BiScheme Level JSON Guide

Level Files

The JSON files for levels can be specified in one of two formats:

- As files within the `levels\` directory

  e.g. `levels\example.json`

- As their own directory within the `levels\` directory. When a level is specified within its own directory the core file for the level should be named `info.json`

  e.g. `levels\example1\info.json`

Level JSON Guide

The following are required within the Level JSON:

- "**name**" – The in-game display name for the level.
  e.g. `"name": "Example Level",`
- "**id**" – The unique integer identifier for the level.
  e.g. `"id": 0,`
- "**prerequisites**" – An array of ids of levels that must be completed prior to the level becoming available.
  e.g. `"prerequisites": [1, 2],`
- "**colourPrimary**" – Hex code for the level's PRIMARY colour.
  e.g. `"colourPrimary": "ffffff",`
- "**colourSecondary**" – Hex code for the level's SECONDARY colour.
  e.g. `"colourSecondary": "000000",`
- "**initRoomID**" – The id for the room of the level where the player starts.
  e.g. `"initRoomID": 0,`
- "**rooms**" – An array of either Room JSON or an array of Strings denoting the file names which hold the level's Room JSON.
  e.g. `"rooms": ["room0.json", "room1.json", "room2.json"]`

Room JSON Guide

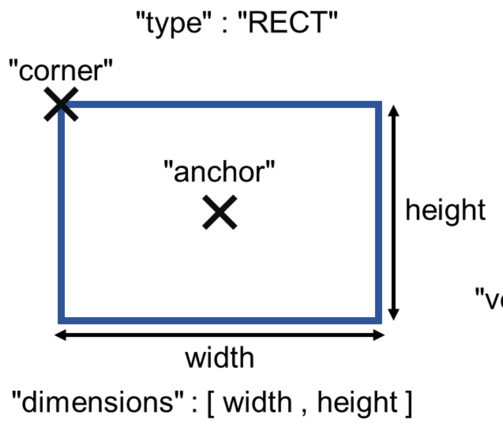
Whether they are specified within the "rooms" array within Level JSON or within separate room files, the Room JSON requires the following:

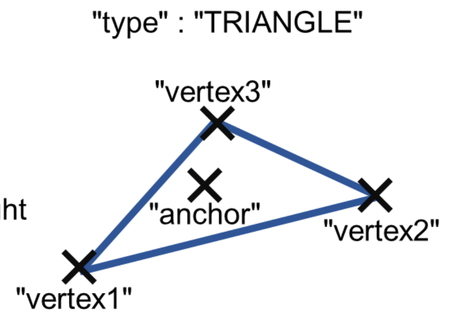
- "**id**" – The unique integer identifier for the room.
  e.g. `"id": 0,`
- "**dimensions**" – An array of numbers specifying the width (x-axis) and height (y-axis) of the room. Minimum dimensions of [16, 10] are recommended but not enforced.
  e.g. `"dimensions": [16, 10],`
- "**spawnPosition**" – An array of two floats specifying the position within the room at which the player will spawn/respawn.
  e.g. `"spawnPosition": [1.5, 7.5],`
- "**geometry**" – An object containing two arrays, "primary" and "secondary" which each contain geometry objects (see Geometry Guide)
  e.g.
  ```
  "geometry": {
      "primary": [],
      "secondary": []
    }
  ```
- "**adjacent**" – An array of adjacent objects (see Adjacency Guide)
  e.g. `"adjacent": [],`
- "**objects**" – An array of room objects (see Room Object Guide)
  e.g. `"objects": [],`

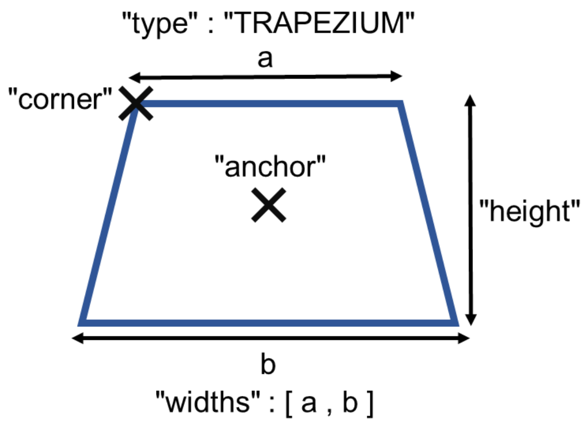
Geometry Guide

The geometry of a room concerns the two monochromatic regions which comprise its structure, the primary region coloured with the level's primary colour and the secondary region coloured with the level's secondary colour. These two regions are determined by the geometry objects of the arrays "primary" and "secondary".

