# Platform Games

Computer Games Development

CSCU9N6

# Introduction

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  - Drawing Sprites
  - Collision Detection
  - Animation Loop

## 2D Platform Games

The 2D Platform Game

- Player moves through a scrolling world running and jumping between platforms, picking up power-ups and being chased by creatures
- Examples: Sonic the Hedgehog, Super Mario Brothers
- Same principles for a variety of games
- Puzzles, monsters & power ups make the difference

Core Elements

- The player: a sprite
- The game world: a tile map + scrolling background image
- Power ups: animated tiles in the game map or sprites
- Monsters: more sprites
- Collision handler

# Drawing the Game World

We have a number of choices for the game world:

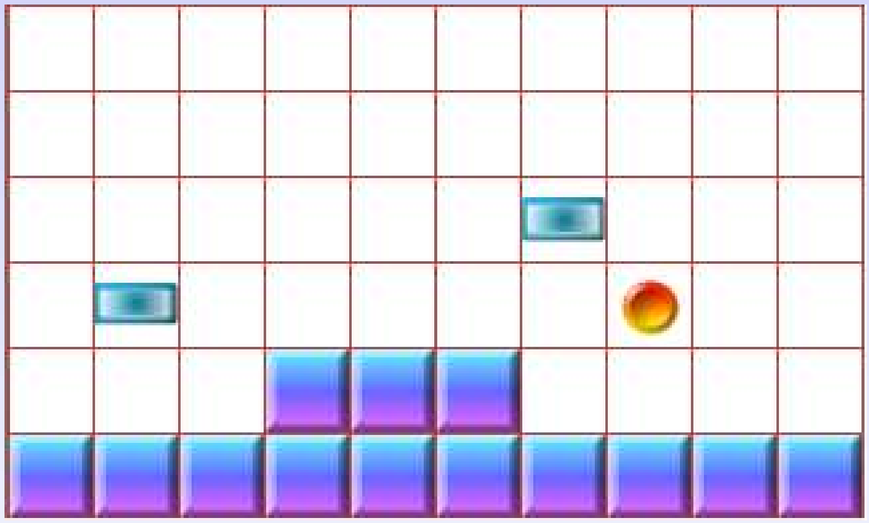
- Draw a complete image of the entire 2D game world and show the player the bit they are on
  - High memory requirement
  - Requires specific code to detect if the player has collided with relevant parts of the image
- Compose the game world from a small number of tiles
  - Low memory requirement
  - Very flexible
  - Provides useful context information for collision detection

We will look at Tile Maps (DGJ p222-p237)

# Tile Maps

## Tile Maps

- A tile map consists of a coded grid where each symbol in the grid is represented by a particular tile in the game
- The complete map is loaded into a 2D array where each cell <u>references</u> the relevant image
- The section of the tile map the player is on is then displayed
- Very compact representation
- Very flexible
  - It is very easy to alter map cells during the game
- Each game level uses a different map



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# Tile Maps

## Code Requirements

- Load a Tile Map
- Display Tile Map
- Alter Tile Map

# Loading A Tile Map

## Example Tile Map Format

```
10 5 32 32
// The first line should contain the width and height of the
// map and the width and height of each tile. A list of character to
// tile mappings is then provided where each character is preceded by a
// # character. The dot character always defaults to a blank space
// Note that the referenced files should be in the same directory as the
// tile map.
#b=orangeblock.png
#c=greencircle.png
#g=glasses.png
// The actual tile map is preceded by the #map line
#map
bbbbbbbbbb
b........b
b..g.....b
bccccccccb
bbbbbbbbbb
```

# Loading a Tile Map

## Java Code (from handout)

```
public boolean loadMap(String folder, String mapfile)
{
... Read in the map and tile dimensions
... Read in the character to tile mappings and store them

// Now read in the tile map structure
if (trimmed.startsWith("#map"))
{
  int row=0;
  while ((line = in.readLine()) != null)
  {
    if (line.trim().startsWith("//")) continue;

    for (int col=0; col<mapWidth && col<line.length(); col++)
      tmap[col][row] = new Tile(line.charAt(col),col*tileWidth,row*tileHeight);
    row++;
  }
}
...
}
```

## Displaying a Tile Map

### Java Code (from handout)

```java
public void draw(Graphics2D g, int xoff, int yoff)
{
  if (g == null) return;

  Image img=null;
  Rectangle rect = (Rectangle)g.getClip();
  int xc,yc;

  for (int r=0; r<mapHeight; r++)
  {
    for (int c=0; c<mapWidth; c++)
    {
      img = getTileImage(c, r);
      if (img == null) continue;
      xc = xoff + c*tileWidth;
      yc = yoff + r*tileHeight;

      // Only draw the tile if it is on screen, otherwise go back round the loop
      if (xc+tileWidth < 0 || xc >= rect.x + rect.width) continue;
      if (yc+tileHeight < 0 || yc >= rect.y + rect.height) continue;
      g.drawImage(img,xc,yc,null);
    }
  }
}
```

## Altering a Tile Map

### Java Code (from handout)

```
public char getTileChar(int x, int y)
{
  if (!valid(x,y)) return '?';
  return tmap[x][y].getCharacter();
}

public boolean setTileChar(char ch, int x, int y)
{
  if (!valid(x,y)) return false;
  tmap[x][y].setCharacter(ch);
  return true;
}
```

# Sprites & Tile Maps

A common task will be to work out which tiles a sprite is colliding with. It will usually be sitting on more than one tile but we consider the simple case first by looking at the top left corner of a sprite.

- First we find the sprite's top left coordinates:
  - sx = s.getX(), sy = s.getY()
- Then we find out how wide and how tall a tile is
  - tileWidth = tmap.getTileWidth(), tileHeight = tmap.getTileHeight()
- If we divide the sprite's x coordinate by the width of a tile, we will get the number of tiles across the x axis that the sprite is positioned at
  - xtile = (int)(sx / tileWidth)
- The same applies to the y coordinate
  - ytile = (int)(sy / tileHeight)
- Example:
  - sx = 35, sy = 22
  - tileWidth = 10, tileHeight = 10
  - xtile = 35/10 = 3
  - ytile = 22/10 = 2
  - If you count from 0...
- Note: You will need to look at each corner of your sprite.