

**Clarification:** This document illustrates a way of specify mechanics and dynamics for a game. The example is based on the video game Donkey Kong (TM).

## **2 Mechanics**

### **2.1 *Game elements categories***

The categories of elements in the game are:

#### **Player character**

Description: avatar representation of the game.

General attributes:

- Appearance
- State

General actions:

- Movement actions
- Other actions

#### **Non player character**

Description: These are characters that interact in the game, they are not enemies and they are not controlled by the player.

General Attributes:

- Appearance
- State

General actions: No specific.

#### **Enemy**

Description: These are characters or objects, which in some way try to hinder the player of reaching his goal.

General attributes:

- Appearance
- State

General actions: No specific.

#### **Final enemy**

Description: Character to beat in the game, the villain.

General Attributes:

- Appearance
- State

General Actions: No specific.

#### **Help object**

Description: Objects with which the player can interact but by themselves do not generate any action. When acquired they give some advantage to the player.

General attributes:

- Appearance
  - State
- General actions: No specific.

### **Extra Objects**

Description: Objects with which the player can interact but by themselves do not generate any action. When acquired they add points to the player's score.

General attributes:

- Appearance
- State

General actions: No specific.

Platform

Description: Objects on which other objects move.

General attributes:

- Appearance
- State

General actions: No specific.

### **Other objects**

Description: Objects that do not fall into any other classification.

General attributes:

- Appearance
- State

General actions: No specific.

## **2.2 Core game elements**

The main elements of the game are:

### **Mario – Player Character**

Description: The character the player controls, the player takes his role as a carpenter trying to rescue his girlfriend from the giant ape who kidnapped her.

Attributes:

- Appearance: Mario is a carpenter with a mustache who wears overalls, shirt and cap.
- State: Mario can stand facing left, stand facing right, running left, running right, jumping left, jumping right, jumping static, using stairs, using a hammer to the left, using a hammer to the right, beaten or killed.

Movement actions:

- Run left: Mario moves to the left.
- Run right: Mario moves to the right side.
- Vertical jump: Mario jumps and falls into the same site
- Jump left: Mario jumps to the left.

- Jump right: Mario jumps to the right.
- Climb stairs: Mario climbs a ladder.
- Climb down stairs: Mario climbs down a ladder.

Other actions

- Use hammer: Mario waves a hammer from top to bottom, he can do it when standing or running to either side.

**Pauline** – Non player character

Description: She is Mario's girlfriend at the beginning of the game is kidnapped taken to the top of several platforms. She waits at the top of each level asking for help.

Attributes:

- Appearance: Pauline is taller than Mario; she wears a long dress and has long hair.
- State: Pauline can be carried, standing facing left, standing facing right, asking for help facing left or asking help facing right.

Actions:

- Ask for help: The word "help!" appear near the face Pauline as if she were yelling it.

**Barrel** – Enemy

Description: Barrels thrown by Donkey Kong to keep Mario from coming up.

Attributes:

- Appearance: Wooden barrels smaller than Mario.
- State: A barrel can be spinning or falling.

Actions:

- Spin: The barrel moves down by the platform.
- Fall: The barrel falls vertically.

**Blue barrel** – Enemy

Description: It shares the same characteristics of the wooden barrel with the only exception that touching the oil turns it into a fireball.

**Fireball** – Enemy

Description: Appears from burning oil. They move randomly

Attributes:

- Appearance: They look like flames with eyes. Smaller than Mario.
- State: they can be facing left, facing right, moving left, moving right and using stairs.

Actions:

- Move to the left: the fireball moves toward the left side.
- Move to the right: the fireball moves to the right.
- Climb stairs: the fireball climbs a ladder.
- Climb down stairs: the fireball climbs down a ladder.

**Firefox** – Enemy

Description: Like fireballs, they can make the same movements but faster. Their movements are less random and more directly pursue Mario.

Attributes:

- Appearance: They look like flaming eyes, but with the shape of ducks. Smaller than Mario.
- State: Can be facing left, facing right, moving left, moving right and using ladders.

Actions:

- Move left: Firefox moves to the left side.
- Move right: Firefox moves to the right side.
- Climb ladder: Firefox goes up a ladder.
- Climb down ladder: Firefox goes down a ladder.

### **Spring – Enemy**

Description: A spring that bounces forward on the platform before falling vertically. Its movement is quick. Its size changes from smaller than Mario to larger than Mario.

Attributes:

- Appearance: Spring in hourglass shape, as he moves it expands and contracts. When it drops it's vertically expanded.
- State: The spring can be expanded or contracted.

Actions:

- Move right: Spring bounces to the right. When the spring bounces it makes an arc greater than the height of Mario. This implies that Mario can occupy the space between the beginning and the end of the spring without touching it.
- Fall: The spring falls vertically when the platform upon which it bounced ends.

### **Cement – Enemy**

Description: The cement itself is not moving, but travels along a conveyor belt.

Attributes:

- Appearance: A container with cement on top. Approximately half the size of Mario. It is the enemy of lesser height but wider.
- State: Moving left and moving right.

Actions: No action.

### **Donkey Kong – Final Enemy**

Description: The giant ape that kidnaps Mario's girlfriend. The villain of the game always at the top of the stage he is guarding his victim or throwing obstacles to Mario.

Attributes:

- Appearance: A gorilla twice the size of Mario.
- State: Climbing stairs, climbing stairs with Pauline, standing, pounding his chest, facing left, facing right.

Actions:

- Climb stairs: Donkey Kong climbs the stair.
- Climb stairs with Pauline: Donkey Kong climbs the stair with Pauline.

- Pound his chest: Donkey Kong beats his chest with both arms.
- Throw barrel: Donkey Kong turns left, take a barrel and throws it to the left side.

### **Hammer** –Help object

Description: Hammer that appears in certain parts of the stage, Mario can take it by jumping to it. When reached, for a short time Mario can hit any enemy in its reach and disappear it. During this time Mario can't jump or go down stairs.

Attributes:

- Appearance: A small hammer that appears to by hang.
- State: Hanging.

Actions: No actions.

### **Bag** – Extra object

Description: Bag left by Pauline while being kidnapped. Mario can retrieve it by touching it.

Attributes:

- Appearance: A bag smaller than Mario at floor high.
- Estado: Lying.

Actions: No actions.

### **Hat** – Extra object

Description: Hat dropped by Pauline while being kidnapped. Mario can retrieve it by touching it.

Attributes:

- Appearance: A hat smaller than Mario at floor high.
- Estado: Lying.

Actions: No actions.

### **Umbrella** – Extra object

Description: Umbrella dropped by Pauline while being kidnapped. Mario can retrieve it by touching it.

Attributes:

- Appearance: An Umbrella same size than Mario at floor high.
- Estado: Lying.

Actions: No actions.

### **Beam** – Platform

Description: On this beam you can move the characters with movements to the left and right.

Attributes:

- Appearance: Beams of different colors and sizes, usually placed vertically in any position of the screen, but may have sections with different angles of inclination.
- State: Horizontal, inclined.
- Size: The beam can have different lengths.

Actions: No actions.

### **Conveyor belt** – Platform

Description: A band with one or two circles on the sides that can rotate. Objects that are on these bands will move to the same side that the band is turning if they are static. They will move faster if moving toward the same side as the band or more slowly if they advance to the opposite side that the band moves. The movement and turning side of the band can be fixed or random.

Attributes:

- Appearance: The same size and thickness as the beam should have at least a circle on either side that depending on his movement points to where the band is turning or if it's not moving in case the circle it's not moving.
- State: Stopped, turning left, or turning right.
- Size: The conveyor belt may have different lengths.

Actions:

- Turn left: The band starts to turn left, moving whatever is on it to that side.
- Turn right: The band starts to turn right, moving whatever is on it to that side.
- Stop: The band stops rotating.

### **Elevator of beams – Platforms**

Description: A vertical string connects two rectangular engines, on the string there are several beams at different heights. The elevator can be going up or down. When the beam reaches the top or bottom of the engine disappears. Every certain distance a beam appears, if the elevator is going up the beams appear from the bottom engine and disappear at top engine. If the elevator is going down the beams appear from the top engine and disappear at the bottom engine.

Attributes:

- Appearance: Each engine is the size of Mario and should be at the height of a beam or a conveyor. The chain that links the motors is thin. Throughout the string there are small beams subject to the string with a fixed distance between them.
- State: Going up, going down.

