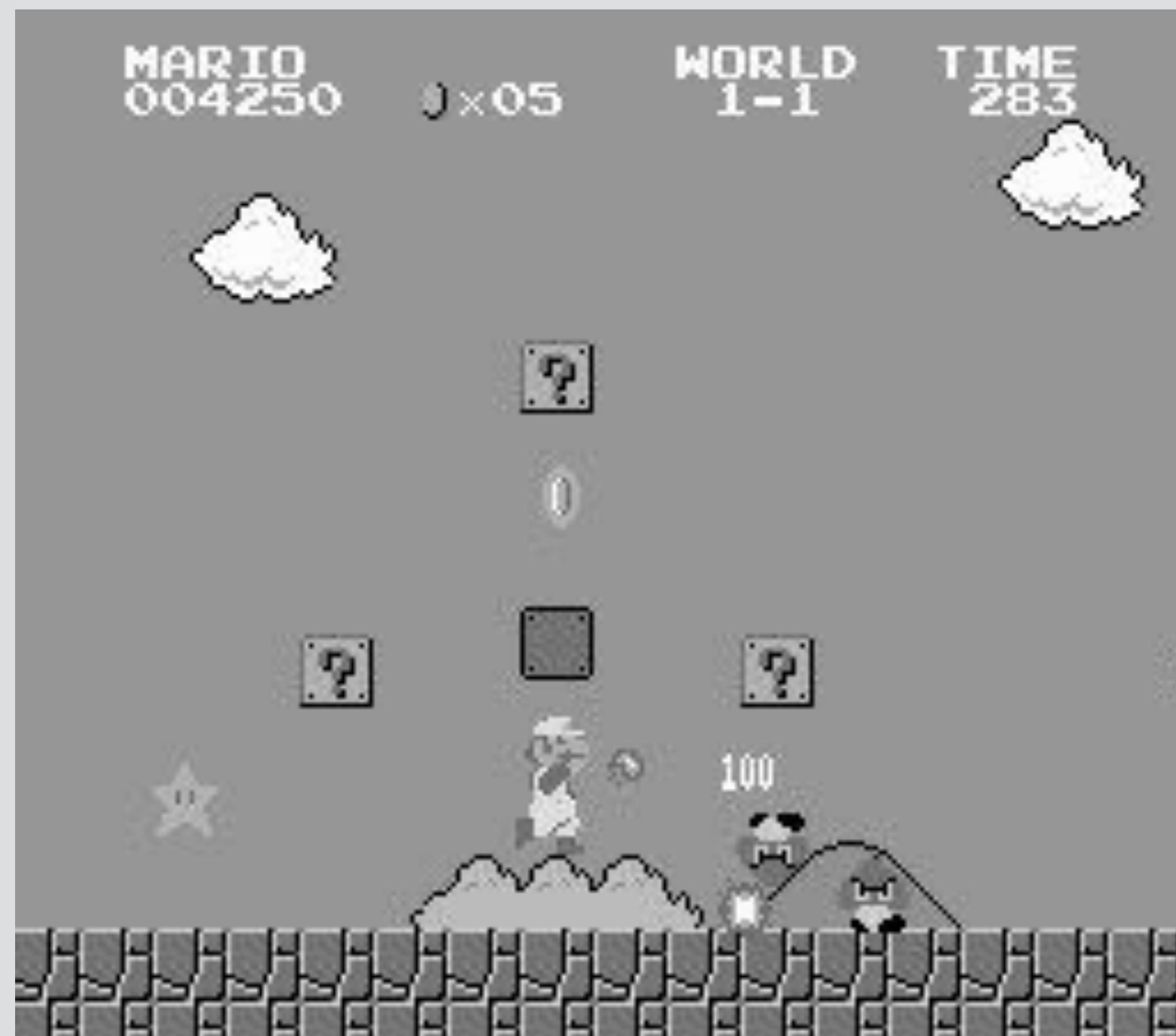


Platformer games.



Revisiting entities

```
class Entity {  
public:  
  
    void Draw(ShaderProgram *program);  
  
    float x;  
    float y;  
    float rotation;  
  
    int textureID;  
  
    float width;  
    float height;  
  
    float speed;  
    float direction_x;  
    float direction_y;  
};
```

Entities are a useful way for us to think about objects in the game.

```
class Entity {  
public:  
  
Entity();  
  
void Update(float elapsed);  
void Render(ShaderProgram *program);  
bool collidesWith(Entity *entity);  
  
SheetSprite sprite;  
float x;  
float y;  
  
float width;  
float height;  
  
float velocity_x;  
float velocity_y;  
  
float acceleration_x;  
float acceleration_y;  
};
```

Updating the Entity class.

```
class Entity {  
public:  
  
Entity();  
  
void Update(float elapsed);  
void Render(ShaderProgram *program);  
bool collidesWith(const Entity &entity);  
  
SheetSprite sprite;  
Vector3 position;  
Vector3 size;  
Vector3 velocity;  
Vector3 acceleration;  
};
```

Updating the Entity class.

Dynamic and static entities.

Dynamic: gravity
applied and checking
collisions with other
entities.



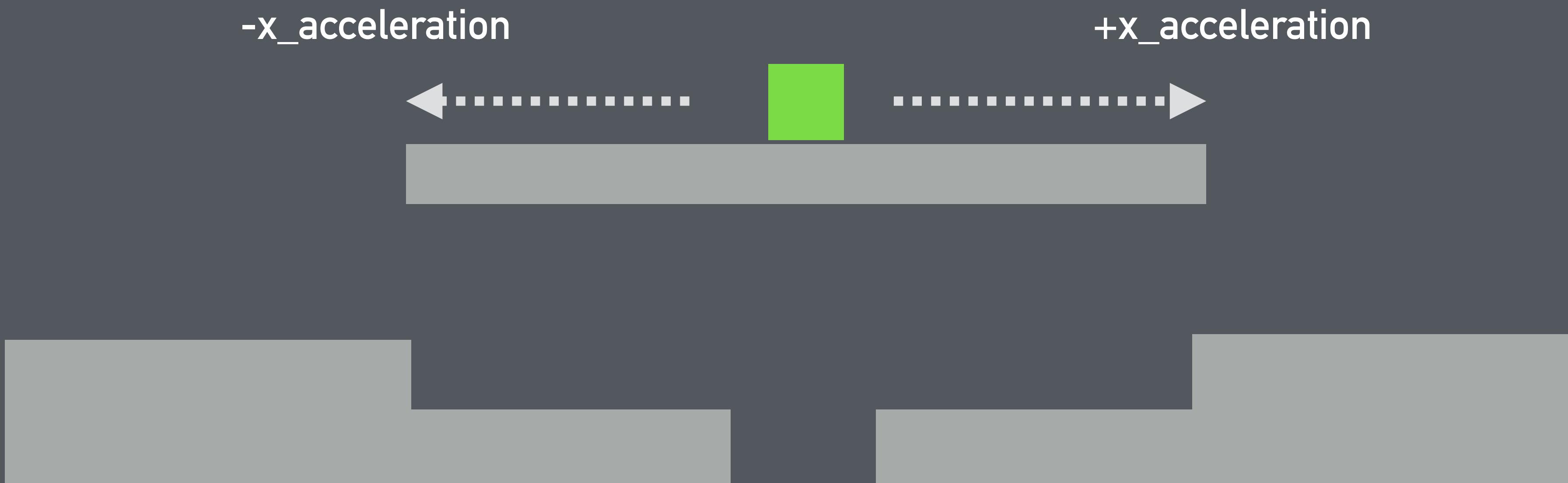
Static: No gravity, no
movement, no
collision checking!

```
class Entity {  
public:  
  
Entity();  
  
void Update(float elapsed);  
void Render(ShaderProgram *program);  
bool collidesWith(Entity *entity);  
  
SheetSprite sprite;  
  
float x;  
float y;  
  
float width;  
float height;  
  
float velocity_x;  
float velocity_y;  
  
float acceleration_x;  
float acceleration_y;  
  
bool isStatic;  
};
```

Adding a static
flag.

