Research document – The Talos Principle toolkit

Introduction

The Talos Principle is a game that is played through its level ingredients. The player can't do more than pick up and manipulate level elements and the puzzles are only solved by getting the level elements in the right states and positions. The level elements can share a lot of functionality but also all differ from each other in important ways. In this research, I will dissect how the level elements work, what functions they have, and what functions are shared between level elements.

Research question

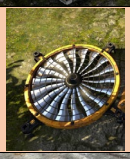
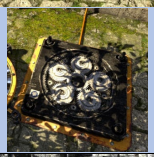
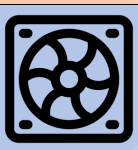
What functionality is shared between level elements in The Talos Principle?

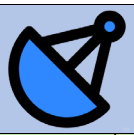
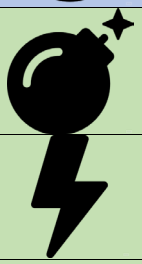
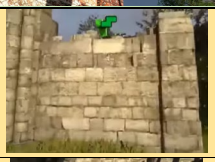
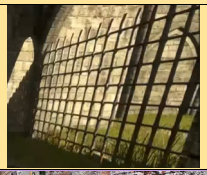
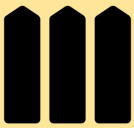
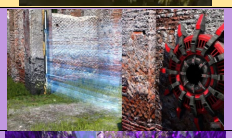
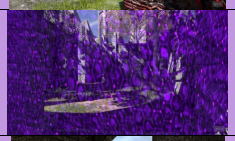
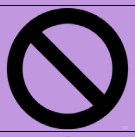
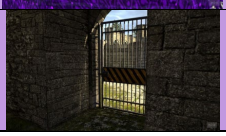
Contents

Data

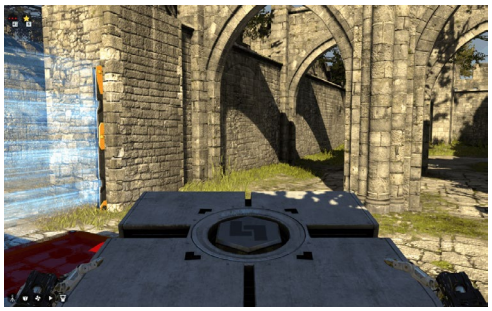
Categories

The game consists of many different elements that can be used to build a level. The elements can be broken down into pickups, static interactables, hazards, environment, and doors.

Type	Name	Image	Icon
Pickups	Jammer		
	Laser connector		
	Hexahedron		
	Fan		
	Platform		
	Keys		
Static Interactables	Fan base		
	Playback		
	Pressure plate		
	Wall switch		
	Laser generators		

	Laser receivers		
Hazards	Bomb		
	Buzzer		
	Turret		
Environment	Wall		
	Fence		
Doors	Energy wall		
	Exclusion field		
	Locked gate		

Pickups



- To pick up an item the player uses the left mouse button (by default)
- To place down an item the player used the left mouse button (by default)
- The player can only pick up an item if they are currently not holding any
- When looking at a pickup in range with an empty hand → Show UI [left click Take (object name)]
- When holding an item, it is attached to the player and either appears in the right hand, above or in front of the player.
- An item can be picked up if it is in the pickup range and will appear on the player instantly unless there is an energy wall between the player and the pickup, then the player will first walk towards the object before picking it up
- When placing down an item it will prioritize placing it on objects it can snap to
- When placing down without snapping the object will be placed where the player is looking except when it is further than its placement distance, then it will be placed at the edge of this radius.
- Pickups can't pass through exclusion fields when they are placed down or when held by the player. If a pickup is held by the player, the exclusion field will make the player drop the item.

Jammer

A jammer is an object that can be picked up by the player when held the player can select an object to jam by looking at it and clicking the left mouse button (by default). When a jammable object is selected the jammer will automatically be placed down and the selected object will go to its "Jammed" state.

Jamming: When an object is jammed it turns off its default functionality objects that can be jammed include the fan base, bomb, buzzer, turret, and energy wall.