Actions:

- Going up: The beams on the elevator moves up, appears in the bottom and disappear at the top.
- Going down: The beams on the elevator is moving downward, appears at the top and disappears at the bottom.

### **Ladder – Platform**

Description: They must be attached to the top or bottom of a beam or conveyor belt. Connects a beam or a conveyor belt to another above or below. Some enemies and Mario use them to ascend or descend between different beams or conveyors.

Attributes:

- Appearance: Ladders are thinner than Mario and can have different height.
- State: Unique.
- Size: A ladder can have different heights depending on the heights of the levels to be connected.

Actions: None.

### **Broken ladder – Platform**

Description: Must be attached to the top of a beam or conveyor. Doesn't connect a beam or conveyor belt to another, because they lack a part in the middle. The barrels can drop these steps even if they are broken. Certain enemies and Mario can climb these ladders partially to the point where they are broken.

Attributes:

- Appearance: A ladder thinner than Mario and can have different heights, with a missing connection between the top and bottom
- State: Unique.
- Size: A broken ladder can have different heights depending on the heights of the levels that could be connected.

Actions: No actions.

### **Escalator – Platform**

Description: Must be attached to the bottom of a beam or conveyor belt. Connects a beam or a conveyor belt to another above or below in certain moments. Certain enemies and Mario can use them to ascend or descend between different beams or conveyor belts. The top of the stairs moves every certain time up and down. When the top of the ladder is down it overlaps with the bottom part. When the top of the ladder is at the top connecting the upper beam or conveyor belt it allows going up that level.

Attributes:

- Appearance: The top mobile part of the escalator is a little wider than the lower, when the moving part is below the two sides overlap.
- State: Ladder up, ladder down, going up, going down.
- Size: An escalator can have different heights depending on the heights of the levels to be connected.

Actions:

- Ascend: The moving part of the escalator goes up to connect it to the lower beam or conveyor belt with the one on above.
- Descend: The mobile part of the escalator goes down to connect the beam or conveyor belt below with the upper one.

### **Oil pot – Other Objects**

Description: A pot of oil from which can appear other enemies under certain circumstances.

Attributes:

- Appearance: A container with the word "oil" written, with the size of Mario.
- State: Off, afire.

Actions:

- Light up: If the oil pot is off it can be ignite when it's hit by a blue barrel.

Creating fireball: If the oil pot is light up it can appear from this a fireball.

### **Rivet – Other objects**

Description: A rivet that connects two beams at the same level. When Mario passes over the rivet o jumps over it, it disappears. When the rivet disappears it leaves a gap between the connecting beams and the enemies cannot pass the gap. Mario can jump the gaps left by the rivets.

Attributes:

- Appearance: Of the same thickness of a beam. Of height and width is smaller than Mario.
- State: Unique.

Actions: No actions.

## 2.3 Rules

### 2.3.1 Interaction rules

Element	Element which it interacts	Result
Mario	Beam	<p>On the beam: Mario can move left and right while he is on the beam. Also he can jump on the beam.</p> <p>Other contact with the beam: If Mario touches a beam but is not over this one, for example when jumping and contacting a top beam. The contact between the beam and Mario doesn't generate any action.</p>
	Conveyor belt	<p>On the conveyor belt: Mario can move left and right while he is on the conveyor belt. Also he can jump on the conveyor belt. When the conveyor belt is moving to either side. If Mario is static he moves to the same side the conveyor belt is turning, if he moves to the same side he moves quicker than what he normally do and if he moves the opposite side he moves slower that what normally he does.</p> <p>Other contact with the conveyor belt: If Mario touches a conveyor belt but is not over this one, for example when jumping and contacting a top conveyor belt. The contact between the conveyor belt and Mario doesn't generate any action.</p>
	Ladder	<p>Aligned with a ladder: If Mario is aligned with a ladder that allows him to go up or down to another level Mario can move up or down that ladder. To reach the next level that connects the ladder.</p> <p>Using a ladder: Mario can stop at any height of the ladder, can go up to the next top level or go down to the inferior level.</p>
	Broken ladder	<p>Aligned with a broken ladder that goes up: Mario can climb the ladder till the partially missing section of the ladder.</p> <p>Using the broken ladder: Mario can stop at any height of the section where the broken ladder is. Can go down to the level where he began to climb the broken ladder.</p>
	Escalator	<p>Aligned to an escalator: If the escalator connects to a higher level, Mario can climb to the maximum height of the escalator. If the escalator connects to a lower level, Mario will have to wait to the escalator to go up and connect to a level where he can get down.</p>



		Using the escalator: Mario can stop at any height of the ladder; can go up to the top level or down to the lower level only when the escalator connects with both levels.
	Elevator of beams	On a beam of the elevator of beams: While Mario is on the beam, he will go up or down depending on the direction of the elevator in which it is located. If Mario comes into contact with the engine below or above the elevator he loses a life.
	Any category of enemy or final enemy	Contact: If Mario comes into contact with any enemy or boss creature he will lose a life.  At jump: If Mario manage to jump an enemy when skip will add 100 to the scoreboard.
	Hammer	Contact: If Mario comes into contact with a hammer for a period of time he can't jump or go up or down ladders. Mario can move left and right as he does it regularly but only that he will do it agitating the hammer up and down. Any enemy that comes in contact with the hammer while being wielded by Mario disappears and will add 300 points to the scoreboard.
	Any extra object	Contact: If Mario comes into contact with an extra object this will disappear and add 300 points to the scoreboard.
	Rivet	Passing over the rivet or jumping it: If Mario jumps over or steps on a rivet, it disappears and adds 100 points to the scoreboard.
Barrel	Beam	On a beam: The barrel spins in one direction, every time it falls to another beam changes its direction depending on the inclination of the beam. In the lowest beam at the edge of the screen the barrel disappears.
	Ladder/Broken ladder	On a ladder or broken ladder: The barrel has a possibility to fall to the next level or keep rolling in the same direction.
Blue barrel	Beam	Same behavior as the barrel.
	Ladder/Broken ladder	Same behavior as the barrel.
	Oil pot	In contact: When a blue barrel makes contact with the oil pot this disappears. In case of not being on fire, the oil pot ignites and generates a fireball that comes out of the oil pot.
Fireball	Beam	On the beam: The fireball can move left and right while it's on the beam.
	Conveyor belt	On the conveyor belt: The fireball can move left and right while he is on the conveyor belt. When the conveyor belt is moving to either side. If the fireball is static it moves to the same side the conveyor belt is turning, if it moves to the same side he moves quicker than what it normally do and if it moves the opposite side it moves slower that what normally it does.
	Ladder	Aligned with a ladder: If the fireball it's aligned with a ladder

		<p>that allows it to go up or down that level it can start to go up or down that ladder. To reach the level that connects the ladder.</p> <p>Using the ladder: The fireball can stop at any height of the ladder; it can go up to the top level or go down to the lower level.</p>
	Broken ladder	<p>Aligned with a broken ladder that goes up: The fireball can go up the ladder partially till the missing section of the ladder.</p> <p>Using the broken ladder: The fireball can stop at any height of the section where the broken ladder is. Can go down a level where it began to climb the broken ladder.</p>
	Escalator	<p>Aligned to an escalator: If the escalator connects with a superior level, the fireball can go up to the maximum height of the escalator. If the escalator connects with a lower level, the fireball will have to wait to the escalator to go up and connect to a level where it can get down.</p> <p>Using the escalator: The fireball can stop at any height of the ladder; can go up to a superior level or go down to a lower level, only when the escalator is connecting both levels.</p>
Firefox	Beam	<p>On the beam: The Firefox can move left and right while it's on the beam.</p>
	Conveyor belt	<p>On the conveyor belt: The Firefox can move left and right while he is on the conveyor belt. When the conveyor belt is moving to either side. If the Firefox is static it moves to the same side the conveyor belt is turning, if it moves to the same side he moves quicker than what it normally do and if it moves the opposite side it moves slower that what normally it does.</p>
	Ladder	<p>Aligned with a ladder: If the Firefox is aligned with a ladder that allows him to go up or down to another level the Firefox can move up or down that ladder. To reach the next level that connects the ladder.</p> <p>Using a ladder: the Firefox can stop at any height of the ladder, can go up to the next top level or go down to the inferior level.</p>
	Broken ladder	<p>Aligned with a broken ladder that goes up: the Firefox can climb the ladder till the partially missing section of the ladder.</p> <p>Using the broken ladder: The Firefox can stop at any height of the section where the broken ladder is. Can go down to the level where he began to climb the broken ladder.</p>
	Escalator	<p>Aligned to an escalator: If the escalator connects to a higher level, the Firefox can climb to the maximum height of the escalator. If the escalator connects to a lower level, the Firefox will have to wait to the escalator to go up and connect to a level where he can get down.</p>

		Using the escalator: The Firefox can stop at any height of the ladder; can go up to the top level or down to the lower level only when the escalator connects with both levels.
Spring	Beam	On the beam: When on a beam the spring moves jumping on the beam. If the spring doesn't have a beam on which land, it falls vertically until it exits the screen.
Cement	Conveyor belt	On the conveyor belt: The cement doesn't have movement on its own it moves to the side the conveyor belt is turning or stays static in case the conveyor belt is not moving.
	Oil pot	In contact: When the cement comes into contact with the oil pot, the cement disappears.