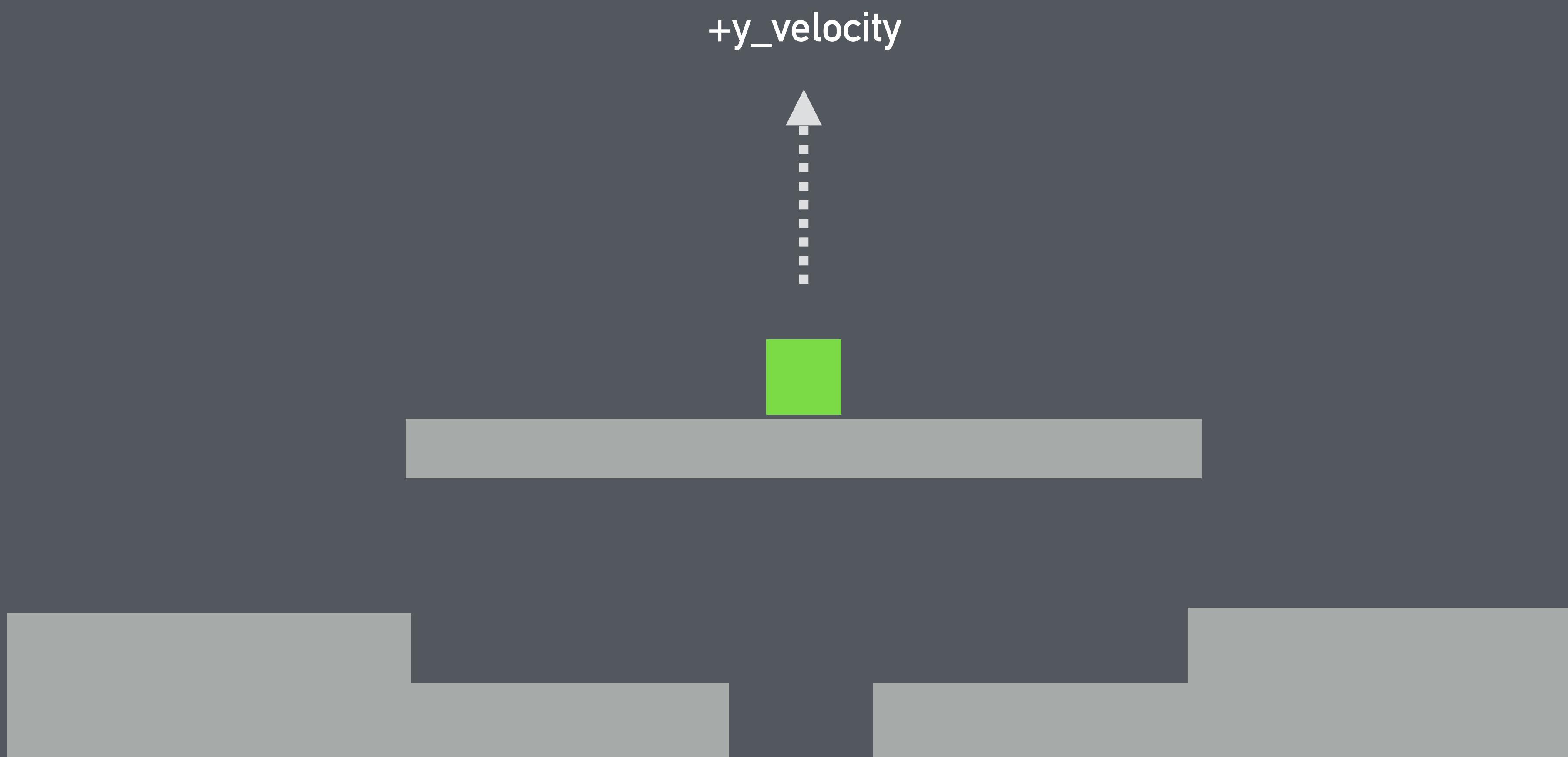
Movement

Set X acceleration to positive or negative
to move and to 0 to stop.



Jumping

Set Y velocity directly to jump.



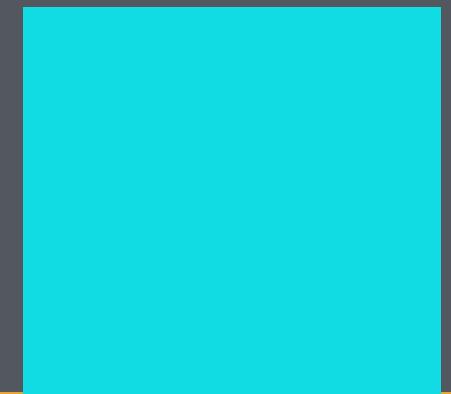
Entity types

```
enum EntityType {ENTITY_PLAYER, ENTITY_ENEMY,  
ENTITY_COIN};  
  
class Entity {  
public:  
  
Entity();  
  
void Update(float elapsed);  
void Render(ShaderProgram *program);  
bool collidesWith(Entity *entity);  
  
SheetSprite sprite;  
  
float x;  
float y;  
float width;  
float height;  
float velocity_x;  
float velocity_y;  
float acceleration_x;  
float acceleration_y;  
  
bool isStatic;  
EntityType entityType;  
};
```

Adding an entity type.

Type: ENTITY_ENEMY

Type: ENTITY_COIN



Type: ENTITY_COIN



Type: ENTITY_PLAYER



Type: ENTITY_COIN

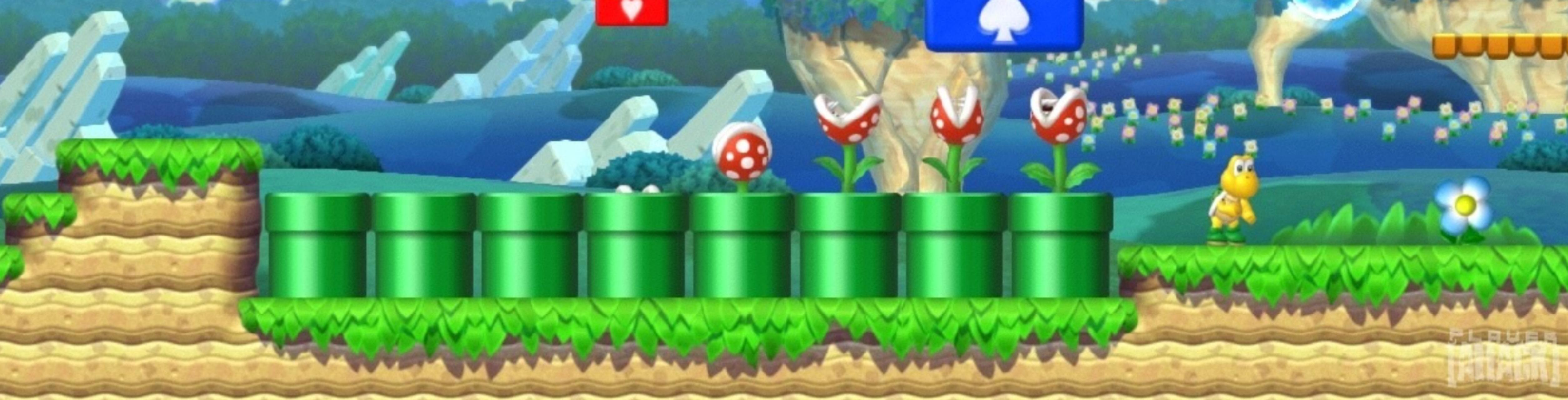


Check collision between all dynamic entities
and do something based on their types.

Platformer game breakdown.