A jammable object shows up in the player HUD by highlighting the corners of the jammable objects' hitbox.

The jammer has no collision with the player when placed down but will block laser beams from passing through it.

When the jammer collides with an exclusion field, either when placed down or when in the player's hand, it will be blocked and removed from the player's hand. These fields prevent the jammer from passing through it.

The Jammer snaps to Hexahedrons, platforms that are held by the player and pressure plates

The jammer is unlocked by default and is used from level 1 onward.

Laser connector

Can be picked up | Blocks laser beam | Blocked by exclusion field | Highlights place position | Can be selected with connector

The laser connector is an object that can be picked up by the player when held the player can select objects that it will attempt to connect. This mirror-like object connects red and blue colored laser beams to the objects that were selected.

When the player is looking at an object that it can connect to and the left mouse button (by default) is pressed this item will be added to the UI. There is no limit on how many objects you can select.

Objects that can be selected are another laser connector, a laser generator, or a laser receiver.

Laser beams Will be blocked by any form of collisions like walls, pickups, closed energy walls, bombs/buzzers, and the player. When the player blocks the laser beam it will decay over time instead of instantly disappearing. Laser beams can not cross each other even if they are of the same color.

A laser connector that is not connected to anything will block other laser beams

The player has no collision with this object when placed down

The laser connector snaps to Hexahedrons, platforms that are held by the player and pressure plates

Hexahedron

Can be picked up | Blocks laser beam | Blocked by exclusion field | Highlights place position | Has player collision | Can be jumped on

The hexahedron is essentially just a cube, this object can be picked up by the player and placed down.

When placed down the player can jump onto this object using the space bar (by default). This will be indicated by two footprints on the box and with the HUD element [press space to jump here] appearing.

Hexahedrons have a collision box meaning that it doesn't only block the lasers but also the player, unlike the other pickups.

The Hexahedron snaps to other hexahedrons, platforms being held by the player, pressure plates, bombs, buzzers, and a fan attached to a fan base.

Fan

Can be picked up | Blocked by exclusion field | Highlights place position

The fan is an object that on its own doesn't do a lot, besides being able to activate pressure plates like the other pickups. Its main use is when combined with the fan-base static interactable.

The fan will snap to pressure plates, bombs, buzzers, the fan-base, a platform being held by the player, and the hexahedrons.

When the fan is snapping to a fan base the HUD will show [Left click to attach] instead of [Left click to drop] when the left mouse button is pressed (by default) the fan will not be placed on the ground like with other snapping objects, but it will attach itself to the fan-base becoming a single object. When looking at a fan attached to a fan-base it can be removed using the left mouse button (by default) this will also show the HUD [Left click to detach] instead of [left click to take fan].

How the fan on the fan-base functions will be discussed in the fan-base section of this research document.

Platform

Can be picked up | Blocked by exclusion field | Can be jumped on

The platform object is never used without the playback object in the game. To read more about the playback object read the playback section of this research document.

The reason the platform is only used with the playback object is because the platform is most useful while it's being held, but because the player can't do anything except drop the platform while holding it you need your previous self to make this item useful.

The platform doesn't snap to any object even though it can activate the pressure plate.

When the platform is held it can be used to jump onto this object using the space bar (by default). This will be indicated by two footprints on the platform and with the HUD element [press space to jump here] appearing.

When being held the original player can be moved around while standing on a platform held by a recorded player.

Keys

Can be picked up

Blocked by exclusion field

Keys are a very unique pickup compared to the others; it is not picked up by using the interact button (left mouse by default) but instead by walking into it. The object doesn't appear in the player's hand(s) but instead is added to its inventory. When the player possesses a key this is indicated by a HUD element at the bottom of the screen.

With this item, the player can interact with the locked gate object. To read more about what the locked gate does see the section about the locked gate in this research document.

When the player possesses a key and walks through an exclusion field it is not left behind like the other pickups but is removed from the player's inventory permanently. This means that if the player walks through one of these fields the keys are no longer available in that level. The only way to get the option of picking up the keys again is by resetting the level where they were found.