### 2.3.2 Artificial Intelligence

The game not uses it.

### 2.4 Game world elements

The game not uses it.

### 2.5 Game log elements

Time limit

Each level has a fixed time to complete it. If the time runs out before completing the level the player loses a life. At the beginning of each level the player will have 1 minute 40 seconds to finish the level. That time will be represented by the bonus points the player receives after finishing the game. The bonus begins at 5000 pts. That will decrease from 100 pts. in 100 pts. Every 2 seconds. When the level is completed the remaining bonus points will be add to the scoreboard.

Scoreboard

Keeps track of the points accumulated by the player. Different actions generate points. The actions that generate points and the points they give are:

- Jump on an enemy = 100 pts.
- Destroy enemies with the hammer = 300 pts.
- Collect an extra object = 300 pts.
- Removing a rivet = 100 pts.
- Complete a level = equivalent points of the remaining time limit.

Lives

The player has a fixed number of attempts to accomplish the victory condition. Every time the player loses a life the number of attempts decreases by 1. The number of attempts with which the player counts is 3. The reasons why the player can lose a life are:

- Come into contact with an enemy or Donkey Kong.
- Come into contact with an engine of the elevator of beams.
- Falling from a height greater than Mario's height.
- Falling out of the screen.

- The time limit to pass the level ends.

## **2.6    *Other elements***

None.

## **2.7    *Assets list***

Pending.

## **3 Dynamics**

### **3.1 *Game World***

#### **3.1.1 Game theme details**

The environment in which the game is played is buildings under construction. Therefore these elements are what integrate the game. The game will have music to ambient each level. Mario's actions as walking, climb ladders, jump among others will generate sound effects. When Mario gets the hammer the level music is replaced by a melody that indicates that Mario has a hammer and some enemies will change color to indicate that they are vulnerable. The idea is that the player feels the need to reach the top level do the screen as fast as possible.

#### **3.1.2 Missions/levels/chapters Flow**

The game has 4 levels, before the first level and between levels there is a transition. Upon completion of the 4 levels, the levels start repeating but with increasing difficulty.

1. Title
2. Initial animation
3. Challenge screen
4. Level 1
5. End of level 1
6. Challenge screen
7. Level 2
8. End of level 2
9. Challenge screen
10. Level 3
11. End of level 3
12. Challenge screen
13. Level 4
14. Final animation

If the player loses a life he returns to the challenge screen above the level in which he loosed a life. If the player loses all his lives the "Game Over" screen appears and returns to the title screen.

#### **3.1.3 Game detailed history**

The story is about a carpenter named Mario who has a pet named Donkey Kong. Mario mistreated his pet so in vengeance to his owner it decides to kidnap his girlfriend named Pauline and run away climbing buildings in the city. It's the work of Mario overcome the obstacles put by Donkey Kong to rescue his girlfriend.

### **3.2 *Missions/levels/chapters elements***

#### **3.2.1 Objectives**

##### **3.2.1.1 Primary**

At each level of the game except the last, the main goal is to reach a certain platform on the top of the screen. Since the platform is where Pauline is found or the platform where Donkey Kong is. In

the last level the main goal of the game and the win condition is remove all the rivets of the level.

### **3.2.1.2 Secondary**

The game raises different goals that the player can try but are not required to finish the game, which are:

- Finish the game in the shortest time possible, to get a better score.
- Get all reward items in the game.
- Eliminate as many enemies with the hammer.

## **3.2.2 Rewards**

### **3.2.2.1 Implicit**

At the end of level 4 the player looks how Mario rescues his girlfriend Pauline and a heart is drawn on their reunion.

### **3.2.2.2 Explicit**

All the rewards are given in function of the score. If the player's score is high enough, the game records his score on a permanent basis as the best in the game until someone else beats it. The way to obtain score points are:

- Jump an enemy.
- Eliminate an enemy with the hammer.
- Pick an object of Pauline.
- Removing a rivet.
- Finish the level before the time bonus ends.

## **3.2.3 Challenges**

The main challenges of the game will be:

- Evading enemies.
- Finish on time.
- Avoid falling.
- Appropriate use of platforms.

## **3.2.4 Other Missions/levels/chapters elements**

None.

## **3.3 Missions/levels/chapters description**

### **Level 1**

#### *Scenario description*

The first level is divided into 6 sections. In Figure 3-1 you can see the sections and the placement of the elements described in the scenario.

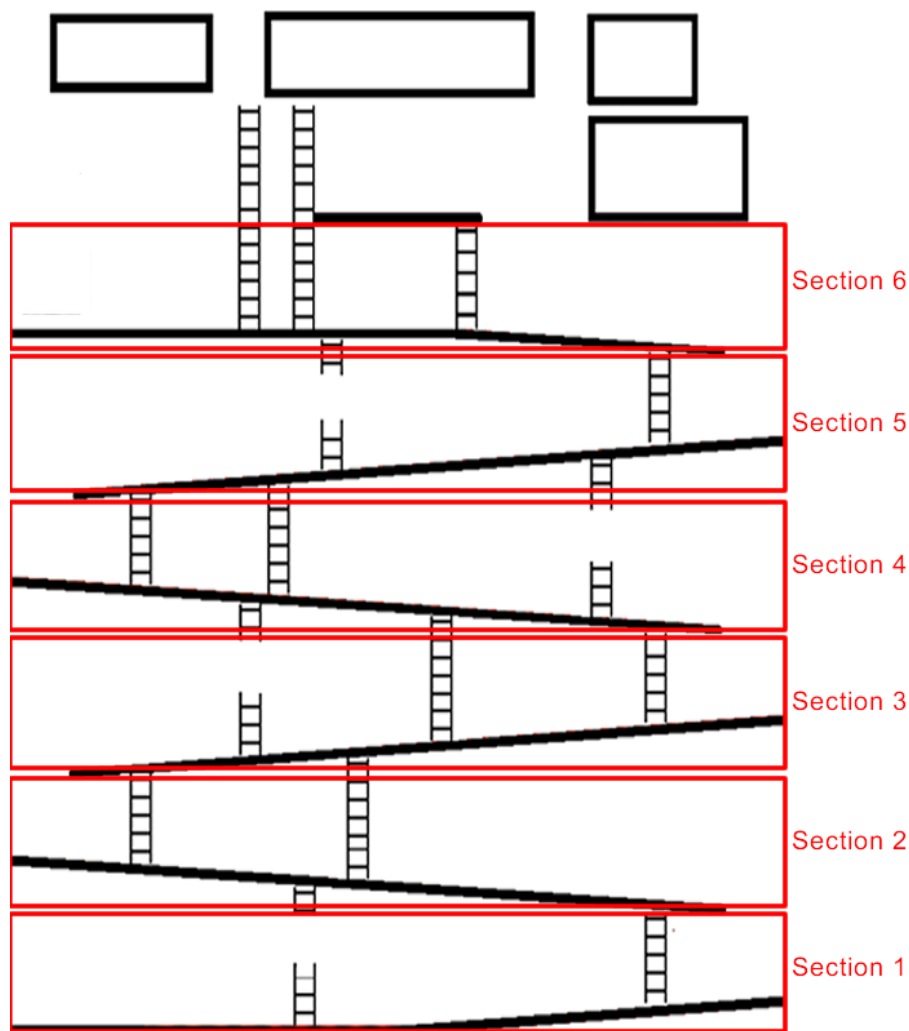


Figure 3-1: Level 1 sections

The first section has a beam, a ladder and a broken ladder. The beam is at the bottom of the screen extends from the left to the right end of the screen. The right side of the beam has a slight vertical cause half of the screen to the right side has a slight raise. The staircase is before reaching the far right of the beam and connected to the beam on section 2. The broken ladder is to the left half of the screen.