Each geometry object requires a "type" which is either "RECT", "TRIANGLE" or "TRAPEZIUM". Each type requires its own parameters.







"RECT"

RECT defines a rectangle; each rectangle takes a "**dimension**" vector defining the width and height of the rectangle. The rectangle may also take a "**orientation**" value which defines the rectangle's rotation around its centre.

To define the position of the rectangle, either "**corner**" or "**anchor**" must be supplied. If "**anchor**" is provided then the rectangle is positioned with its centre at "**anchor**". If "**corner**" is provided then the rectangle is positioned with its top-left corner at "**corner**" (then it is rotated around its centre by a provided "orientation").

e.g. The following two specifications describe the same rectangle:

```
 {
  "type": "RECT",
  "anchor": [5, 6],
  "dimensions": [2, 3],
  "orientation": 0.7854
}
{
  "type": "RECT",
  "corner": [4, 4.5],
  "dimensions": [2, 3],
  "orientation": 0.7854
}
```

"TRIANGLE"

TRIANGLE defines a triangle and such triangles may be specified in two ways. Firstly 3 vertices "**vertex1**", "**vertex2**", and"**vertex3**" may be specified relative to a central "**anchor**". Or 2 vertices "**vertex1**" and "**vertex2**", may be specified relative to a third vertex "**corner**".

e.g. The following two specifications describe the same triangle:

```
{
  "type": "TRIANGLE",
  "anchor": [5, 5],
  "vertex1": [0, 1],
  "vertex2": [1, -1],
  "vertex3": [-1, -1],
}
    {
  "type": "TRIANGLE",
  "corner": [5, 6],
  "vertex1": [1, -2],
  "vertex2": [-1, -2]
}
```

"**TRAPEZIUM**"

TRAPEZIUM defines a trapezium; each trapezium takes a "**widths**" vector (describing the widths of its upper and lower parallel edges) and a "**height**" value ("**height**" is optional and defaults to 1 if not provided). The trapezium may also take a "**orientation**" value which defines the trapezium's rotation around its centre.

To define the position of the trapezium, either "**corner**" or "**anchor**" must be supplied. If "**anchor**" is provided then the trapezium is positioned with its centre at "**anchor**". If "**corner**" is provided then the trapezium is positioned with its top-left corner at "**corner**" (then it is rotated around its centre by a provided "orientation").

e.g. The following two specifications describe the same trapezium:

```
{
  "type": "TRAPEZIUM",
  "anchor": [4, 4],
  "widths": [2, 3],
  "height": 1,
  "orientation": 0.5
}
{
  "type": "RECT",
  "corner": [3, 3.5],
  "widths": [2, 3],
  "height": 1,
  "orientation": 0.5
}
```

When defining a piece of geometry, additional **optional** physical properties may be defined.

- "**restitution**" – Determines the elasticity of collisions, defaults to 0.0 when not specified.
  e.g. `"restitution": 0.0,`
- "**staticFriction**" – Defaults to 1.0 when not specified.
  e.g. `"staticFriction": 0.8,`
- "**dynamicFriction**" – Defaults to 1.0 when not specified.
  e.g. `"dynamicFriction": 0.5,`

Lastly, it is important when defining the "primary" and "secondary" geometry arrays that the ENTIRE room is covered in geometry AND that there is NO OVERLAP between the two regions (geometry of the same region can overlap). Such constraints cannot be checked (easily) and therefore it is not enforced during parsing.

Adjacency Guide

Rooms are connected through Adjacent objects which are specified in a room's "**adjacent**" array. Adjacency objects are both the entrances and exits to remove, each Adjacency is linked to another Adjacency and when a player reaches the Adjacency (on a collision) the room is switched to the linked Adjacency's room and they are positioned in the new room relative to the linked Adjacency.

Adjacency objects are positioned at the edges of rooms so it appears to the player that they are simply walking between rooms. Adjacency objects do not need to be linked in pairs; multiple Adjacency objects may link to a single exit Adjacency.

