Movement to Lines

Thesis Preparation Document

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This thesis sets out to analyse the architecture, and more closely, the drawings of architect Enric Miralles. As the title suggests, the focus is on the lines in the drawings, the lines the architect drew, which were then transcribed into three-dimensional form.

From the myriad of projects across Miralles’ portfolio, I have narrowed down the scope to several key projects, and focus on studying how the architect dealt with the ground, the flow and the order in his architecture. For each aspect, I would break down the analysis into individual operations and conduct research and experimental analysis, developing them with the aid of parametric tools and computational simulations.

The product is a taxonomy of operations which have been distilled from Miralles’ works, which would then be applied to my design process in the next semester.
ARCHITECTURAL DRAWINGS

Architectural drawings consist of lines - different layers, length, weight, thickness; each one represents something different. Lines that we have on our drawings are made a certain way because of design decisions and factors. They represent movement, and/or are consequential of direction.

Lines produce architecture.

Spanish architect, Enric Miralles, produced phenomenal drawings for his architecture and he had a unique design process and way of representation. However, his contribution to the architectural sphere seems to have been neglected in the current age and time, because of the new fads that came along with technology and digital architecture. Today, “computationally advanced design techniques such as scripting and parametric modeling are becoming a pervasive reality such that it is no longer possible to compete within the contemporary avant-garde architecture scene without mastering and refining them”, Patrik Schumacher once commented in an article published in AD Architectural Design. [Schumacher, 2009]

Even before all of that, Miralles worked with geometrically complex forms, creating them by hand from repetitive tracing and sketching - a method unique to him. His intricate designs were magically translated from series of well thought-out and carefully represented two-dimensional drawings. One could argue that the digital aspect in architecture seeks to simplify such tedious design processes, however, it has also began to “shift [in] the understanding of the role of geometry in architecture.” [Kotnik, 2013]

With the focus on Enric Miralles’ works in his short but successful architecture career, this thesis research will establish the connection between the lines and movement in drawings, while deriving a logic to his buildings’ geometry and their relation to landscape.

What role does geometry play in your projects?

We do not take geometry as something with rules. We prefer to think about the movement of things, the sun... the air that pass through... geometry serves all these.

In an interview with Enric Miralles and Carme Pinós

On many accounts, the architect also stated that his designs pay great attention to context: every line that he draws, every angle that he manipulates, they are all due to different factors that he consider. Although hand-drawn, the lines are not arbitrary and there is potential to transcribe the logic of his design parametrically.

The two-dimensional research and analysis of Miralles’ drawings aims to produce a taxonomy of movements and generate certain rules and operations via digitalisation, to allow a better understanding of derivation of form in his architecture, and possibly also the use of geometry for optimisation. The outcome could then, perhaps, challenge the approach of digital design in today’s world.
Miralles’ way of working and system of representation was in fact instrumental in the process of thinking his architecture. The architect firmly believed that repeating, rethinking and reworking the drawings is the key to arriving at a resolved scheme that is not only irrefutable, but also, special. This is what makes his architecture distinctive.

... the most important thing is the path, the process, the dynamics of looking, doing and constantly reviewing in a constant reinvention that avoid the ordinary and give us the answers we need at every moment. The process is much richer, but also more complex and even confusing, but believing in the path always ends up taking you to surprising places that you could not imagine when starting the journey …

Enric Miralles
In an interview with EQUIP Xavier Claramunt

Miralles also often projected the elevations onto the same plane as the plan, and the sections are usually part of the composition as well. Hence, the drawings look as if they were rotated repeatedly during the process of its construction, or that the person who made the drawing moved around the table. At this point, many of his drawings look rather schematic and conceptual, with a strong geometric presence.

Predictably, he was a great fan of Alberto Giacometti. Likewise, the Italian artist was also known for endlessly reworking on the same piece for a period of time, which helps develop a relationship between the creator and his work. In Miralles’ first feature in the El Croquis magazine in 1995, the architect closed the publication with an excerpt from A Giacometti Portrait by James Lord. In fact, the architect recounted in the same issue that he had tried working in the style of Giacometti in some of his projects.

It is not a series, there are no variants. (…) The same movements of the hand appear to occur. The position is fixed. Maybe only the light changes. Over time. And intimacy grows between both subjects …

“A Portrait of Giacometti”, Enric Miralles
El Croquis 72 (II), 1995

The way Miralles worked could also be compared to Franz Kline, an abstract expressionist painter who was known for his large, monochromatic abstract paintings. Because of the scale of his paintings, the marks made on the canvases are consequential of his large gestures. This highlights the close relation between lines and movement. In Miralles’ case, though, the movements he made while drawing the lines, were eventually translated into the movement of elements (such as people, wind or light) in and around the architecture he designed.

Fig 3.1 Plan, section and elevation of Igualada Cemetery

Fig 3.2 Sketch by Enric Miralles
This thesis will take up the approach of analysing a range of projects by Miralles of different scales and different periods in his career.

It starts off by studying the drawings that Miralles had made and identifying the similarities in approach that he has taken to develop his architectural schemes. After narrowing the scope down to several key projects, I proceed to break the analysis down into individual operations, as shown in the table. The next step is to develop my own set of drawings to present my findings, and these operations would be discussed independently and cohesively.