The second section has 1 beam and 2 ladders. The beam is above the beam of the first section, starting from the extreme left of the screen until shortly before the extreme right. The beam has a constant slope from its beginning to its end so that the right side of the beam is further away from the beam in the previous section and the left side is closer. Both ladders are on the left side of the screen and connect to the beam of the upper section. The first ladder is shortly after the extreme left and the second is on the left side, almost half of the screen.

The third section has 1 beam, 2 ladders and a broken ladder. The beam is above the beam of section 2, begins shortly after the extreme left of the screen and ends at the far right. The beam has a constant slight rise so that the left side of the beam is closer to the beam above the right side. Both ladders are on the right side of the screen and connect to the upper level beam, The first ladder is at the right half of the screen. The second ladder is just before the far right of the screen aligned with the ladder that is in the first section. The broken ladder is located at the left of the half of the screen.

The fourth section has 1 beam, 2 ladders and a broken ladder. The beam is above the beam of section 3, beginning at the extreme left of the screen and ends just before the far right. The beam has a constant slope from its beginning to its end so that the right side of the beam is further away

from the beam in the previous section and the left side is closer. Both ladders are on the left side of the screen and connect to the beam of the upper section. The first ladder is shortly after the extreme left and the second is at the left side of the half of the screen. The broken ladder is on the right side of the screen.

The fifth section is a beam, a ladder and a broken ladder. The beam is located above the beam of section 4, begins shortly after the extreme left of the screen and ends at the far right. The beam has a constant slight rise so that the left side of the beam is closer to the beam above the right side. The ladder connects with the first beam of section 6 and is in the right side of the screen, before reaching the far right of the screen. The broken ladder is to the left of the screen shortly before the middle of the screen.

The sixth section has 2 beams and 3 ladders. The first beam is above the beam of Section 5, beginning at the extreme left of the screen and ends just before the far right. The beam begins horizontally and shortly after the middle of the screen has a slight tilt. The second beam is located above the first beam of the section. It begins shortly before the left half of the screen and ends shortly after the right side of half of the screen. The second beam is completely horizontal. The first 2 ladders are in the left side of the screen. These ladders do not connect with any visible element of the game, but suggests connecting to the next level. These ladders cannot be used by Mario. They are only use by Donkey Kong to escape to the next level with Pauline. The third ladder is connected with second beam of the section and is located on the right side of the screen.

#### *Placement of elements on stage*

Figure 3-2 shows in detail the placement of the elements described in this paragraph and the possible flow of blue barrels and barrels.



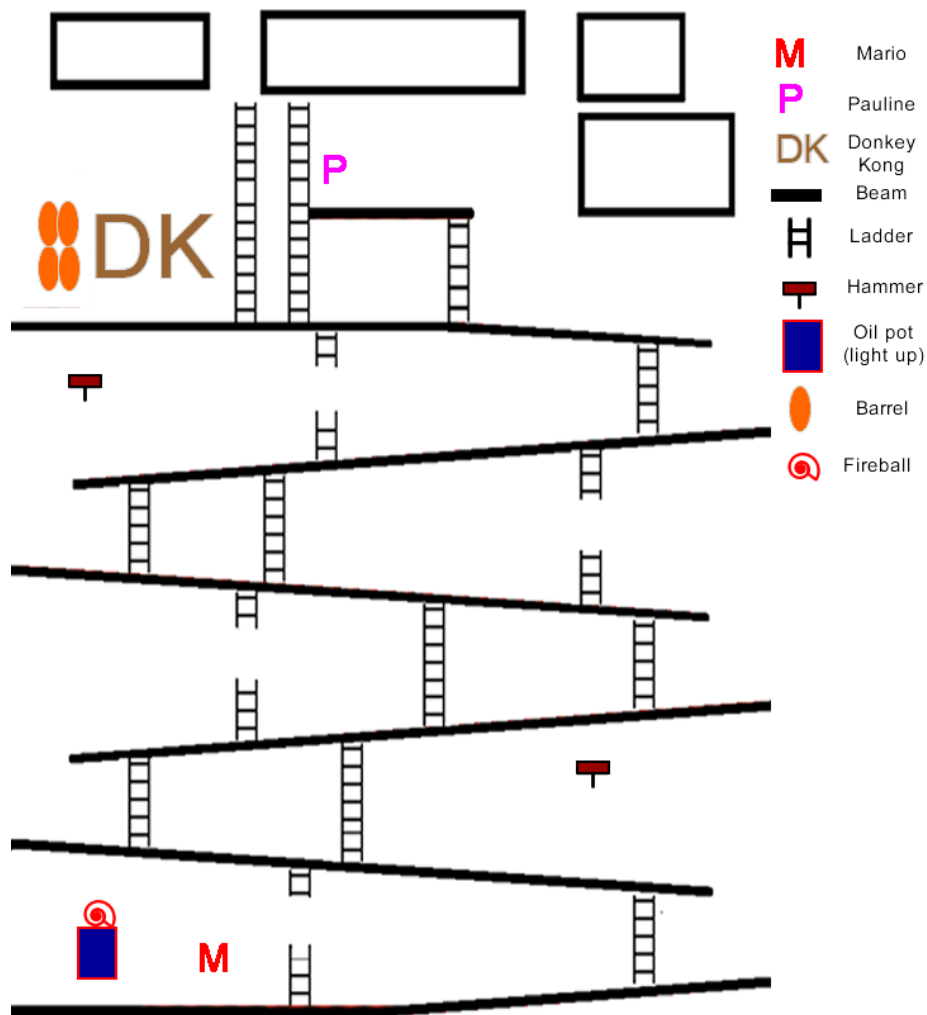


Figure 3-2: Level 1 elements

**Mario:** Starts at the beam in section 1, at the left side of the screen.

**Oil pot:** Found in the beam of Section 1, shortly after the extreme left of the screen.

**Hammer:** The lever has 2 hammers. Both hammers are placed above Mario, which requires him to jump so that they can be taken. The first is found in section 2 at the right side of the screen, just to the left of the ladder that connects section 1 to section 2. The second hammer is located in Section 5, at the left side of the screen, right where it starts the beam of the section.

**Donkey Kong:** Located on the first beam of section 6, at the left side of the screen, right next to the first ladder on the section. Periodically throws barrels at random. It can throw blue barrels or barrels.

**Blue Barrel:** It is thrown at the beginning of the level by Donkey Kong. It travels in a vertical line to the oil pot of section 1 and lights it, which generates the first fireball. Later the blue barrels can have the same behavior of a barrel except when they touch the oil pot they are destroyed and a fireball appear.

**Barrel:** They are thrown by Donkey Kong. They travel along the inclination of the beams. The barrels can fall for any ladder broken or not at random. If it reaches the end of the beam it can disappear at any edge of the screen or bounce to fall into the lower beam. If it reaches the oil pot it disappears when touched.

**Fireball:** They appear every time a blue barrel hits the oil pot. It can move left and right on a beam and can go up or down ladders.

Pauline: Located on the second beam of section 6, at the left side of the screen, in the beginning of the beam.

Set of barrels: Found in the extreme left of the screen at the beginning of the first beam of section 6. Four barrels stacked, they pretend to be the place where Donkey Kong takes the barrels to throw, but the image of the barrels always remains the same.

### *Objectives*

Primary: The primary objective is to reach the platform where Pauline is found. By achieving the objective the player can move to level 2.

Secondary:

- Finish the game in the shortest time possible to get a better score.
- Finish the level before the end of the time bonus.

### *Rewards*

Explicit:

- Jump an enemy
- Eliminate an enemy with the hammer.
- Finish the level before the end of the time bonus.

### *Challenges*

- Evading enemies.
- Finish on time
- Prevent falls.

## **Level 2**

### *Scenario description*

The second level is divided into 5 sections, as shown in Figure 3-3.