Each adjacency requires 4 parameters:

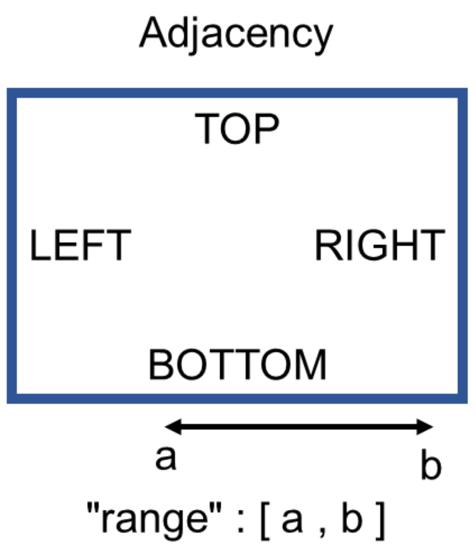
- "**id**" – A unique integer to identify the Adjacency from all other Adjacency objects and Room objects.
  e.g. `"id": 0,`
- "**colour**" – The colour which the player must be to pass through the Adjacency. Two linked Adjacency objects must have the same colour. The values of "**colour**" can be either PRIMARY or SECONDARY.
  e.g. `"colour": "PRIMARY",`
- "**side**" – The side of the room which the Adjacency lies along. Side is either LEFT, RIGHT, TOP or BOTTOM. Linked Adjacency objects must have opposite sides (LEFT links to RIGHT, TOP links to BOTTOM).
  e.g. `"side": "TOP",`
- "**range**" – Is a vector describing the start and end positions of the Adjacency along its respective side. Linked Adjacency objects must have the same different between their start and end range positions. ([0, 5] and [3, 8] would link but [0,5] and [3,6] would not)
  e.g. `"range": [0, 5]`

To link an adjacency to another room, 2 additional parameters must be provided.

- "**destRoomId**" – The unique identifier of the room which the adjacency links to.
  e.g. `"destRoomId": 1,`
- "**linkId**" – The unique identifier of the Adjacency in the destination room which the Adjacency links to.
  e.g. `"linkId": 0,`

e.g. Two rooms with a one-way Adjacency link would be.

```
"rooms":[
    {
      "id": 0,
      "adjacent": [{
        "id": 0,
        "colour": "SECONDARY",
        "side": "LEFT",
        "range": [4, 8],
        "destRoomId": 1,
        "linkId": 5
      }]
    },
    {
      "id": 1,
      "adjacent": [{
        "id": 5,
        "colour": "SECONDARY",
        "side": "RIGHT",
        "range": [2, 6]
      }]
    }
```



Room Object Guide

Room objects are the components of a room which display properties beyond the static geometry that has been described.

Each room object requires 4 parameters:

- "**id**" – A unique integer to identify the Room Object from all other Room Objects and Adjacency objects.
  e.g. `"id": 0,`
- "**type**" – The type of Room Object, the following options are available and described later. GEOMETRY, BLOCK, DOOR, LEVER, SPIKE, PORTAL, EXIT, and CUSTOM.
  e.g. `"type": "BLOCK",`

- "**colour**" – The colour of the Room Object. The PORTAL and EXIT types of Room Object do not use or require "**colour**". The values of colour can be either PRIMARY or SECONDARY.
  e.g. `"colour": "PRIMARY",`
- "**anchor**" – The position of the Room Objects centre in the room. For some types, BLOCK, DOOR, and some "**gType**" variations of GEOMETRY and CUSTOM, "**anchor**" may be replaced with "**corner**". "**anchor**" is not required for the EXIT "**gType**".
  e.g. `"range": [0, 5]`

When defining any Room Object, additional **optional** physical properties may be defined.

- "**restitution**" – Determines the elasticity of collisions, defaults to 0.0 when not specified.
  e.g. `"restitution": 0.0,`
- "**staticFriction**" – Defaults to 1.0 when not specified.
  e.g. `"staticFriction": 0.8,`
- "**dynamicFriction**" – Defaults to 1.0 when not specified.
  e.g. `"dynamicFriction": 0.5,`

"GEOMETRY"

GEOMETRY Room Objects allow for creating additional pieces of geometry which are not held to the constraints described in Geometry Guide (i.e. they can overlap with the geometry of different colours).

The type of the GEOMETRY object is specified by "**gType**", which takes the values RECTANGLE, TRIANGLE, TRAPEZIUM, CIRCLE, ELLIPSE and POLYGON. Depending on the value of "**gType**", additional fields must be provided.

RECTANGLE, TRIANGLE and TRAPEZIUM use the same parameters described for their respective shapes in Geometry Guide.

CIRCLE uses the provided "**anchor**" and a "**radius**".

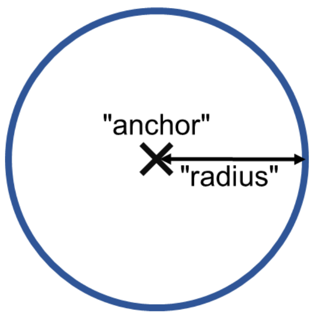
ELLIPSE uses the provided "**anchor**" and a "**dimensions**" vector to describe the width and height of the ellipse. The ellipse may also take an "**orientation**" value which defines the ellipse's rotation around its centre.