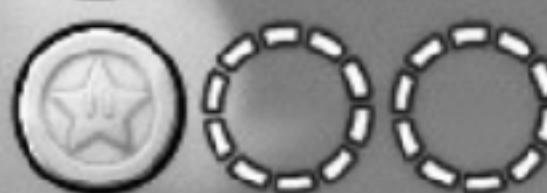
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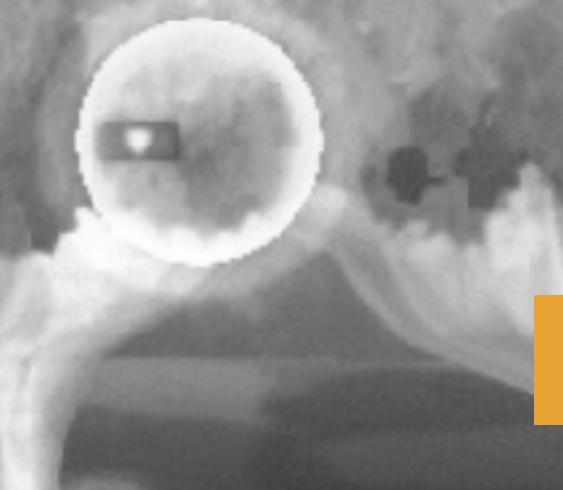
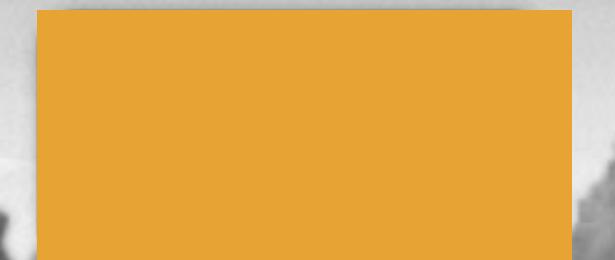
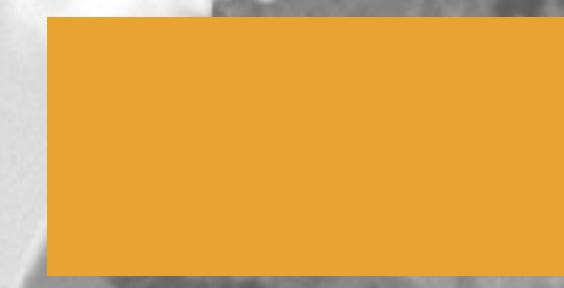


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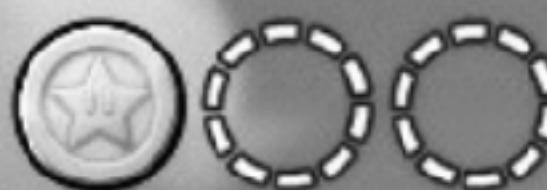
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L 203