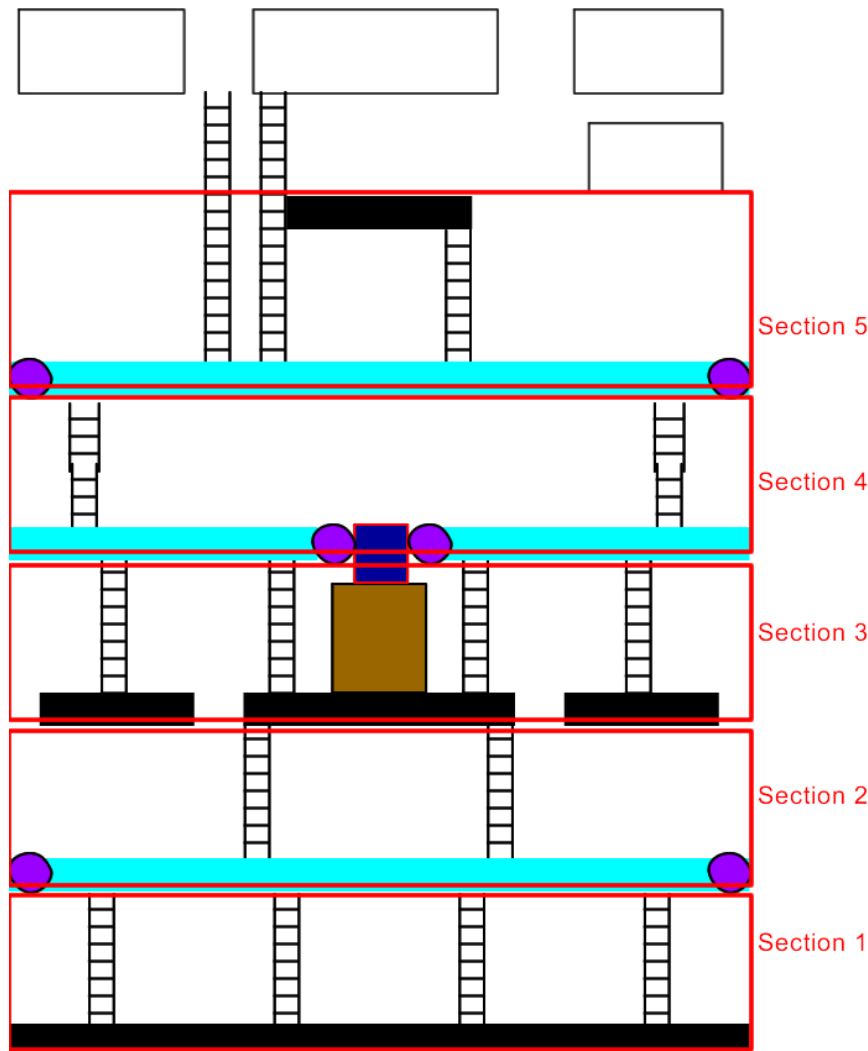


Figure 3-3: Level 2 sections

The first section consists of a beam and 4 ladders. The beam is located at the bottom, has the length of the screen, the 4 ladders leads to section 2 and they have a separation of 4 times the width of Mario between them, and the first and last are spaced from the edge of the screen by double Mario's width.

The second section has a conveyor belt and 2 ladders. The conveyor belt is just above the section 1 and has the same width as the screen, the 2 ladders leads to section 3 and they are separated from each other and the edges of the screen by equal distances.

The third section contains 3 beams, 4 ladders and 1 mesh. 2 of the beams are on the sides of the section, their width is 3 and a half times Mario's width, they are separated from the screen and the beam of the middle by Mario's width, and each one has a ladder in the middle, the intermediate beam has a mesh in the center that appears to be the platform where a oil pot of section 4 lies, and there are 2 ladders a body of Mario away from the mesh.

Section 4 has 2 conveyor belts, 2 escalators and a oil pot. Conveyor belts are joined by the oil pot in the middle of the screen and escalators are almost at the edges of the screen

The last section consists of a conveyor belt, 3 ladders and 1 beam. The conveyor belt is above section 4, also occupies the width of the screen. The first of the 3 ladders is to the right side of half of the screen, it leads to the beam where Pauline is located, and the other 2 are to the left of half of the screen, they pretend to look like connecting to the next level.

*Placement of elements on stage*

Figure 3-4 shows in detail the placement of elements described in this paragraph and the possible rotation of the conveyor and the movement of the fireball.

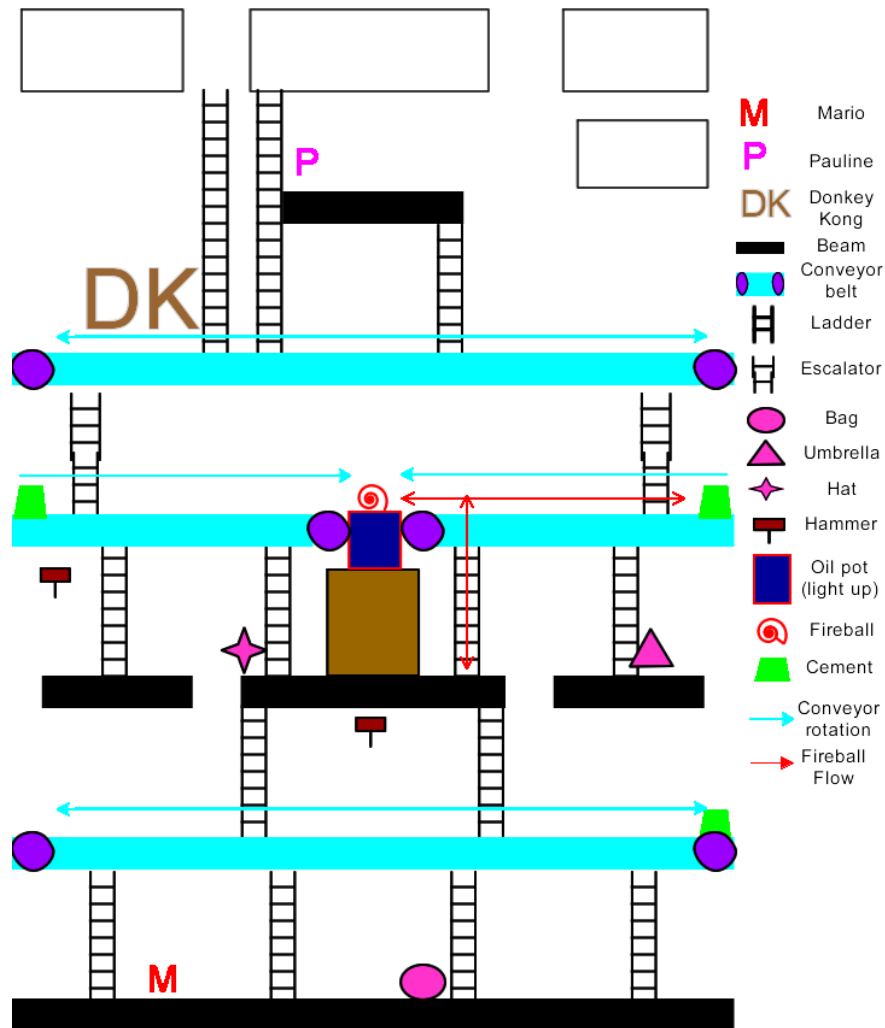


Figure 3-4: Level 2 elements

Mario: Starts in the lower beam to the left of the first ladder in section 1.

Pauline: She's located on the top beam of section 5.

Donkey Kong: It's found on the conveyor belt of section 5, almost at the extreme left of the screen.

Hammer: There are 2 hammers, one is in the middle of the screen at the top of section 2, the other is located in section3, next to the ladder in the left side.

Pauline Bag: Her bag is in section 1, to the left of the third ladder from left to right.

Pauline Umbrella: Located in section 2 the umbrella is next to the ladder of the right

Pauline Hat: The hat is in the left corner of the intermediate beam.

Cement: They are not found when the level begins, one of them appears at the right side of section 2, it moves along the conveyor according to this rotation. In section 4 there is 2 cements that come out from the edges of the screen, they are carried to the center by the conveyor belts. When the first cement reaches the oil pot, it turns into a fireball, and the next ones are only destroyed.

Fireball: When the first cement reaches to the center, where the oil pot is, it becomes a fireball that can move on the conveyor belt and can go up and down the ladders.