Static interactables

Static interactables are objects that are fixtures in the level and although the player can interact with them in some way they will never move from their position. Within the static interactables there also are some subcategories

- Interacts with pickup
- Can be selected when holding a pickup
- Direct player interaction

Interacts with pickup: certain pickups snap to this static interactable when the player tries to place it down. When it is placed down at this static interactable the interactable will activate.

Can be selected when holding a pickup: When a specific pickup is held these objects can be selected by looking at them and left-clicking (by default). When selected certain functionality will happen

Direct player interaction: When the player is within range and the player presses the left mouse button (by default) the static interactable will activate.

Fan Base

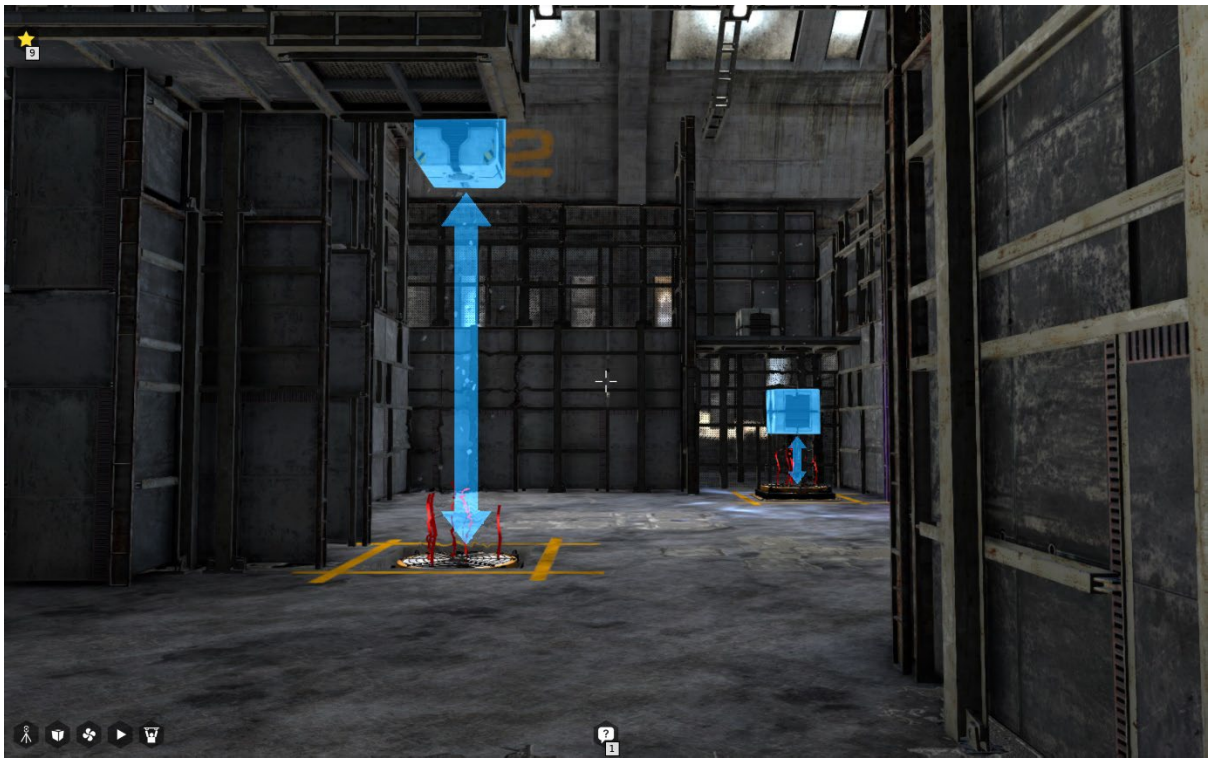
Objects snap to position

Can be turned On/Off

Fan bases come in a couple of varieties, they either are placed on the floor, on a wall, or at a tilted angle. The fan base is either permanently turned on or can be turned on and off by a connected switch (pressure plates, wall switches, laser receivers).