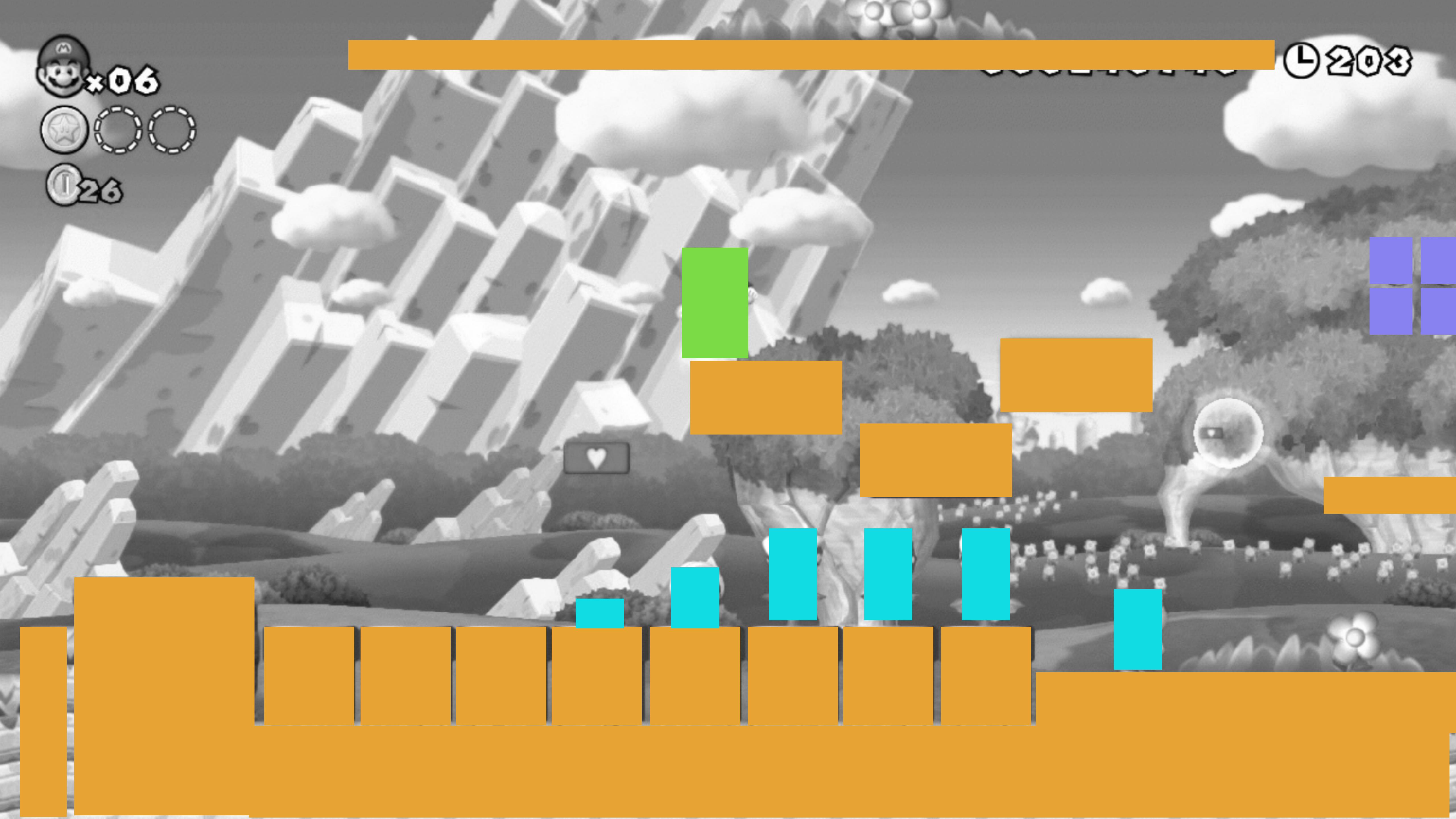


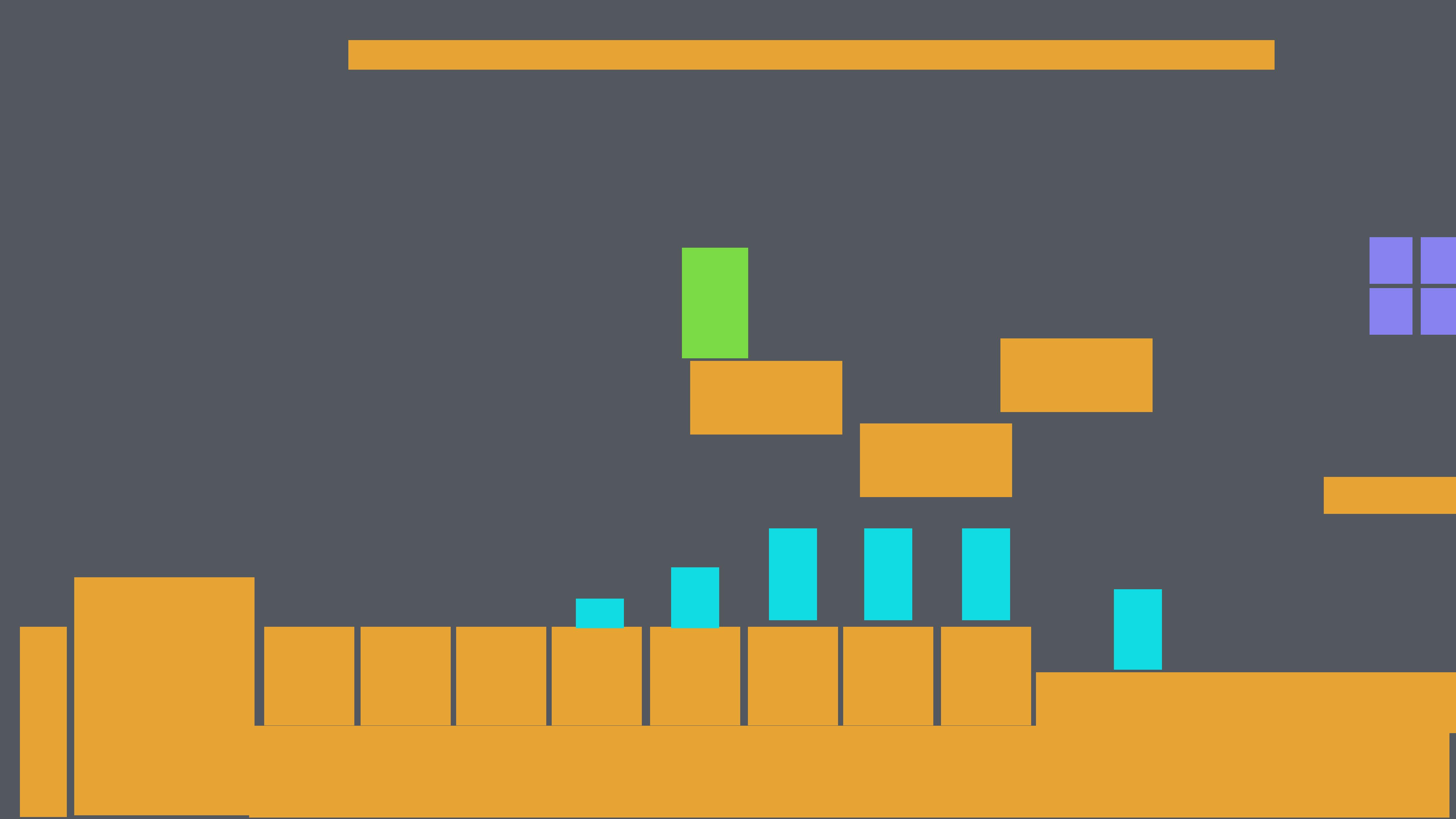
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