### Objectives

Primary: The main goal is to reach the platform where Donkey Kong is, to advance to the next

level.

Secondary:

- Finish the level in the shortest time possible to get a better score.
- Get all reward items of the level.
- Eliminate as many enemies possible with the hammer.

*Rewards*

Explicit:

- Jump an enemy
- Eliminate an enemy with the hammer
- Pick an object of Pauline
- Finish the level before the end of the time bonus.

*Challenges:*

- Evading enemies.
- Finish on time.
- Prevent falls.
- Appropriate use of platforms

### **Level 3**

*Scenario description*

Level 3 is somewhat irregular, compared with the other levels, it has 6 sections as shown in Figure 3-5.

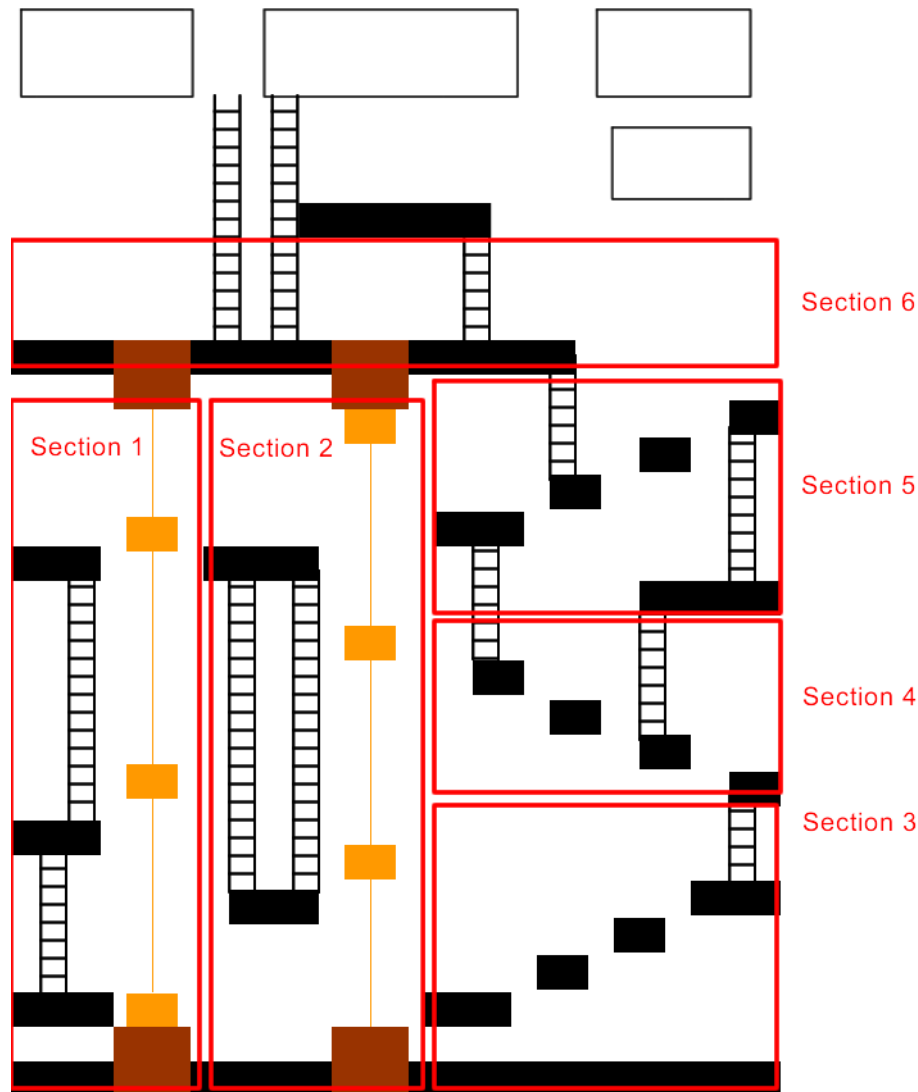


Figure 3-5: Level 3 sections

Section 1 has 4 beams and an elevator of beams. The beams are 3 times the width of Mario; the first is at the bottom left, the second one is above the first separated by one beam height, followed by the third upwards to 4 times the height of a beam, they are connected by a ladder at the middle of the beam, and the last one is at 7 times the height of a beam separated from the third beam, which is also linked by a ladder on the right corner of the beams. The elevator of beams has his lower engine at the base of the screen at one side of the first beam, and its upper engine is where section 1 and 6 joins, it has 3 beams on the elevator, each one starting around where the other beams of the section are, you can jump from one of them to section 2.

The second section has another elevator of beams and 3 beams and 2 ladders. The first beam width is 4 bodies of Mario and it's on the bottom connected to the elevator of beams in the previous section, separated by 4 times the height of a beam there is the second beam, which is only 3 times the width of Mario, the 2 ladders are on this beam, one on each side that connects to the third beam, this beam is at 9 times the height of a beam of the second beam and has 4 times the width of Mario, the elevator of beams has his lower engine to one side of the bottom beam, and the upper engine where section 2 and 6 join, it has 3 beams, one starts at the top of the elevator, another one below the third beam of the section, and a third one near the second beam, you can jump to from a beam in the elevator section 3, 4 and 5.

The third section is located in the lower right corner of the level, after elevator of beams in section 2. The section has 5 beams and a ladder. One of the beams is at the bottom, to one side of the elevator of beams in section 2 and ends at the edge of the screen, the other 4 beams forms a stair

that goes from left to right, they are separated between them by a body of Mario, and each starts at the height where the other ends, the first beam starts at the left edge of the section at one beam height from the bottom beam, and the last one is at the right edge of the section at 4 beams height from the bottom one, in the middle of this beam there is a ladder that connects to section 4, the first and last beam of the stair are 3 times the width of Mario, while the other 2 in the middle, only has 2 bodies of Mario width.

The fourth section has 4 beams and 2 ladders. The beams, as in the previous section, form a stair, that goes from right to left, they are separated between them by a body of Mario, and each starts at the height where the previous ends, the first beam starts on the right edge of the screen, above the section 3, and the last ends at one body of Mario from section 2, One of the ladders is on the second beam from right to left, and connects with section 5, the other ladder is located on the fourth beam from right to left, and continues in section 5.

Section 5 contains 5 beams and 3 stairs. The first beam is located above the section 4, attached to the right edge of the screen and has width of 5 times the width of Mario, the other four beams form a stair from left to right, separated between them by a body of Mario and each one starts at the height where the previous ends, the first has a width of 3 times the body of Mario, and is at 2 times the height of the beam on section 4, the other 2 beams has 2 times the width of Mario, and the last beam ends in the right corner of the section, The first ladder is the continuation of the ladder on section 4, the second ladder is in the second beam from left to right, and connects with section 6, and the third ladder connects the lower beam with the highest beam, which are on the right side of the section.

The sixth section has 2 beams and 3 ladders. The first beam is at above section 1, 2 and 5, beginning at the extreme left of the screen and ends in the middle of the second beam from left to right in section 5. The second beam is located above the first beam of the section, begins shortly before the left half of the screen and ends shortly after the right side of half of the screen. The second beam is completely horizontal. The first two ladders are in the left side of the screen. These ladders do not connect with any visible element of the game, but suggest connecting to the next level with Pauline. The third ladder is connected with the second beam of the section, is located on the right side of the middle of the screen.

#### *Placement of elements on stage*

Figure 3-6 shows in detail the placement of elements described in this section and the flow of some of the elements.