POLYGON defines a regular polygon defined around the provided "**anchor**". It takes "**sides**" value to denote the number of sides it possesses and a "**dimensions**" vector to describe its width and height. The polygon may also take an "**orientation**" value which defines the polygon's rotation around its centre.

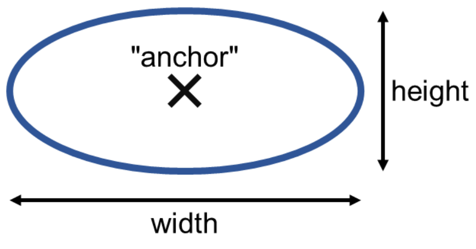
e.g. Some GEOMETRY objects using gType would be:

```
{
  "id": 0,
  "colour": "PRIMARY",
  "type": "GEOMETRY",
  "gType": "CIRCLE"
  "anchor": [2, 4],
  "radius": 1.5,
},
{
  "id": 1,
  "colour": "PRIMARY",
  "type": "GEOMETRY",
  "gType": "ELLIPSE"
  "anchor": [6, 4],
  "dimensions": [3, 1],
  "orientation": 0.0
},
{
  "id": 2,
  "colour": "PRIMARY",
  "type": "GEOMETRY",
  "gType": "POLYGON"
  "anchor": [10, 4],
  "sides": 6,
  "dimensions": [3, 3],
  "orientation": 0.0
}
```

"gType" : "CIRCLE"

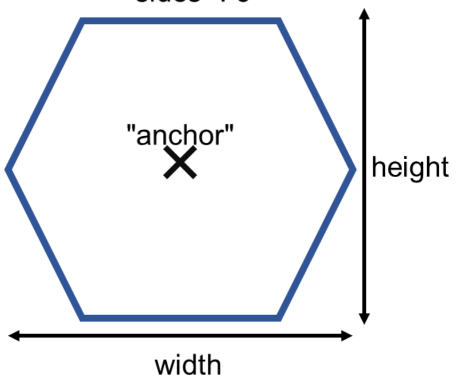


"gType" : "ELLIPSE"



"dimensions" : [width , height]

"gType" : "POLYGON"
"sides" : 6



"dimensions" : [width , height]

"BLOCK"

A BLOCK is a rectangle that may be pushed around. A BLOCK requires a "**dimensions**" vector to describe its width and height. It also takes a "**mass**" value which defines its mass for in the context of physics interactions (if "**mass**" is not provided it defaults to 1). As the BLOCK is a rectangle, the "**anchor**" vector may be replaced with a "**corner**" vector instead (at which the BLOCK is position with respect to the corner instead of its centre).

The BLOCK optionally takes a boolean value "**initState**". The BLOCK has two states, when the state is true, the BLOCK cannot be pushed or moved. When the state is false, the BLOCK can be pushed and moved. This state may be switched by LEVERs or special Behaviours. "**initState**" defines the initial state of the BLOCK. If "**initState**" is not provided it defaults to false.

e.g. A BLOCK definition would look like:

```
{
 "id": 3,
 "colour": "PRIMARY",
 "type": "BLOCK",
 "anchor": [5, 6],
 "dimensions": [2, 2],
 "mass": 5.0,
 "initState": true
}
```

"DOOR"

A DOOR is a rectangle with too states, opened/closed (defined as by an internal state as true/false). A DOOR requires a "**dimensions**" vector to describe its width and height. As the DOOR is a rectangle, the "**anchor**" vector may be replaced with a "**corner**" vector instead (at which the DOOR is position with respect to the corner instead of its centre).

The DOOR optionally takes a boolean value "**initState**" which the initial state of the DOOR (true = open, false = closed). If "**initState**" is not provided it defaults to false.

e.g. A DOOR definition would look like:

```
{
 "id": 4,
 "colour": "PRIMARY",
 "type": "DOOR",
 "anchor": [5, 6],
 "dimensions": [1, 5],
 "initState": true
}
```

"LEVER"

A LEVER is a 1x1 Room Object which the player may interact with. When interacted with the LEVER changes the state of other Room Objects in the room.