The fanbase will not do anything (even if turned on) without having a fan attached to it. If the player is holding a fan and stands close to a fan base the highlight will snap to the fan base and the UI will say: left-click to attach fan. When this action is performed the fan will become part of the fan base.

When a fan is attached to a fan base and is turned on the following will happen. Any object in the direction of the fan will be pushed in that to a specified distance. This distance is not consistent and can be different per fan base. Angled fan bases will move objects along a specific path with a constant landing point.



Playback

Can be directly interacted with

The playback machine is the second to last gameplay element that is unlocked and is the most complicated.

When the player is in range and looks at this object the UI will show: left click to record. When this action is taken a new UI overlay is activated showing a blinking record button in the top right. And a recorded time in the bottom left.

When recording the player can do all their normal actions like move connectors, activate switches etc. when the player walks back towards the playback item and looks at it again the UI shows: left click to play. When the recording is played a shimmery blue version of the player appears alongside a shimmery blue version of all pickups in the level. The blue player will do all the same actions you did while you were recording. The current player can now also pick up connectors and connect to recorded connectors as well, essentially doubling all available pickups.

The recording has a time limit of 5 minutes, the blue version of the character has no collision with the current player, and when walking through an exclusion field the recording is stopped and not played back.

Pressure plate

The pressure plate works similarly to how it works in a lot of games, if a pickup or the player collides with the top of the pressure plate it will activate.

A pressure plate acts like a switch and can activate and deactivate all object in the game that support it like: energy walls, turrets and fan bases.

All pickups can activate the pressure plate and almost all objects snap to a pressure plate to make placing down easier. The only exception for snapping is the platform which doesn't snap.

A pressure plate can also be activated by a playback character.

A line is most of the time connected from the pressure plate to whatever it powers.

Wall switch

Can be directly interacted with

Can turn objects Off/On

The wall switch works as a switch in the game and only has one interaction with the player.

If the player is in range the UI will show: left click to use. When the player takes this action the switch will change state between ON and OFF.

A switch can activate and deactivate objects like: energy walls, turrets, and fan bases.

A line is most of the time connected from the wall switch to whatever it powers.

Laser generator

Can be selected with connector

Laser generators are one of the 3 parts needed for any laser puzzle. Generators are the origin points of a laser from which it can be redirected.

When no connector is linked to this object it will not produce a laser. However, when a player has linked a connector with this generator or if the designer had already set a connection on the start of the level, a laser beam will come from this object to its connection.

To read more about how lasers work see the section about the connector

Laser generators come in two colors namely: red and blue. The laser produced from this object will have the same color.

laser receiver

Can be selected with connector

Can turn objects Off/On

Laser receivers are the goal of the lasers, connectors will be used to redirect lasers into this object.

Laser receivers come in two colors namely: red and blue. The color of the incoming laser and the color of the receiver needs to be the same for it to activate

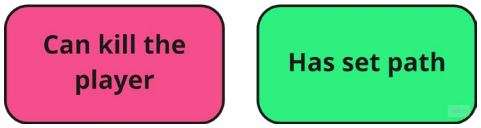
Laser receivers have a variable timer to activate completely, this means that a laser needs to be constantly connected until the timer is full, and only then will it activate or deactivate the object(s) it's connected to.

When a receiver fully turns on it acts as a switch and will activate and deactivate objects like: energy walls, turrets, and fan bases.

Hazards

Hazards are the group of objects that externally influence the player. This can be damaging the player or knocking them back.

Bomb



The bomb is an object that moves on a set path, this path is made up of points. The bomb will move between these points in a straight line. The bomb can either go back and forth between the points or create a loop.

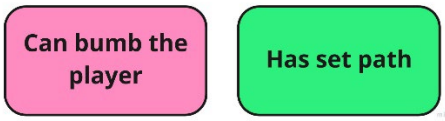
When the player gets in a range around the bomb the bomb will move towards the player really fast. When the bomb reaches the player, it will explode, and the player will die.

Dying causes the level to reset and the player to start at the beginning of the level.