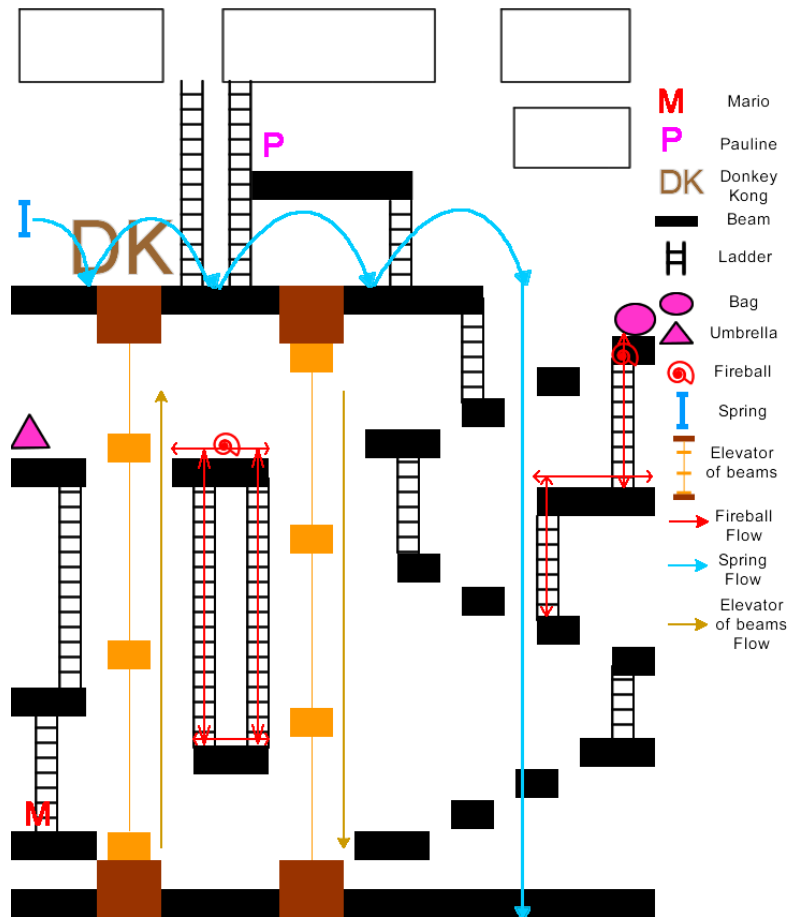


Figure 3-6: Level 3 elemets.

Mario: He starts in the second beam from bottom to top, by the ladder that is in that beam of section1.

Pauline: She is at the top beam of the level.

Donkey Kong: Located on the first beam of section6, at the left of the screen, right next to the first ladder of the level.

Pauline's bag: Her bag is at the top beam of section 5.

Pauline's Umbrella: Found in the upper beam of section 1.

Fireball: There are 2 fireballs in the level. The first is found in section 2, starting from the center of the upper beam, and can move across the beam, the ladders, and the other beam connected by the ladders. The second begins in section 5, under the bag of Pauline, and can move to the 2 lower beams using the ladders.

Spring: Each spring comes at a certain time to the left of Donkey Kong and begins to bounce the beam of section 6, at the end it falls to the bottom of the screen.

### Objectives

Primary: The main goal is to reach the platform where Pauline is to advance to the next level.

Secondary:

- Finish the level in the shortest time possible to get a better score.
- Get all reward items of the level.

### Rewards

Explicit:



- Jump an enemy
- Pick an object of Pauline
- Finish the level before the end of the time bonus.

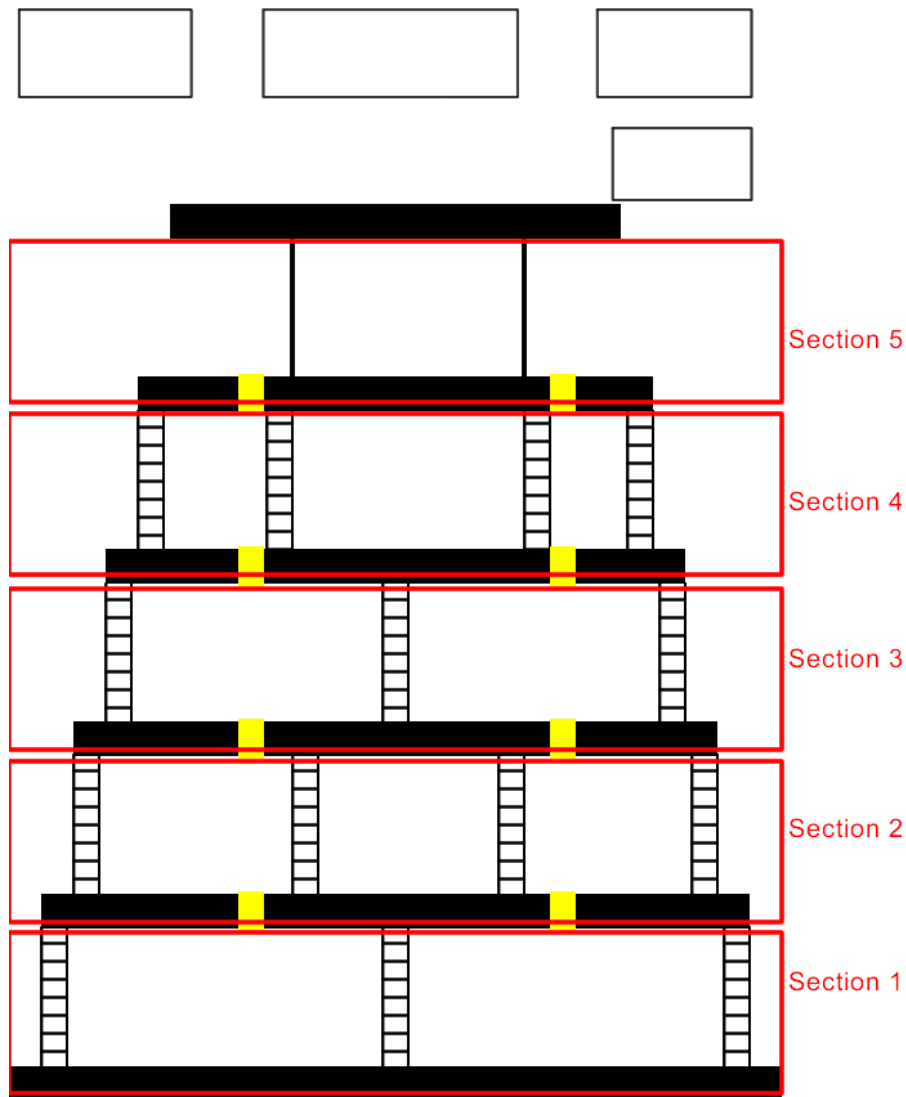
### *Challenges*

- Evading enemies.
- Finish on time
- Prevent falls.
- Appropriate use of platforms

## **Level 4**

### *Scenario description*

There are 5 sections on level 4 as shown in Figure 3-7.



**Figure 3-7: Level 4 sections**

The first section contains a lower beam that runs across the screen, and 3 stairs connecting with section 2, one in the middle of the screen and the other 2 to a body of Mario from the edges of the screen.

Section 2 has 3 beams joined by 2 rivets and 4 ladders that go to section 3. The ladders are spaced the same distance between them and those in the edges are separated by 2 times the width of Mario,

the rivets are at half the width of Mario from the central ladders to the outside, and the beams starts at one body of Mario from the edges of the screen.

