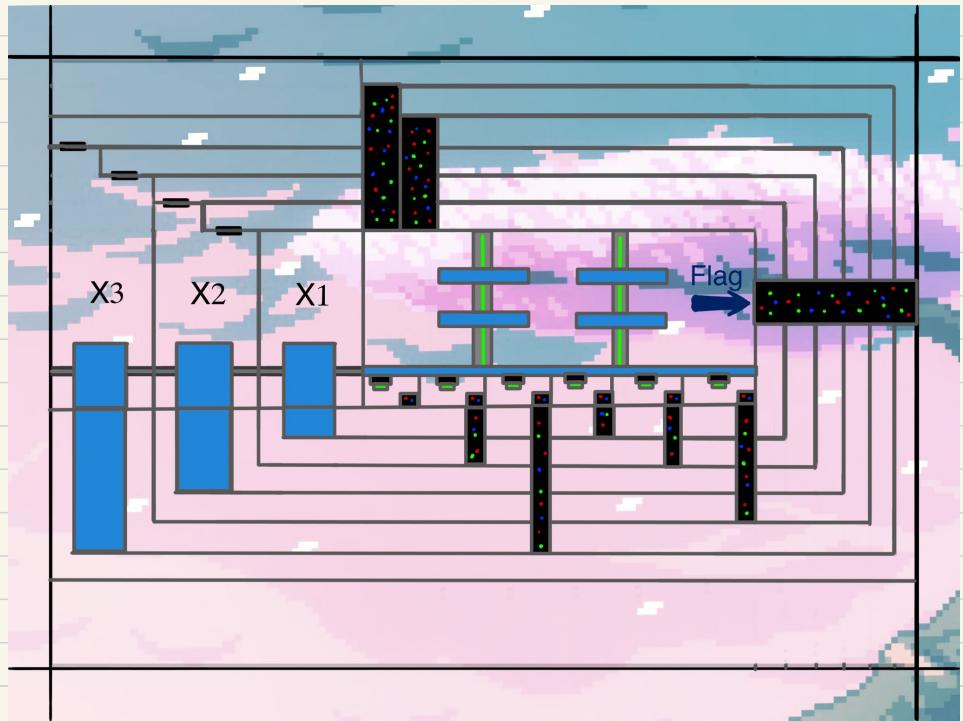
But due to the thickness of the tunnels, player can't access other tunnel.



Sequence of frames

$x_1 \rightarrow \text{tunnel} \rightarrow x_2 \rightarrow \dots \rightarrow \text{tunnel} \rightarrow x_n \rightarrow \text{tunnel} \rightarrow \dots$

& start of the clause frame sequence  $\rightarrow$  End flag



start position :  $x_1$

Winning criterion : Needs to reach the flag.