Super Mario Bros.

Given any Super Mario Bros. stage, is it possible to complete that stage.

$$3SAT \leq_p \text{Super Mario Bros.}$$

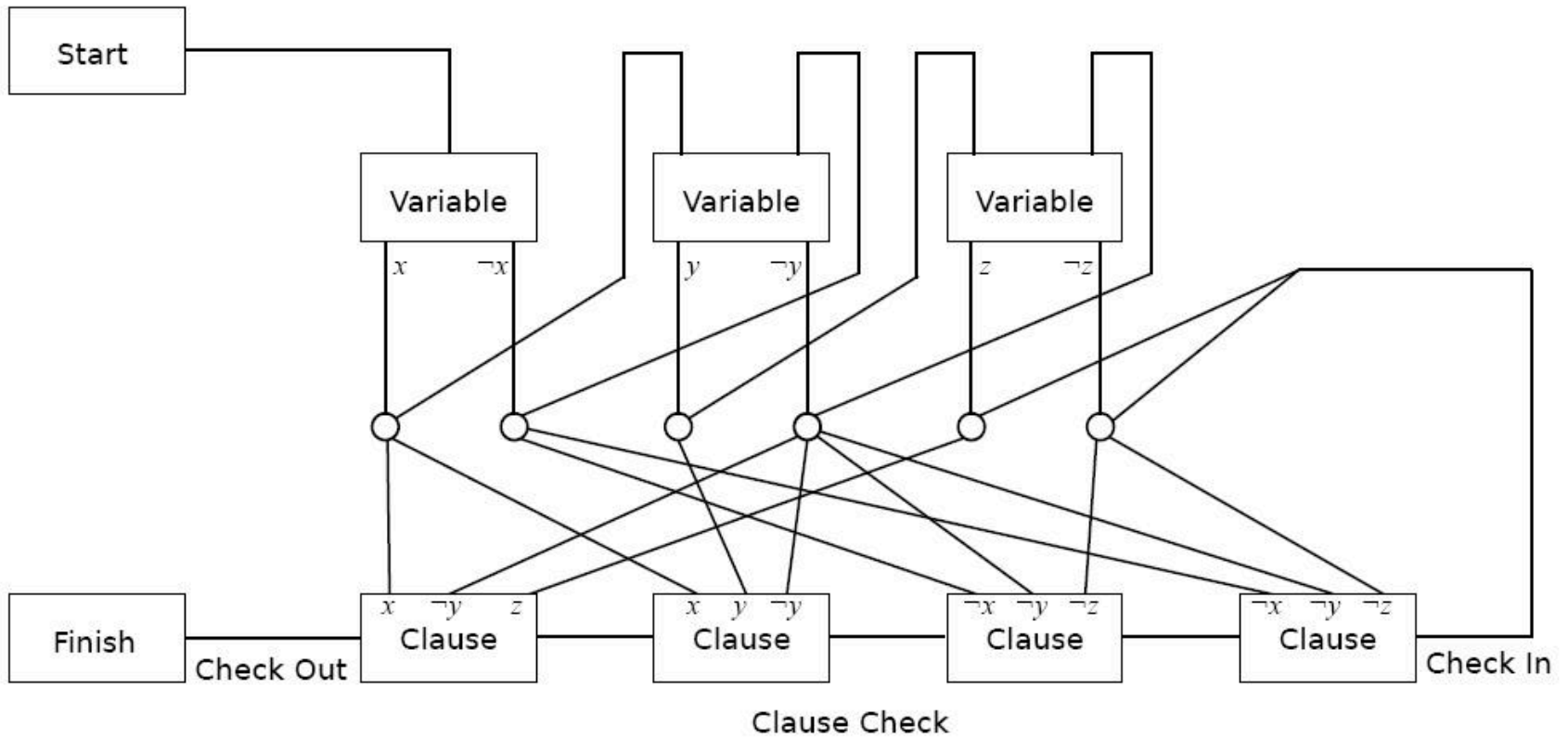A 3CNF boolean formula is in 3SAT iff it has a satisfying assignment.

3CNF Reminder

$$\phi = C_1 \wedge C_2 \wedge ... \wedge C_m$$

$$C_i = (x \vee y \vee z), \text{where}$$

$$x, y, z \in \{x_1, x_2, ..., x_n\} \cap \{\overline{x_1}, \overline{x_2}, .., \overline{x_n}\}$$

We will describe gadgets to represent each clause and variable in φ so that the stage we create will only be possible if φ has a satisfying assignment.