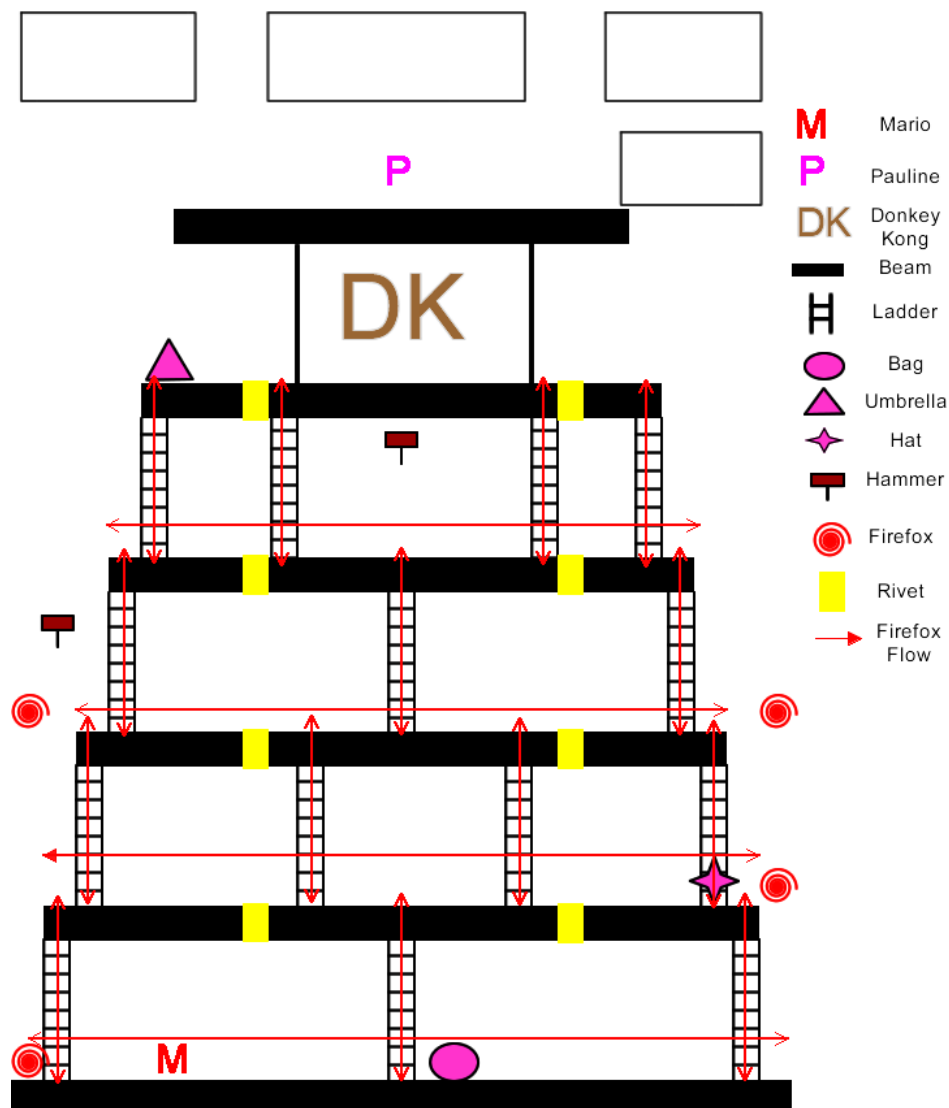
In section 3 there are 3 beams joined by 2 rivets, and 3 ladders. The edge beams are shorter because they begin with 2 time the width of Mario; the ladders are connected to section 4, one in the middle of the screen, and 2 to a body of Mario from the edge contrary to the rivets of the beams nearest to the edges of the screen.

Similar to section2, section 4 has the same elements. The difference is that the beams on the edges begins at 3 bodies of Mario from the edge of the screen, so they are smaller, the ladders of the edges are at one body of Mario from the edge of the beam, and the central ladders are on the edges of the central beam, beside the rivets

Finally the section 5 has 2 beams connected by 3 rivets, and has 2 walls in the center. The beams are separated from the edges of the screen for 4 times the width of Mario, and the walls are at one body of Mario to the inside from where the rivets are.

#### *Placement of elements on stage*

Figure 3-8 shows in detail the placement of elements described in this section and the possible flow of firefoxs.



**Figure 3-8: Level 4 elements**

Mario: Starts in section 1, near the ladder nearest to the left edge of the screen.

Pauline: Located in the beam at the top of the level, in the middle of the screen.

Donkey Kong: It's between the walls of section 5.

Hammer: There are two hammers, the first is located in the upper part of section 4, at the middle of the screen, and the second is in the upper part of left section 3, near the ladder nearest to the left edge.

Pauline's bag: Located on the right of the ladder in the center of the screen in section 1.

Pauline's hat: Her hat is next to the ladders nearest to the right edge of section 2.

Pauline's umbrella: Located in section 5, on the left edge of the beam of the same side.

Firefox: at this level there are several firefox, not at the beginning but they will appear over time to a maximum of 5 in the places indicated in the figure.

### *Objectives*

Primary: The main task for victory is to remove all the rivets to rescue Pauline.

Secondary:

- Finish the level in the shortest time possible to get a better score
- Get all reward items in the level.
- Eliminate as many enemies with the hammer.

### *Rewards*

Implied: At the end of the level the player will see how Mario rescues his girlfriend Pauline and a heart is drawn in their reunion.

Explicit:

- Jump an enemy
- Eliminate an enemy with the hammer
- Pick an object of Pauline
- Removing a rivet
- Finish the level before the end of the time bonus.

### *Challenges:*

- Evading enemies
- Finish on time
- Prevent falls

## **3.4 Special areas**

The game does not contain any special area.

## **3.5 Game interface**

The game has different screens. The following describes each one of them.

Home screen (without player interaction): At the top left appears the player score, the highest score recorded in the game is at center and at the right side the current level, for this screen is displayed as zero. In the middle of the screen the words Donkey Kong are displayed. Under the name of the game Donkey Kong character appears. Figure 3-9 shows a sketch of the home screen.

Abduction animation (without player interaction): This screen shows the same surface elements on the screen. The difference in these is that the score doesn't show the previous player score but rather

zeros, to reflect the score of the player in turn. The level rather than zero is one and above where it marks the level the number of attempts that the player has appears and is represented by small figures of Mario. In this case at the start of the game 3 figures appears. At the beginning of the animation there is the same number of beams at level 1. At the right of the middle of the screen, there is a pair of stairs from where Donkey Kong appears climbing, with Pauline grabbed by the waist. Donkey Kong climbs to the second last upper beam, and puts Pauline in the last one. He begins to jump to its initial position for level 1. For each jump a beam is bend or tilt until they are placed as they are in level 1. Figure 3-10 shows what the initial state of the abduction animation.

Challenge screen (without player interaction): At the beginning of each level, a challenge screen appears. The 3 upper elements keep appearing. At the bottom of the screen the message “HOW HIGH CAN YOU GET?” shows, just above the message there is a picture of Donkey Kong and to his left side there is a number followed by the letter m. This indicates how many meters has gone up in the level. The first time the challenge screen shows the number is 25 m. This indicates that is intended to climb 25 meters in the platform, each time a level is pass 25 meters will be added to the challenge screen. Such way that for level 2 screen challenge screen will be 50 m. The 50 m message m will be displayed above the 25 m and a new figure of Donkey Kong will appear above the first. Figure 3-11 shows a sketch of the challenge screen.

Levels (with interaction): At each level the player can execute Mario’s pre-defined movements. Every time that Mario makes a move that generates points, this score is reflected in the upper left of the screen, adding each point generated by Mario to the score. In case the score generated by Mario is higher that the score found in the top center of the screen, this score will be updated as the player’s score with the difference than when a new game begins this score will not restart. At the top right of the screen each time the player loses, a figure that represents attempts will disappear. If there are no more figures the player loses and the game ends. Below where the current level and the attempts are shown, for each level there is a box that represents the time that Mario has to finish the level and also represents the extra points that will be added to the player’s score at the end of the level. Figure 3-12 represents where each of the elements described here appear.

### 3.6 Controls interface

The player can only interact in the section of levels, where a lever will allow him to make the movements to the left, right, up and down the ladders, depending on the direction of the lever. The jump will be performed by pressing a button. Next are the actions that the player can make and how to perform them.

Action	Condition	Controls
Walk to the left	Being on top of a platform	Lever inclined towards the left side
Walk to the right	Being on top of a platform	Lever inclined towards the right side
Walk with hammer to the left	Being on top of a platform and holding a hammer	Lever inclined towards the left side
Walk with hammer to the right	Being on top of a platform and holding a hammer	Lever inclined towards the right side
Go up a ladder	Being in front of a ladder or be using a ladder	Upwardly inclined lever
Go down a ladder	Being in front of a ladder or be using a ladder	Downwardly inclined lever
Jump	Being on top of a platform	Press the jump button

Jump to the left	Being on top of a platform	Press the jump button while holding the lever inclined to the right side
Jump to the right	Being on top of a platform	Press the jump button while holding the lever inclined to the left side

### 3.7 *Game Balance*

The elements that can help adjust the difficulty level of the game in a simple way are:

Level 1:

- Frequency at which the barrels are thrown.
- Barrel speed
- Number of blue barrels
- Number of hammers on the level
- Number of ladders
- Number of broken ladders
- Time to finish the level

Level 2:

- Speed of conveyor belts
- Number of fireballs that appear
- Speed of fireballs
- Frequency with which cements appear
- Number of escalators

Level 3:

- Number of fireballs by section
- Speed of lifting beams
- Frequency at which the springs appear

Level 4:

- Number of Firefox that appear
- Speed of the Firefox
- Number of rivet to remove
- Number of hammers on the level

### 3.8 *Game learning*

The game is intuitive, the lever must state what actions performs depending on where is tilt, in the same way the jump button should indicate its use. The rest of the movements will be discovered by the player by trial and error. Another way to discover the move that Mario can do is when the game shows a demo of the first level, where at least it should see Mario doing the main actions.