<table>
<thead>
<tr>
<th>THE GROUND</th>
<th>THE FLOW</th>
<th>THE ORDER</th>
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<tr>
<td>TO NEST</td>
<td>TO OBLIQUE</td>
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<td>the architecture inserts itself into the existing landscape of site</td>
<td>the leaning of walls in- or outwards to alter the experience of path</td>
<td>the repetition of elements to form a series and give order to the design</td>
</tr>
<tr>
<td>TO LIFT</td>
<td>TO CONSTRAIN</td>
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<td>the creation of new topography to complement programme</td>
<td>the decrease in width of walkway to alter spatial experience</td>
<td>the organisation of the individual elements that contributes to the overall rhythm</td>
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<td>TO ROTATE</td>
<td>TO BEND</td>
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<tr>
<td>the orientation of building based on site topography and flow diagram</td>
<td>the difference in a continuous and sharp change in direction of a wall.</td>
<td>the relation between the spaces within and also with the exterior</td>
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<th>TO FRACTURE</th>
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<td>to alter the shortest and easiest path through a space with obstacles</td>
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Fig 4.1 Table of operations
When referring to ground, one usually thinks about an empty and flat parcel of land paved with concrete minimally. Or at least, if one grew up in a city and has barely interacted with nature.

The motivation behind this chapter stems from the fact that Singapore's natural terrains had long been eradicated by rapid development through her early years. As such, local architects are usually uncomfortable or lack the incentive to incorporate the use of terrain in their designs due to the homogenously flattened plots that they are often given to work with.

Not only did Miralles work a lot with the grain and topography on site, he was also charting new grounds in this aspect. In many of his projects, there is a thin line between land and architecture.

This section studies the techniques that Miralles used to incorporate the land into his architectural designs. Land, here, refers to more than just the area of the plot; it includes the existing conditions of the ground on site. The operations that he employed when working with existing topography has been categorized into three main types, namely nesting, lifting and rotating.
5.1

TO NEST

The operation “to nest” comes into play when Miralles strategically made use of existing topography, or more interestingly, created contours to include them in his designs to his buildings’ advantage. This section comprehensively explores the two different types of “nesting” – horizontal vertical, through two of his distinctive projects.

Nesting exploits the existing topography of the site in the architectural design.

Horizontal nesting can be seen from the Olympic Archery Range. By carving into the side of a steep hill and building the structure against the side of the hill, it creates a natural enclosure with the earth while exposing the other side of the building entirely. The building, being lodged in the geological form, gives a sense of organic growth from the earth. This was an unprecedented move, and also a strategic one in a sense that it increased the “area” of intervention without affecting the other functions surrounding it.

The Palafolls Library, on the other hand, shows a clear example of vertical nesting. The library compound is sunken lightly into the ground. By creating new contours around the Palafolls Library, Miralles was able to accentuate the fact that the enclosed space is at a lower level. This move of sinking the space changes the entire spatial dynamics – with the compound on a lower level, he introduced a gentle slope down to the entrance, creating a welcoming gesture. The interior space is also ‘protected’ by the new hills and isolated from its surroundings, creating a conducive environment for its function. The new contours also suggest how outdoor green spaces could be used, for instance a generally flatter area allows people to linger comfortably, while the slopes signify the entryways and exits.
Miralles adopted the operation of "lifting" to vary the spatial hierarchy in his works. This was done mainly on ground lines as the ground level where people walk is perceived as the most important. By manipulating the ground level by "lifting", this very importance diminishes in relation to the plane where one treads on.

Through a series of sectional studies of the Igualada Cemetery depicting the transformation of the site, it can be observed how Miralles capitalized on the existing landscape and making minute manipulations to the ground level to create a variety of spaces. A tiered landscape was created by lifting and sinking the ground levels.

The cemetery sits in a dried-up valley of Riera de Odena, and Miralles' choice to design with earthworks further emphasized the existing landform, resulting in a site-specific sculpture. The intimacy between the architecture and the topographical conditions was clear. Since the majority of spaces he designed did not have requirements for enclosure, the architects created a park-like landscape that seamlessly blends the architecture with nature. The materials were also specifically chosen for this same purpose, as they utilized natural materials such as stone, wood, and concrete.

The function as a cemetery informed the form as the architect designed the spaces based on the rituals, programmes and circulation. The journey begins from the entryway with a long, processional pathway that slopes down to the burial grounds.

(to be discussed later)
Miralles’ architecture respects the site conditions very well and his thought process and decisions are articulate throughout his designs. The orientation of a building is key as it is the most apparent relationship between a structure and its surroundings.

In Igualada Cemetery, where the architecture is one with nature, the orientation defines how the visitors approach, enter and move through the building. By studying the existing contours of the hilly site, we observed how Miralles orchestrated the movement of people through his architecture, in relation to its surroundings.

Although the processional walkways are long and straight, the architect jazzes it up by rotating and varying the general orientation slightly, creating a dynamic experience where the views are never the same. The design of movement through the open spaces is organic and flow, with great consideration for how one might see the cemetery.