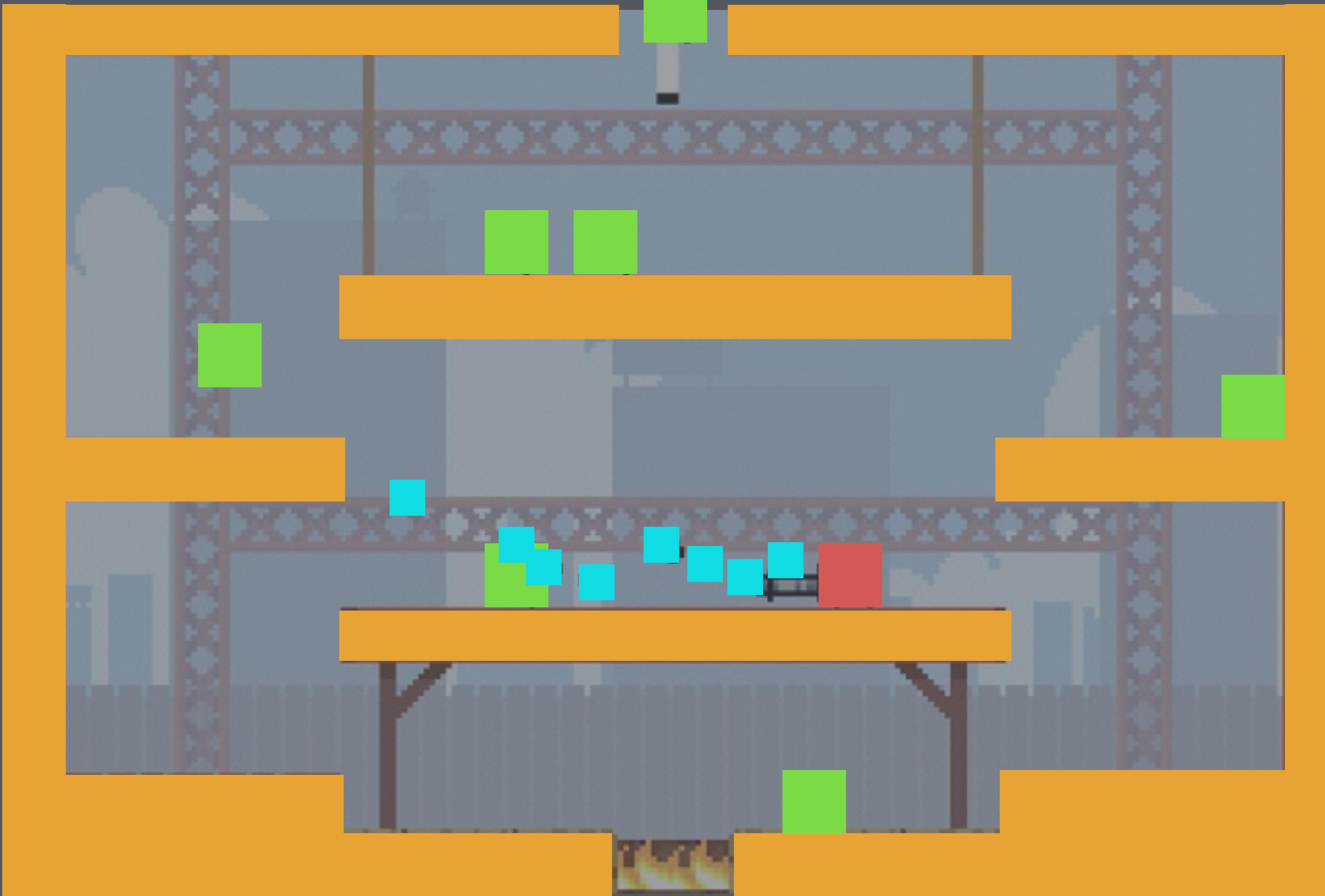


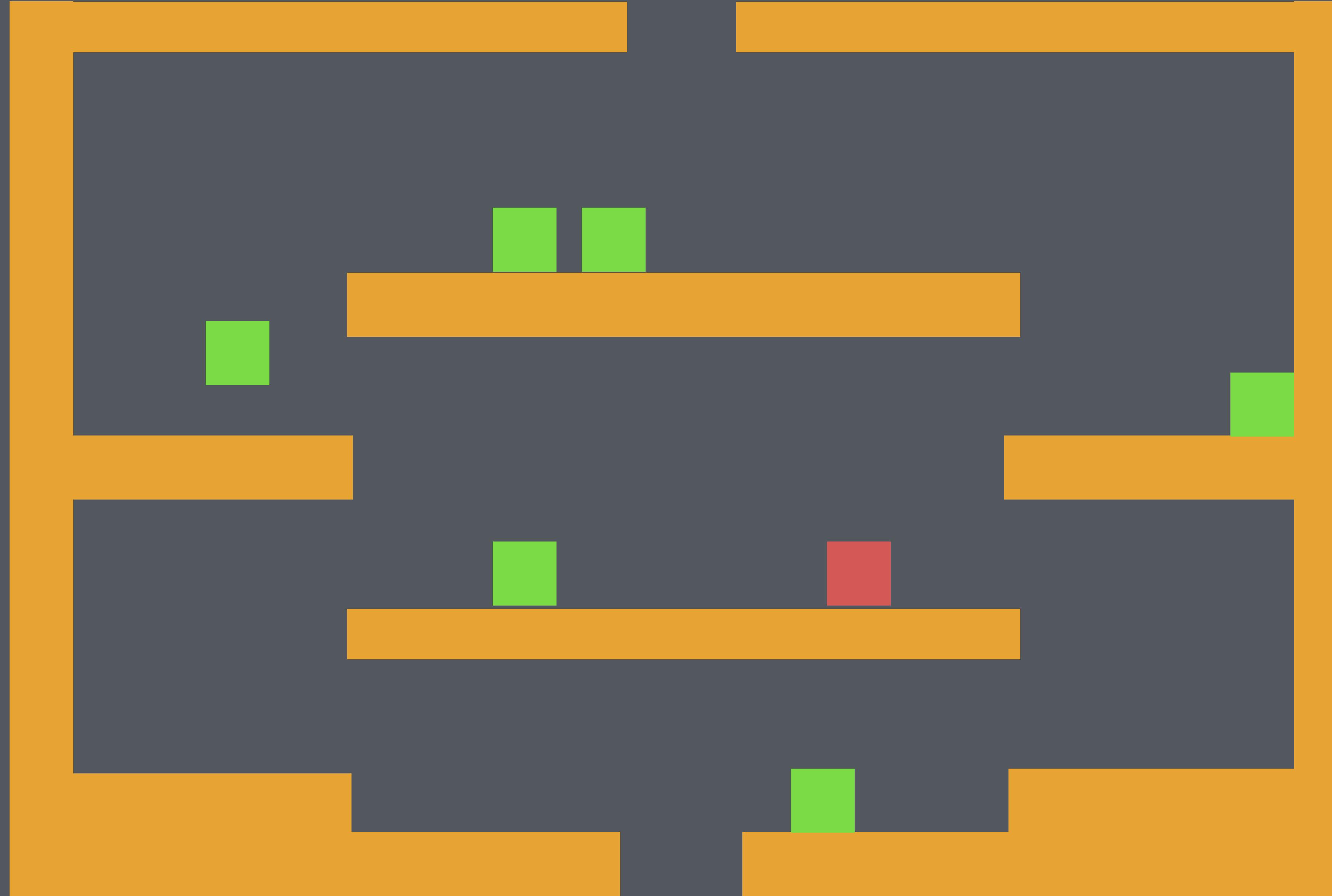
Building a single screen platformer.