Bombs can be jammed using a jammer. When a bomb is jammed it stops its movement along the path and the range to home in on the player. This means that the player can not die from this bomb when it is jammed.

A hexahedron can be placed on top of a bomb, when the bomb moves the hexahedron moves with it. The player can also jump on top of this hexahedron and will move along with it and the bomb along its set path.

Buzzer



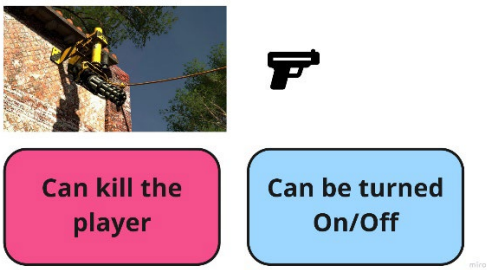
The buzzer is an object that moves on a set path that is made up of points set by the designer. The buzzer will move between these points in a straight line. This object can either go back and forth between the points or create a loop.

When the player enters its radius of effect the player will be pushed back slightly.

Buzzers can be jammed using a jammer. When a buzzer is jammed it stops its movement along the path and the knockback area of effect is disabled.

A hexahedron can be placed on top of a buzzer, when the buzzer moves the hexahedron moves with it. The player can also jump on top of this hexahedron and will move along with it and the bomb along its set path.

Turret



Turrets are static object placed in the level that will has a cone shaped area of effect that checks for the player.

When the player enters the area of effect the turret will move towards the player and after a short period of time the turret will start firing at the player.

When the player is hit by 5 bullets the player dies.

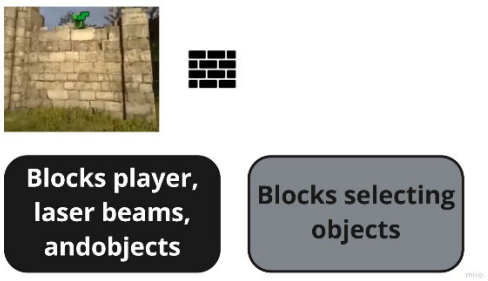
Dying causes the level to reset and the player to start at the beginning of the level.

Turrets can be jammed using a jammer. This will disable its detection abilities, meaning the player can not die by this turret.

Turrets can also be turned on and of by using switches. When a switch is pulled the same behaviour as a jammed turret occurs. Turrets can be enabled again when reversing the switch.

Environment

Walls



Walls come in many different varieties in the game based on the environment. Walls are static meshes that block all elements in the game.

This means that the player, laser beams, and objects cannot pass through.

Lastly walls also block the ability of the player to select objects when holding a pickup (when holding a connector the player cannot select a generator through a wall).

Fences

Blocks player, laser beams, and objects

Fences are very similar to walls but differ in some key aspects. Fences are used in a lot of places through out the game. Because fences are mostly transparent, they are used to give the player better visibility of what is behind a wall.

Fences make sure that the player, laser beams, and objects cannot pass through.

Lastly fences do allow the player to select objects through them when holding a pickup (when the player is holding a connector, they can select a generator through a fence)

Doors

Energy wall

Can be turned On/Off

Blocks player, laser beams, and objects

Energy walls are the doors used in the Talos Principle. They act very similar to fences.

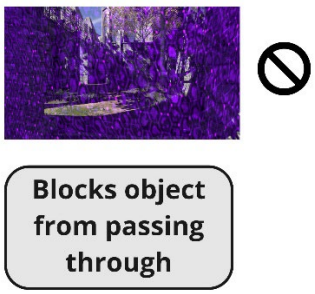
The player, laser beams, and objects can not pass through the closed energy wall.

Energy walls do allow the player to select objects through them when holding a pickup (when the player is holding a connector, they can select a generator through an energy wall).

Energy walls are connected to inputs like switches, pressure plates, and laser receivers. When these inputs are activated the energy wall will open. When multiple inputs are connected one of two things happens. Either all inputs need to be active for the energy wall to open, or at least one of the inputs needs to be active for the energy wall to open.

Energy walls can be jammed by a jammer causing the energy wall to stay open.