Start

Variable   Variable   Variable
x   ¬x   y   ¬y   z   ¬z

Finish
Check Out
x ¬y z   x y ¬y   ¬x ¬y ¬z   ¬x ¬y ¬z
Clause   Clause   Clause   Clause   Check In

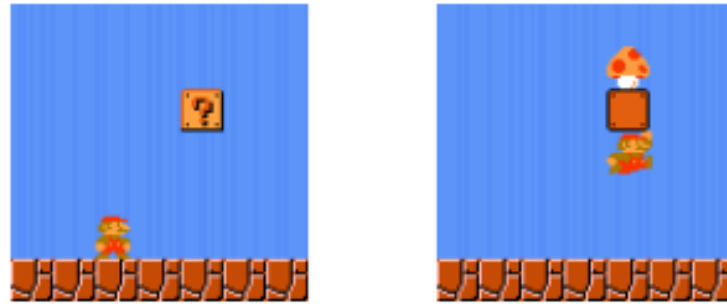Clause Check

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Start and Finish Gadgets

Figure 2: Left: Start gadget for Mario. Right: The item block contains a Super Mushroom
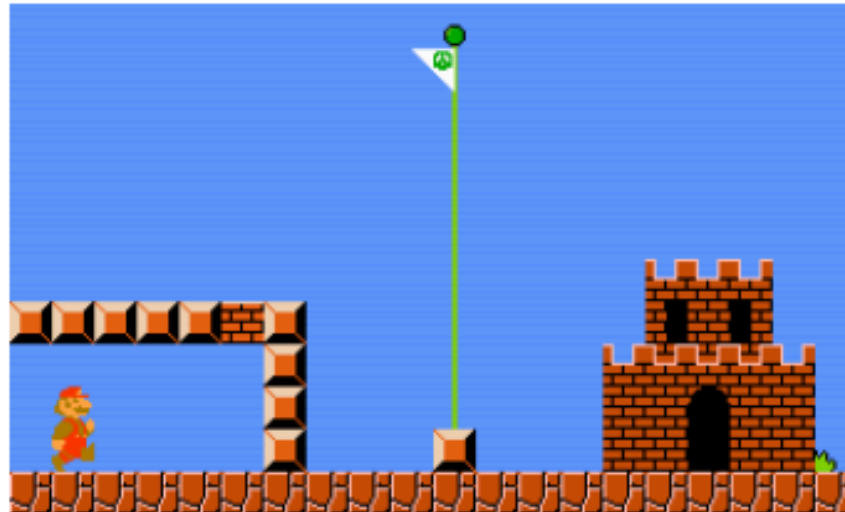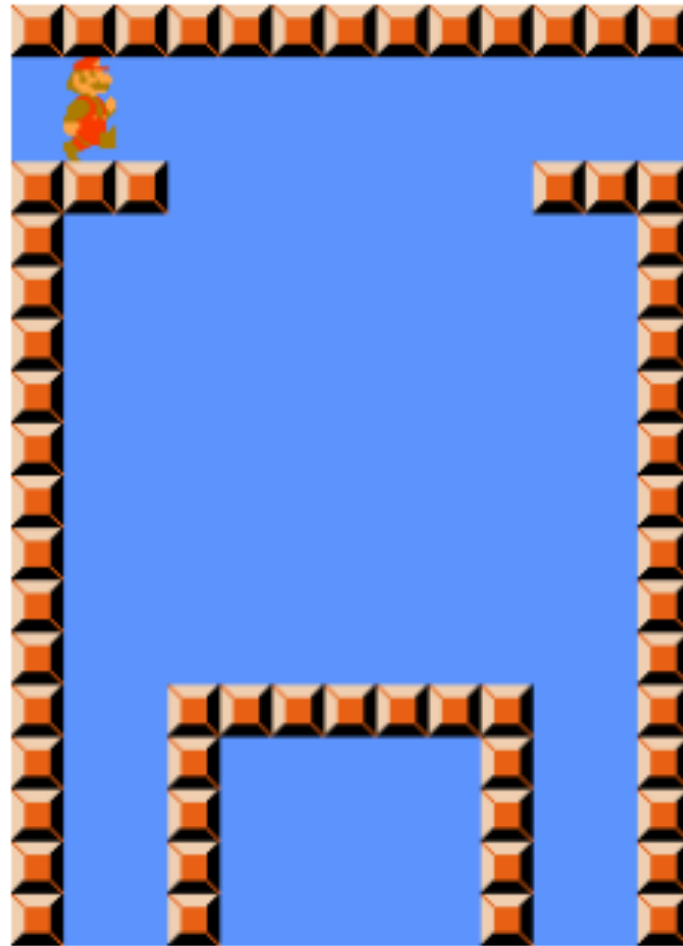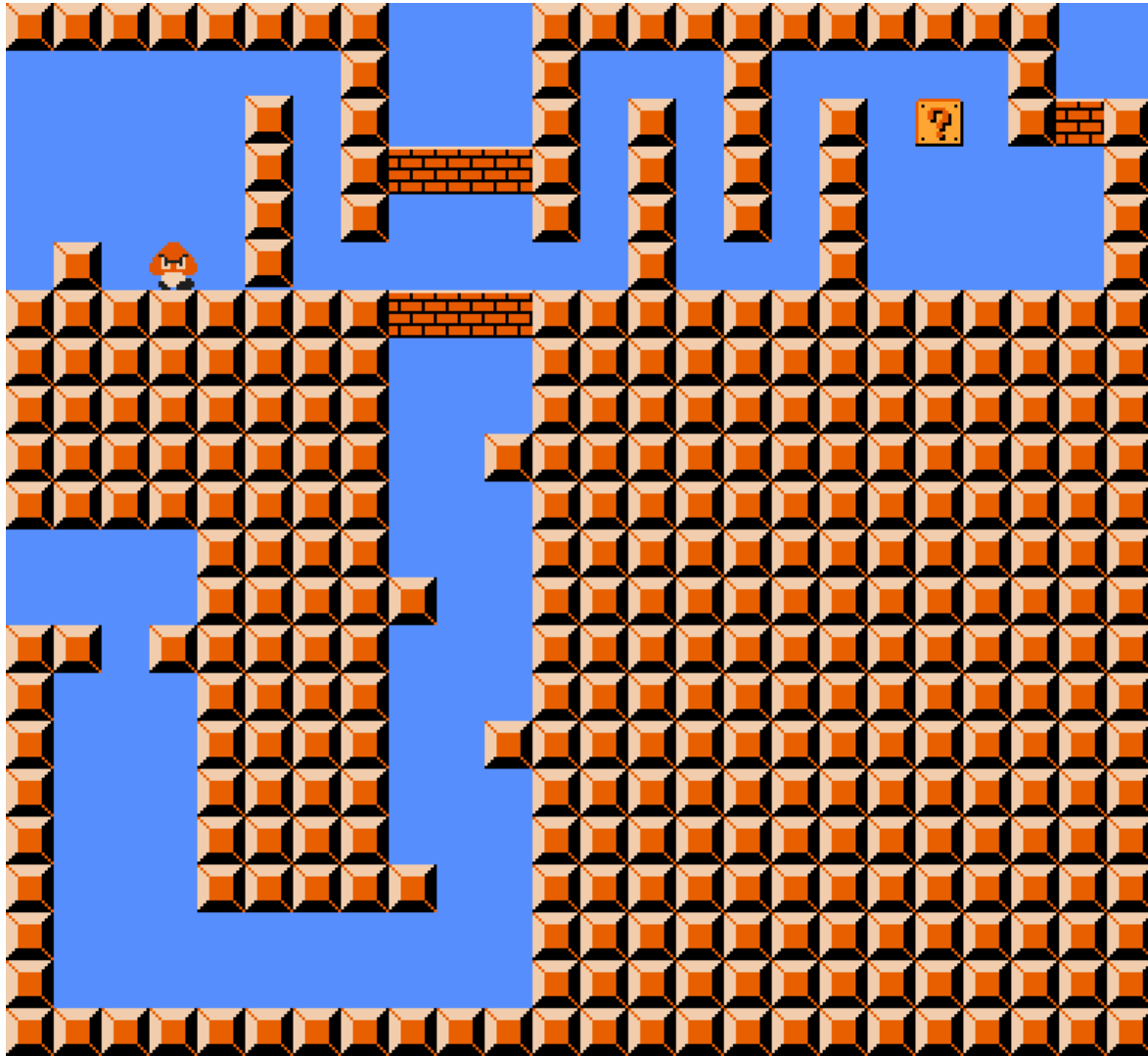

Figure 3: Finish gadget for Mario

Variable Gadget

Crossover gadget

Clause Gadget