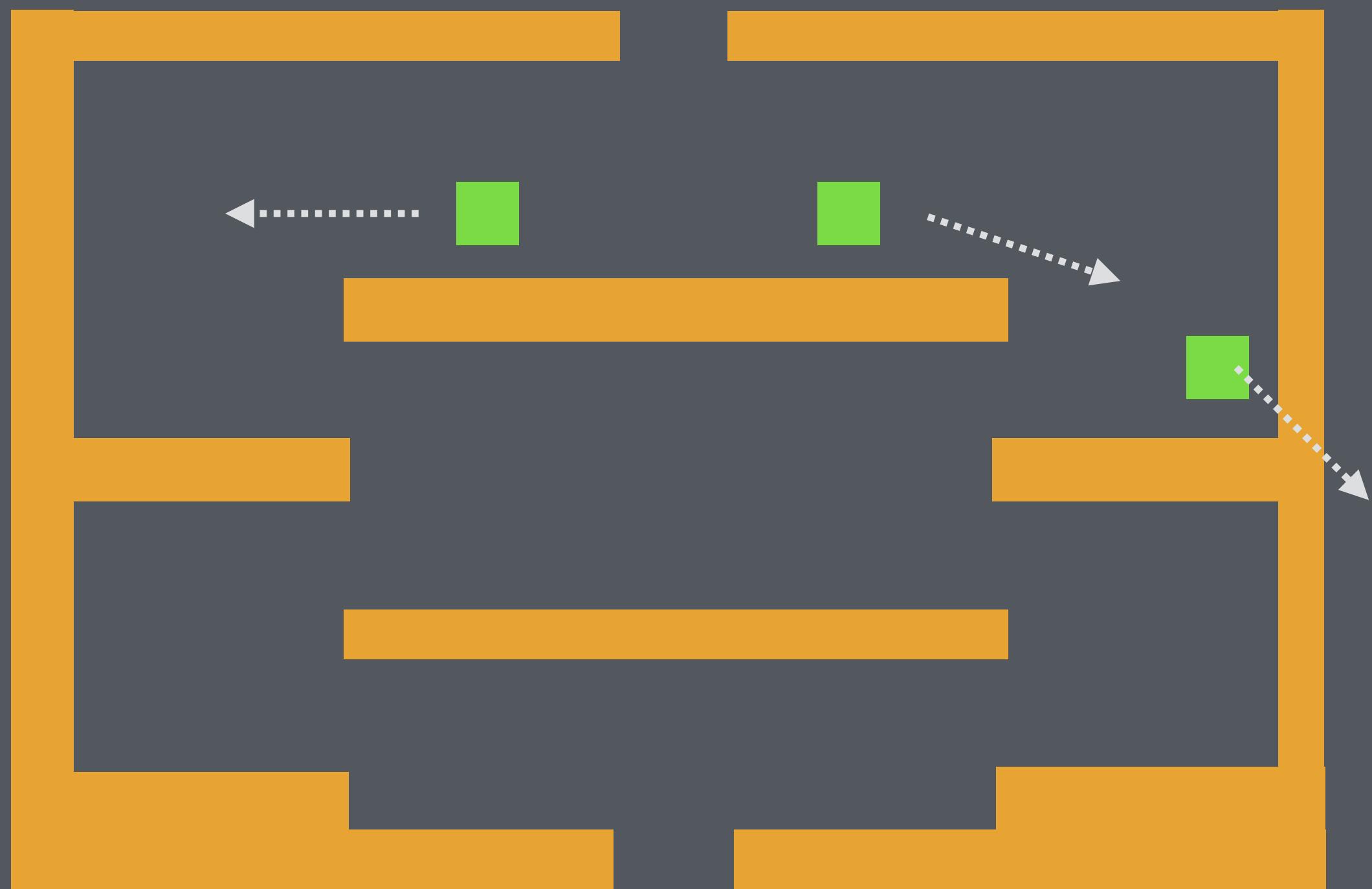




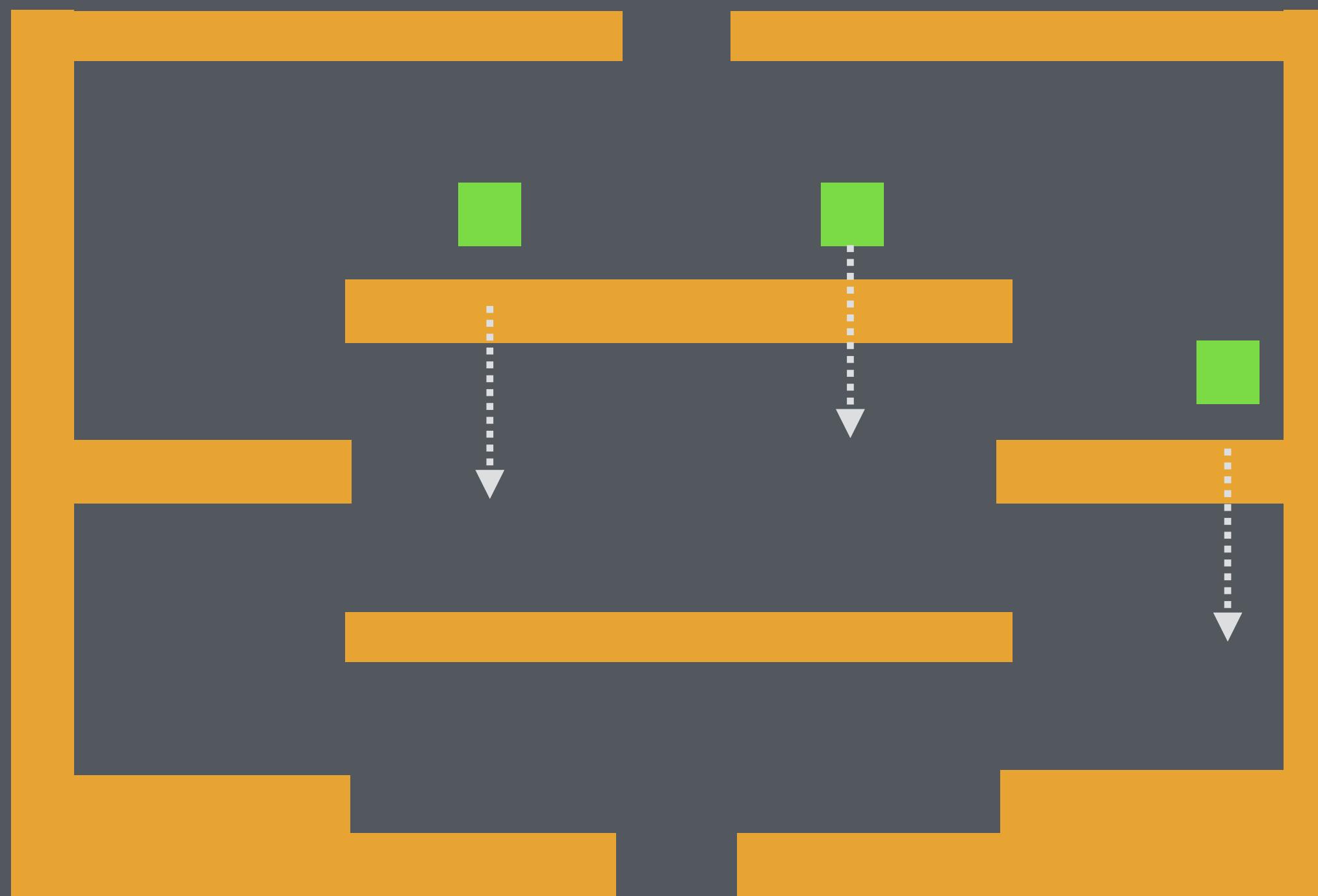


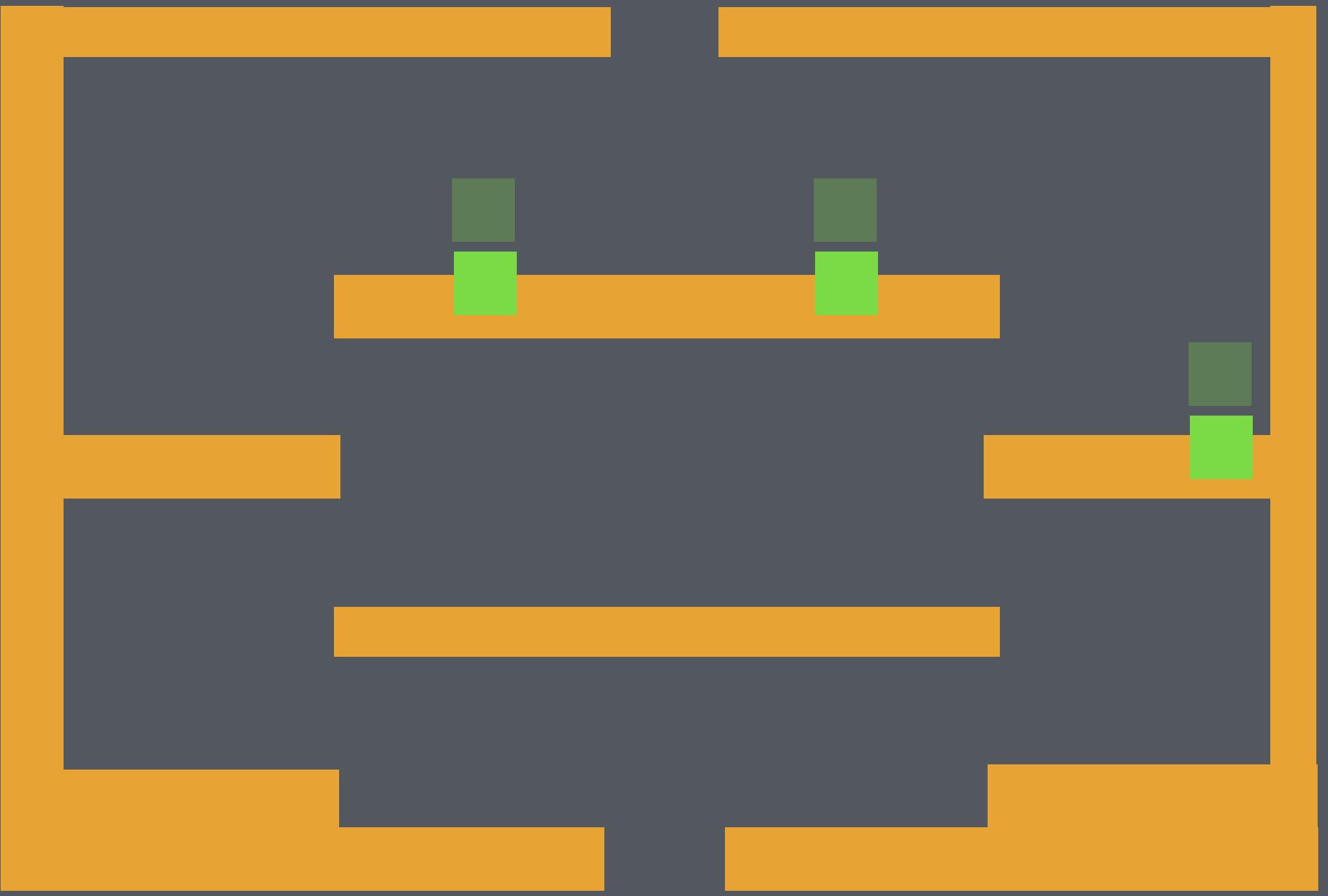
Putting it all together.

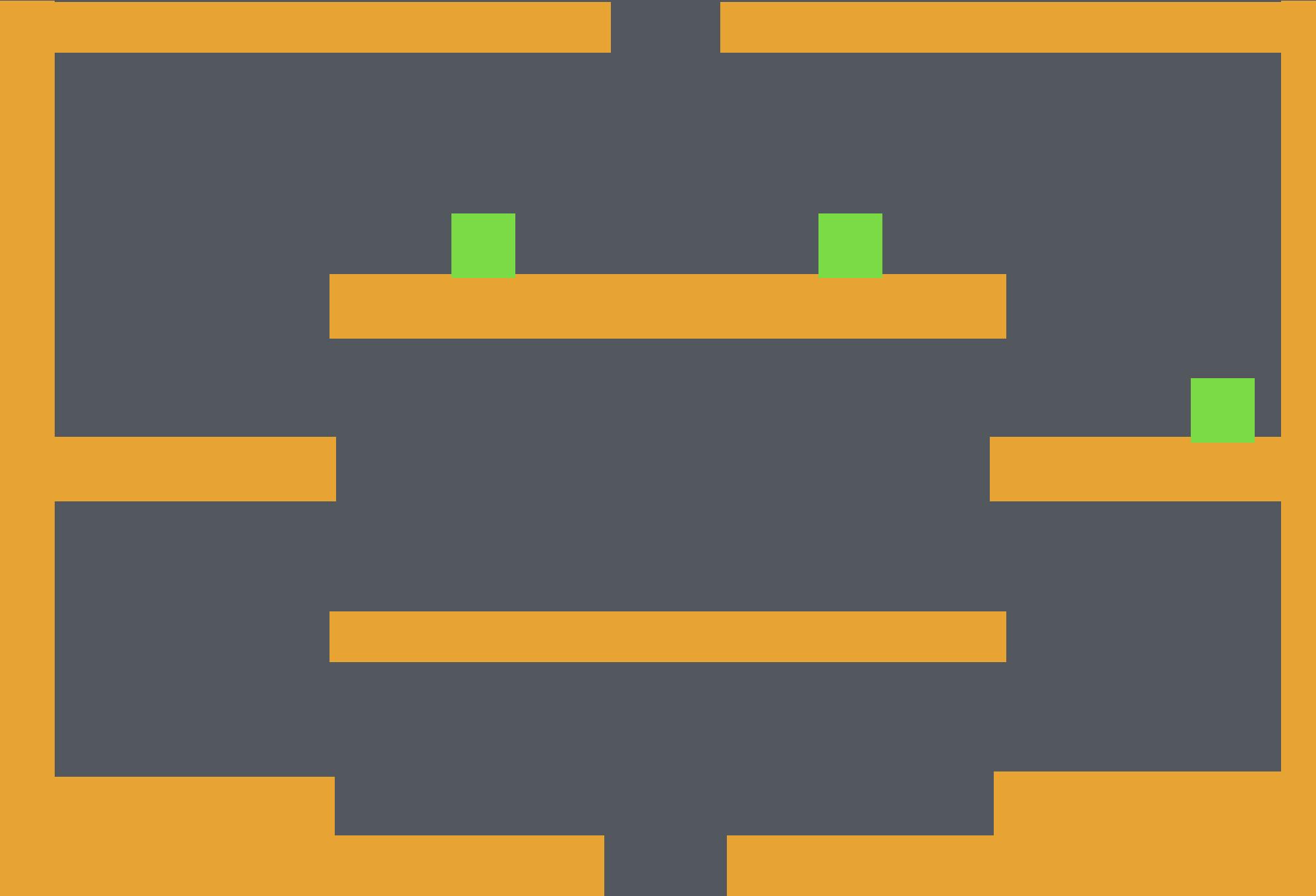
1. Apply **acceleration** and **friction** to velocity of dynamic entities.