Exclusion field



Exclusion fields are translucent volumes placed in gate ways. They make sure that the player can not use objects from one puzzle to solve another.

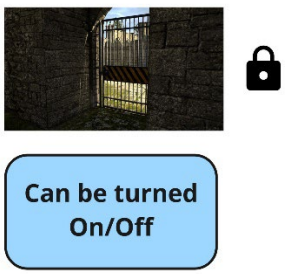
Only two things are allowed to pass through exclusion fields, the player and laser beams.

When an object is blown into an exclusion field they will stop in front of it as if it is a wall.

When the player passes through an exclusion field while holding a pickup the pickup will forcefully be dropped from the players hand before the exclusion field.

Exclusion fields are also used in puzzles to force objects to stay in one area reducing the amount of possible place locations for that pickup.

Locked gates



Locked gates act like fences when closed, blocking the player, laser beams, and objects from passing through.

Locked gates do allow the player to select objects through them when holding a pickup (when the player is holding a connector, they can select a generator through a locked gate).

When the player has a key in their inventory and walks up to a locked gate the option to open the gate using the interact button shows up.

When the player interacts with a gate when possessing a key the locked gate will permanently open.

When opened everything is allowed to pass through a locked gate.

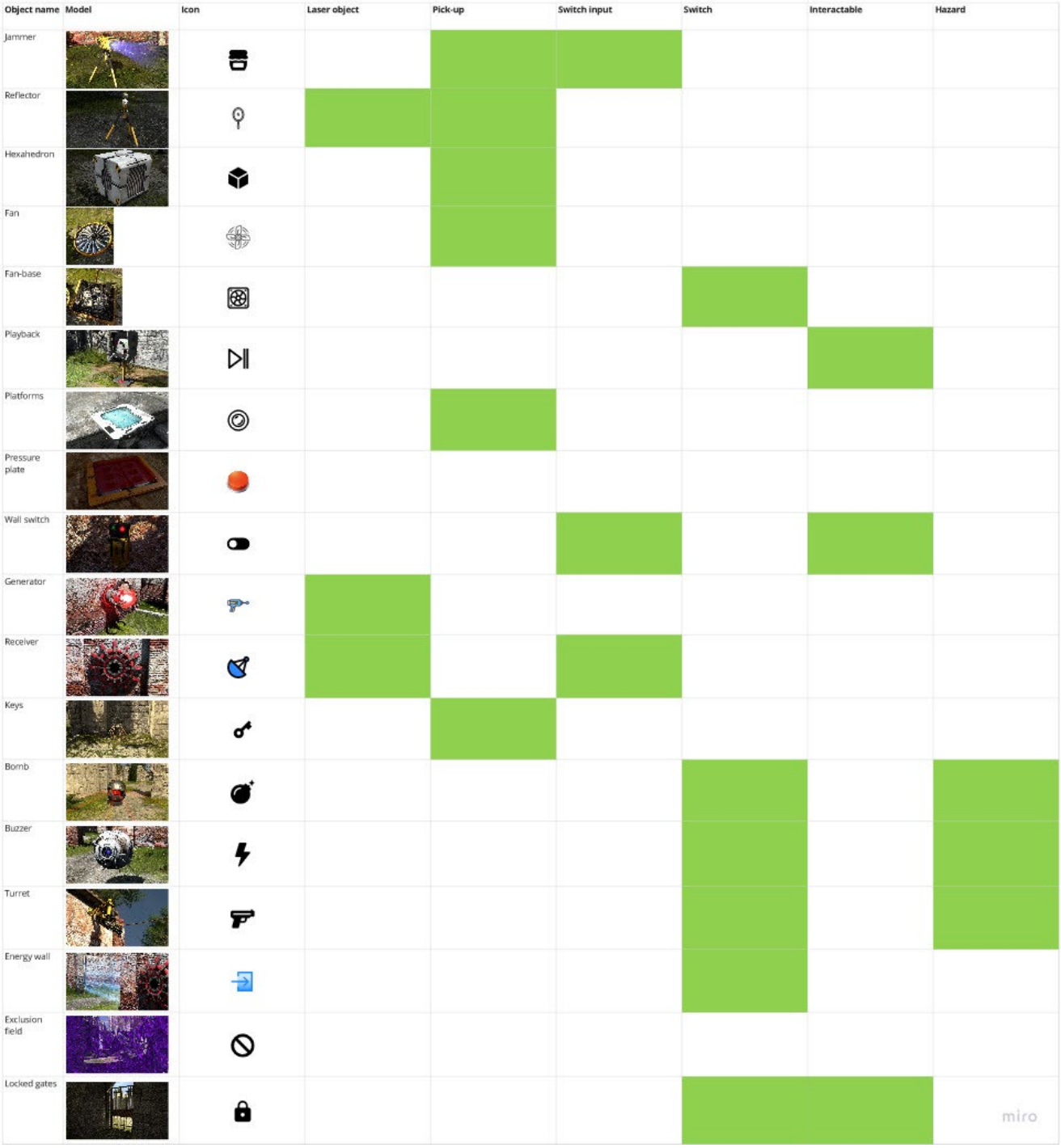
Conclusion

The objects in The Talos Principles Clearly work on a trait-based system, where objects in the game can share functionality with including multiple traits. For example, a laser connector is a laser object and a pick-up. And a jammer is a pick-up but also an object that can activate/deactivate other objects.

This way of designing allows for the creation of new objects by combining different object traits.

I identified 6 object traits

- Laser objects: laser objects allow to be selected by connectors and have the ability to generate a laser beam to connected objects.