The only additional parameter required for a LEVER is "**linkedTo**" which is an array of integer ids to identify which Room Objects the LEVER will change the state of. The LEVER may also take an "**orientation**" value which defines the LEVER's sprite's rotation around its centre.

e.g. A LEVER definition would look like:

```
{
 "id": 5,
 "colour": "PRIMARY",
 "type": "LEVER",
 "anchor": [3, 3],
 "linkedTo": [3, 4]
}
```

"SPIKE"

A SPIKE is a row of one or more 1x1 triangular spikes in a row that cause a player to return a spawn point (die and respawn) upon contact. The number of spikes in a row of SPIKE is determined by "**length**" (which defaults to 1 if not provided). The SPIKE may also take an "**orientation**" value which defines the SPIKE's orientation.

e.g. A SPIKE definition would look like:

```
{
 "id": 6,
 "colour": "PRIMARY",
 "type": "SPIKE",
 "anchor": [6, 3],
 "length": 5
}
```

"PORTAL"

The PORTAL Room Object allows for a player, upon interaction, to switch between two geometry regions, switching their colour and potentially their direction of gravity.

PORTAL requires several parameters:

- "**width**" – The width of the PORTAL (or height if the portal is aligned vertically)
- "**startOpen**" – A boolean to state whether the PORTAL is initially open or must be opened by a LEVER or special Behaviour. If "**startOpen**" is not provided, it defaults to true.

- "**isOneWay**" – A boolean to state whether the PORTAL is only one way or not. If false, two parallel PORTALs will exist to allow bidirectional teleportation. If "**isOneWay**" is not provided, it defaults to false.

If "**isOneWay**" is true, two additional parameters are required:

- "**colour**" – The colour of the PORTAL (the colour which it switches the player to upon teleportation).
- "**side**" – The side an edge which the PORTAL protrudes from. Takes either LEFT, RIGHT, TOP or BOTTOM.

If "**isOneWay**" is false, 2 additional parameters are required.

- "**isVertical**" – Defines whether the PORTAL teleports the player vertically or horizontally (if true the PORTAL sits along a horizontal edge; if false the PORTAL sits along a vertical edge)
- "**topColour**" or "**leftColour**" – Defines the colour of either the top or left PORTAL or the two PORTALs, "**topColour**" is required if "**isVertical**" is true, otherwise "**leftColour**" is required.

  e.g. PORTAL definitions could look like:
```
{
 "id": 7,
 "type": "PORTAL",
 "anchor": [8, 6],
 "width": 2,
 "isOneWay": true,
 "startOpen": false,
 "colour": "PRIMARY",
 "side": "LEFT"
},
{
 "id": 8,
 "type": "PORTAL",
 "anchor": [8, 6],
 "width": 2,
 "isVertical": true,
 "topColour": "PRIMARY"
}
```

"EXIT"

The EXIT Room Object defines the end of a Level. Once an EXIT is reached, the Level ends and is considered completed.

Other than "**id**", two parameters are required to define an exit:

- "**side**" – The side of the room which the EXIT lies along. Side is either LEFT, RIGHT, TOP or BOTTOM.

  e.g. `"side": "TOP",`
- "**range**" – Is a vector describing the start and end positions of the EXIT along its respective side.

  e.g. `"range": [0, 5]`

  e.g. An EXIT definition could look like:
```
{
  "type" : "EXIT",
  "id" : 9,
  "side" : "RIGHT",
  "range" : [0, 4]
}
```

"CUSTOM"

CUSTOM Room Objects are flexible and customisable Room Objects which may use any of the provided shapes of GEOMETRY and possess an array of Behaviours (see Behaviour Guide) to define their in-game properties.

To define the shape of the CUSTOM, "**gType**" is required. This "**gType**" possesses the same options as "**gType**" in GEOMETRY (and depending on the provided type, the same additional parameters are required/allowed).

The properties of the CUSTOM's rigid body may also be customised, through an optional "**rbType**" parameter which takes GEOMETRY (static and unmoving), NO COLLISION (no physics properties), ROTATEABLE (can only rotate), MOVEABLE (can move but not rotate) or BLOCK (can move and rotate). If ROTATEABLE, MOVEABLE or BLOCK is used then "**mass**" must be provided to specify the mass of the CUSTOM. If "**rbType**" is not provided it defaults to GEOMETRY.

The final, and core, component of CUSTOM is the "**behaviours**" array. Each object of this array is a Behaviour (see Behaviour Guide).

e.g. A CUSTOM definition could look like:
```
{
 "type": "CUSTOM",
 "id": 10,
 "gType": "RECT",
 "anchor": [5, 6],
 "dimensions": [2, 3],
 "orientation": 0.7854
 "rbType": "MOVEABLE",
 "mass": 2f,
 "behaviours": []
}
```

Behaviour Guide

TODO

Behaviours

BHitKIll

BHitStateSwitch

BHitTeleport

BInteractTeleport

BInteractStateSwitch

BStateBlock

BStateFlip

BStateHide

BStateSwapColour

BStateSwitchStates

BUpdateFollowPath

BUpdateTimer