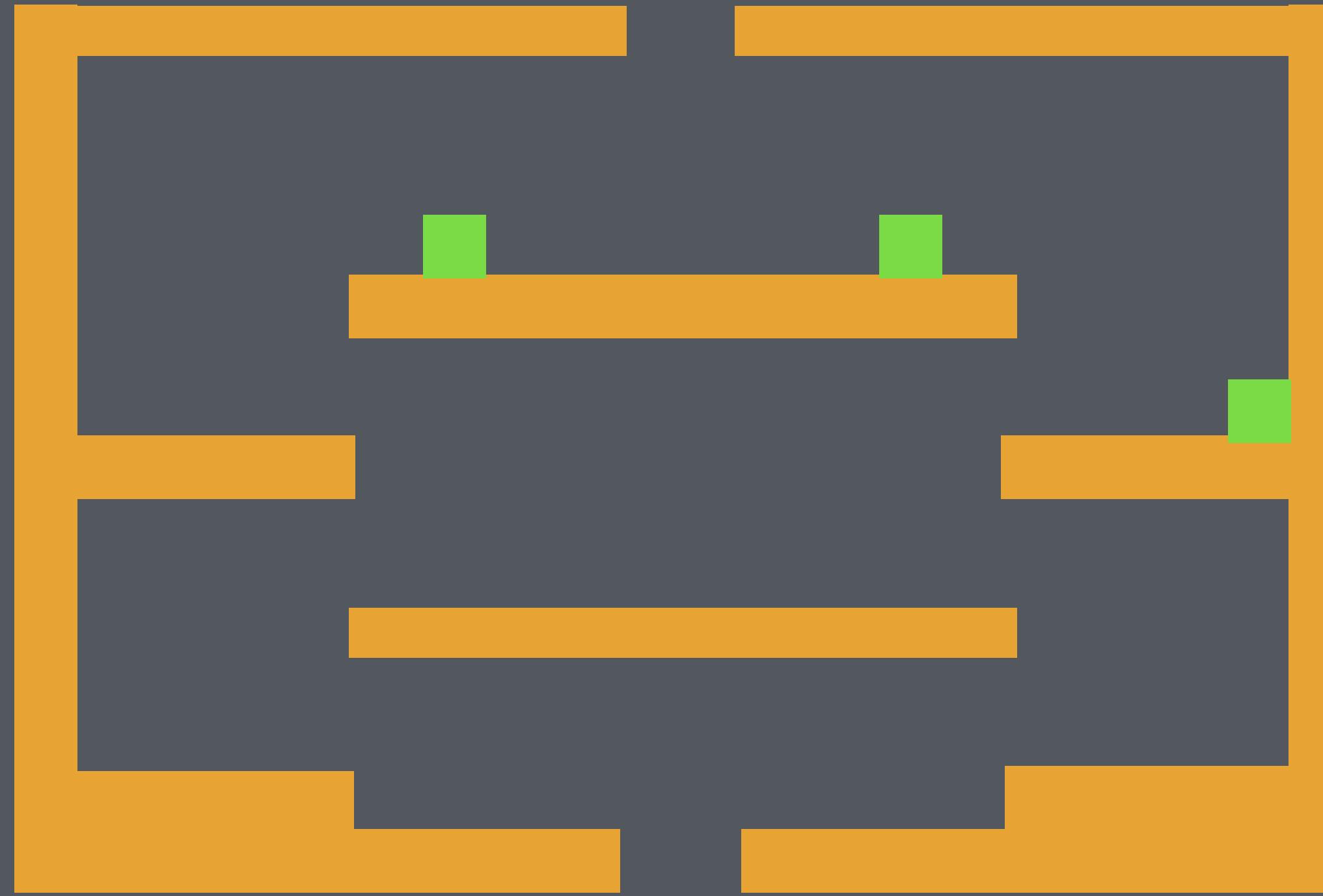
1. Apply **acceleration** and **friction** to velocity of **dynamic entities**.
2. Apply **gravity** to velocity of **dynamic entities**.



- 
1. Apply **acceleration** and **friction** to velocity of **dynamic entities**.
 2. Apply **gravity** to velocity of **dynamic entities**.
 3. Apply **ONLY Y-axis velocity** to **dynamic entity positions**.

- 
1. Apply **acceleration** and **friction** to velocity of **dynamic entities**.
 2. Apply **gravity** to velocity of **dynamic entities**.
 3. Apply **ONLY Y-axis velocity** to **dynamic entity positions**.
 4. For each **dynamic entity**, check collisions with **static entities** and adjust **Y-position** based on **penetration**. If **collided**, set **y-velocity** to 0.

-
1. Apply **acceleration** and **friction** to velocity of **dynamic entities**.
 2. Apply **gravity** to velocity of **dynamic entities**.
 3. Apply **ONLY Y-axis velocity** to **dynamic entity positions**.
 4. For each **dynamic entity**, check collisions with **static entities** and adjust **Y-position** based on penetration. If **collided**, set **y-velocity** to 0.
 5. Apply **ONLY X-axis velocity** to **dynamic entity positions**.



1. Apply **acceleration** and **friction** to velocity of **dynamic entities**.
2. Apply **gravity** to velocity of **dynamic entities**.
3. Apply **ONLY Y-axis velocity** to **dynamic entity** positions.
4. For each **dynamic entity**, check collisions with **static entities** and adjust **Y-position** based on penetration. If **collided**, set **y-velocity** to **0**.
5. Apply **ONLY X-axis velocity** to **dynamic entity** positions.
6. For each **dynamic entity**, check collisions with **static entities** and adjust **X-position** based on penetration. If **collided**, set **x-velocity** to **0**.

Contact flags

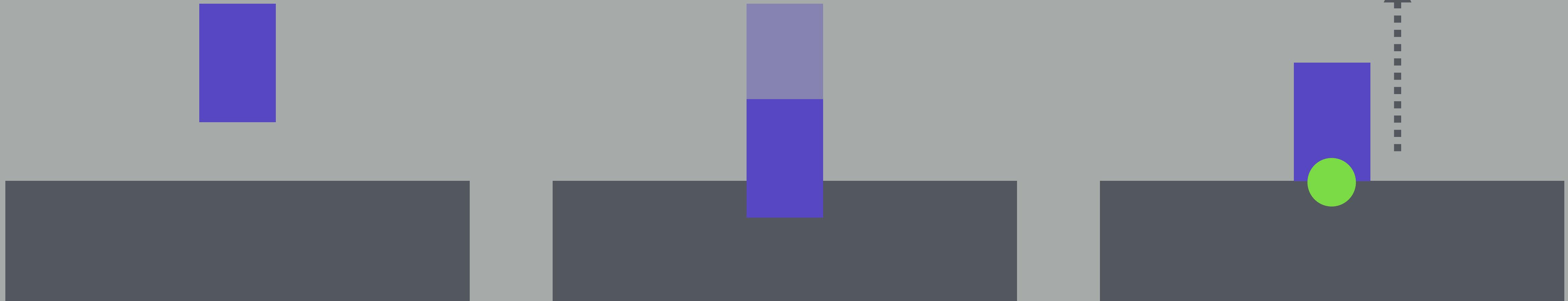
4 boolean flags, one for each side.



```
bool collidedTop;  
bool collidedBottom;  
bool collidedLeft;  
bool collidedRight;
```

```
collidedTop = false;  
collidedBottom = false;  
collidedLeft = false;  
collidedRight = false;
```

Set to false on every frame.