- Pick-ups: Pick-ups are items that the player can place in their hand and when held they can select objects to interact with, or place it down in a new location.
- Switch inputs: Switch inputs are objects that have an On and Off state. The state of this object will effect the state of a connected switch object. (for example a pressure plate can be pressed or not pressed, if pressed it can activate or deactivate objects like energy walls or turrets.
- Switches: Switches are object that change states by their connected switch inputs. (for example an energy wall will open if all of its connected laser receivers are fully charged up)
- Interactables: Interactable objects are static objects that when the player is in range can be interacted with. On interaction they all have different functionality. (for example if a wall switch is pulled it will set its state in its connected switch to active or if a play back machine is interacted with the recording state will be activated)
- Hazards: Hazards are objects that interact by looking for the player in a specific area. When the player is detected they either get killed (bomb and turret) or get pushed back (buzzer).



Take-aways

- The Talos Principle uses a system where objects can possess certain traits
- The game consists of 6 clearly identifiable traits (laser objects, pick-ups, switch inputs, switches, interactables, and hazards).
- The most common traits are pick-ups and switches.
- The laser objects are not useable on their own. All three laser objects need to be present to create a puzzle using lasers.
- Switches are objects that gate progression and are needed to create any puzzle
- Because switches are required this also means that a switch input is needed for the same reason

- The set of laser objects has a large variety of traits namely (laser object, pickup, and switch)
- Hazards are very different in behaviour since they require an interaction with the player.
- Interactables are the least common, not puzzle necessary, objects.

Sources:

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Appendix

A. Interaction and function table

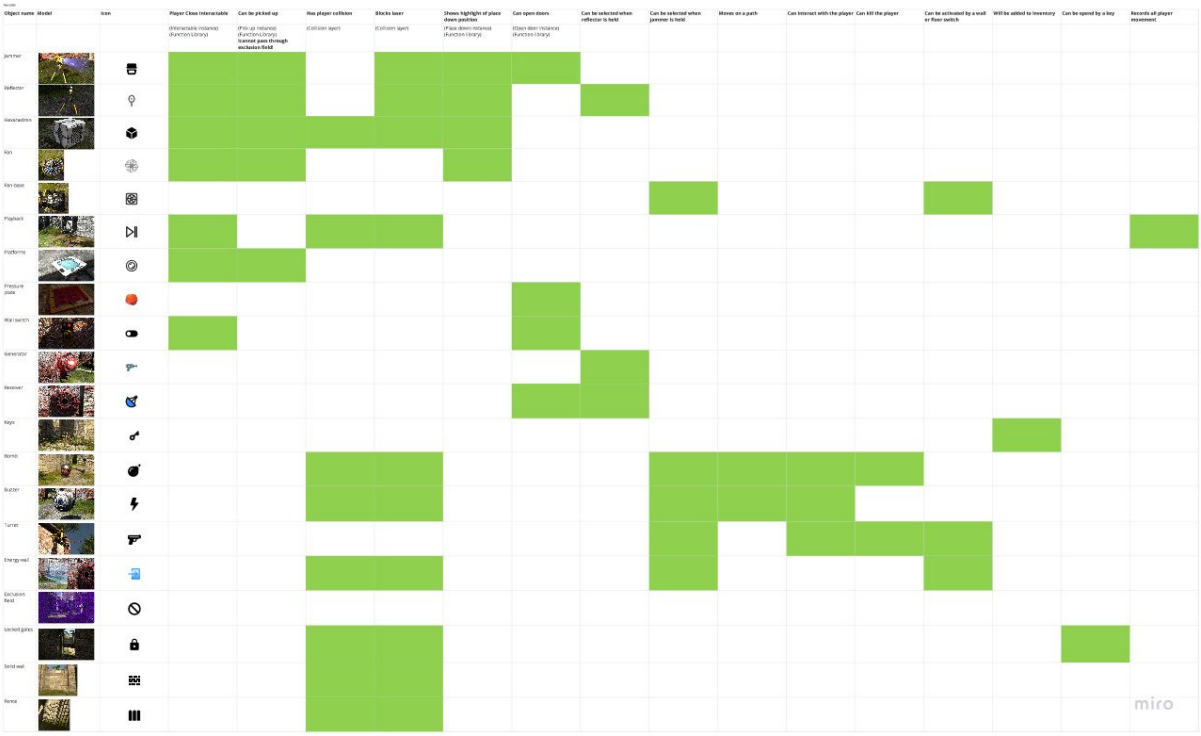
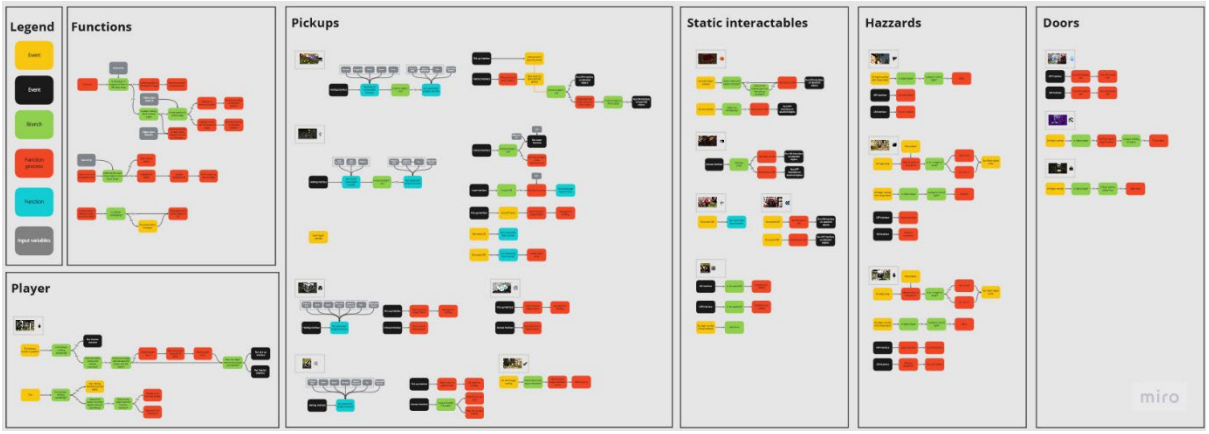


Table of all interactions and which objects contain which interactions and functions. For the full version see: Miro board.

B. Pseudo code for all objects



A simplified version of the code that would be needed to recreate the objects in a game engine. To look at the full version see: Miro board.