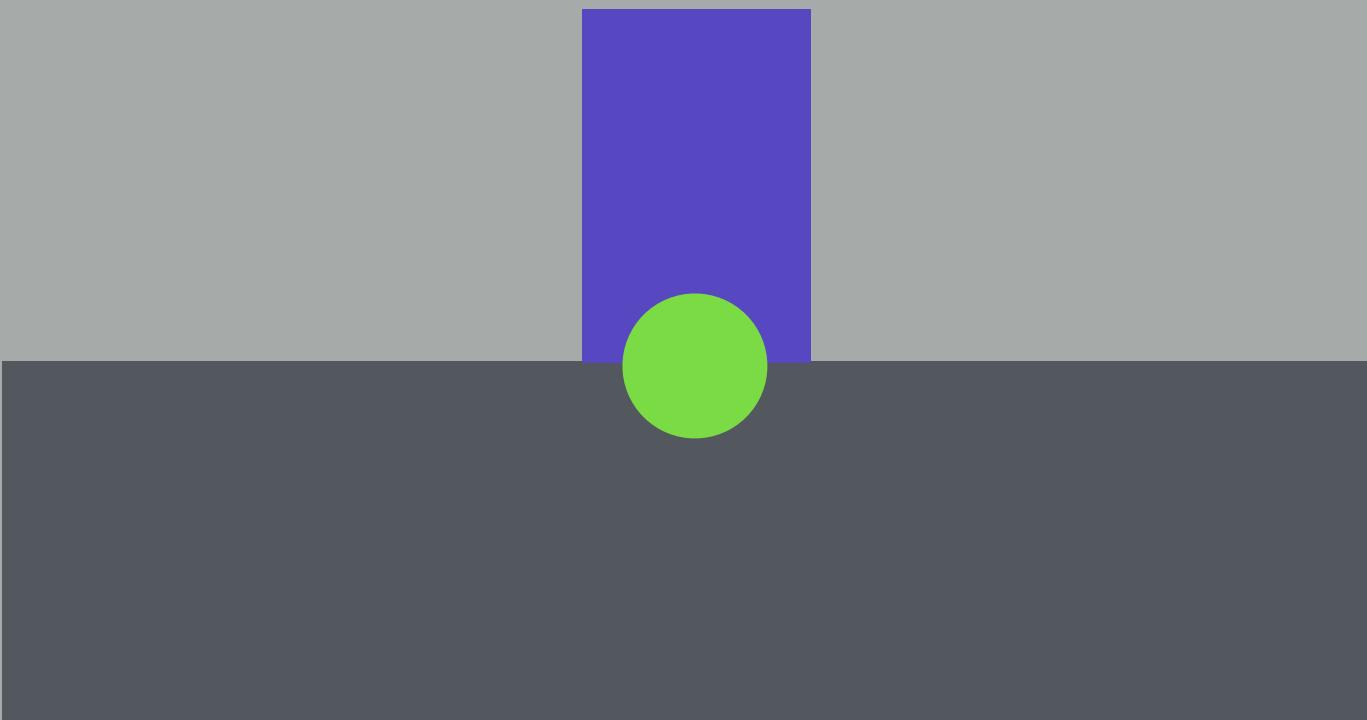


```
collidedBottom = true;
```

Set to true based on collision direction.

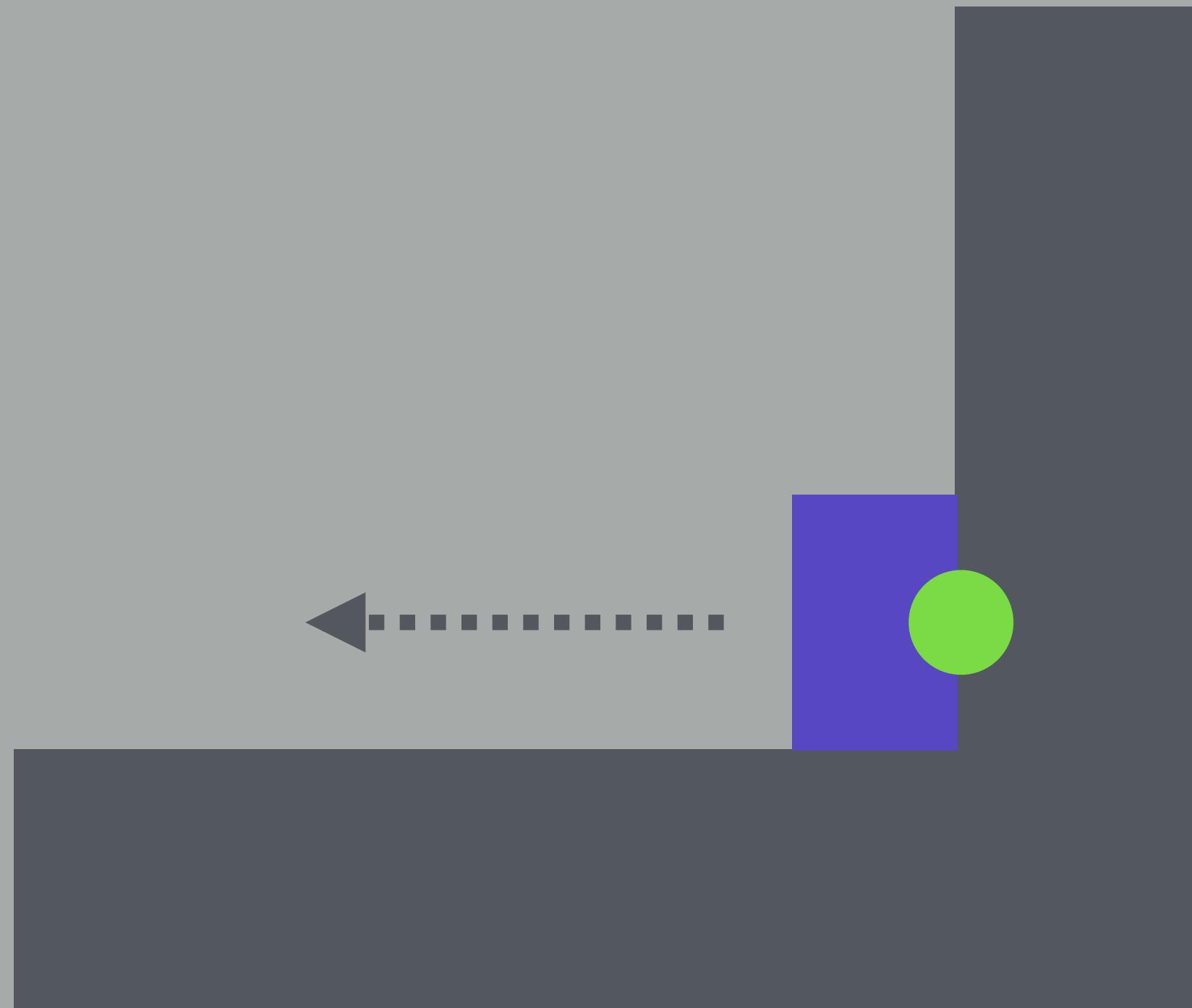
Using contact flags

Detecting if you are standing on the ground.
(Jump only when bottom contact flag is true)



Simple NPC entities that turn around when they hit a wall.

(Constantly apply **x acceleration**, when **left or right contact flag** is **true**, reverse **the x acceleration**)



```
enum EntityType {ENTITY_PLAYER, ENTITY_ENEMY,  
ENTITY_COIN};  
  
class Entity {  
public:  
  
Entity();  
  
void Update(float elapsed);  
void Render(ShaderProgram *program);  
bool collidesWith(Entity *entity);  
  
SheetSprite sprite;  
  
float x;  
float y;  
float width;  
float height;  
float velocity_x;  
float velocity_y;  
float acceleration_x;  
float acceleration_y;  
  
bool isStatic;  
EntityType entityType;  
  
bool collidedTop;  
bool collidedBottom;  
bool collidedLeft;  
bool collidedRight;  
};
```

Final entity properties.