The orientation of the end and distance, though, may seem out of place. However, from the quote about the design of the cemetery, one can tell that it has a clear relation with the typography and flow of water, hence began looking in that direction.

The fluid flow lines generated from the topographical maps suggest the gravitational forces on the site itself. When overlayed with the architecture plan of the cemetery, one can see the constant rotation and movement of the lines that try to achieve perpendicularity to the flow lines of the site. This results in the architecture taking on a natural topography, with parts rotated at different angles and even creating oscillating patterns at some parts.

A mesh of the existing contours of the site below the cemetery was constructed and then rebuilt into a delaunay mesh to achieve a more regular pattern to run the drainage script. The fluid flow lines were generated from the mesh geometry, hence the lines appear in a systematic grid.

Overlaying the building plan directly on the fluid flow diagram allows one to immediately see the directional flow on site and relate it to the orientation of the architecture.

Simplifying the building plan to simple lines helps to achieve clarity against a backdrop of flow lines. It can be observed that the building plan lines are constantly shifting and rotating to establish perpendicularity to the flow.
THE FLOW

Flow refers to the action or the fact of moving along in a steady, continuous stream. The study of flow is a useful form of representation and analysis as it can be translated and applied in many different industries. In architecture, the study of flow could be to analyze many aspects of design such as form, performance, programmatic organization and mobility between spaces.

Perhaps, one of the most important diagram pertaining to flow was done by architect Louis Kahn when he was studying and planning for the city of Philadelphia to help alleviate the problem of traffic congestion. Kahn was studying movement vehicles around the city and represented them in different notations corresponding to the type of flow. The stop and go movements of buses and trucks are shown in dots, while the arrows represent fast moving vehicles. The flow diagram here not only shows the movement, but also the infrastructure system of the city, making it comprehensive and informative.

For Miralles’ projects, the study of flow would begin from a small scale, looking at the different ways the architect shape the flow with the designs of the environment by obliquing and bending. We would then look at how a system of different elements working together to affect the flow (to fracture), and the flow in an enclosed environment (to constrain).

This part of the thesis seeks to examine the different operations that Miralles employed in achieving different kinds of flows in his architecture, and how small gestures and details in a space could alter the experience of the users.
6.1

TO OBLIQUE

An oblique line essentially starts from a straight, vertical line, and pressure is applied close to either ends of the line and causing the said end to move in the direction of the pressure, and the opposite end to move in the other direction. The result can be seen as the line being rotated about an imaginary point (somewhere in the middle). Miralles uses this invisible operation in his architecture design to suggest movements in a static setting.

For instance, in the sections of Igualada Cemetery, one notices that Miralles had designed the loculi as alternating oblique pieces as shown in the photograph below. The slants are somehow reminiscent of Gaudi’s slanting columns at Park Güell. However, the physical width of the pathways are not affected because this design decision affects the “air” space from ground up. Hence, the flow through the cemetery remains relatively unaffected. This seemingly redundant gesture, in fact, applies an invisible pressure to the walkways without disrupting the flow, creating a dynamic choreography of movement through the space.

The choice of obliquing the walls also alters the lighting conditions to the site, where I have tried to represent in a series of illustrations in the opposite page. Although all the walkways are of the same width, the way the walls are obliqued affects the degree of illumination and shade, hence altering the overall experience of the visitors.

With simple gestures such as slanting the walls, the architect was able to transform an ordinary walkway to one with a myriad of different experiences. Furthermore, with the alternating loculus blocks that lean inwards and outwards, the range of change is regulated, whereby the next encounter is somewhat predictable. The result is a refreshing environment, but with familiarity.

The operation to oblique is a simple and gentle gesture on the architecture which does not amount to much changes in the drawings, yet the journey through the cemetery can be altered vastly.

Fig 6.1.1 Oblique concrete loculus blocks at Igualada Cemetery

Fig 6.1.2 Perpendicular walls

A walkway flanked by perpendicular, straight walls frames a very direct path and lets a reasonable amount of light to the site.

Fig 6.1.3 Walls sloping outwards

Walls that slope outwards gives the sense of a wider walkway, allowing more light to the path itself and reducing the shadows.

Fig 6.1.4 Walls sloping inwards

Walls that slope inwards create a darker environment as it limits light from entering the site, resulting in relatively more shadows casted.

Fig 6.1.5 Walls sloping the same direction

Walls that slope in the same direction is essentially a skew version of the first case, which allows approximately the same amount of light to the site, unless, the light source is at a very low angle.
6.2

TO BEND

A bend is essentially the section of a line which has been brought out of its course by constant sideward pressure to a certain point the greater the pressure, the farther the diversion from the straight line and, in the course of this, the greater became the outward tension and, finally, the tendency to close itself. (Kandinsky, 1926, Point and Line to Plane pg 79)

Every bend can be accessed and quantified by its fillet radius and whether it was an internal bend or an external one.

In Miralles’ projects, where the forms and curves are articulated naturally such that they provide rhythm and homogeneity to the architecture, this analysis renders itself appropriate. I began the analysis with the Olympic Archery Range design, which had curvilinear walls throughout the entire interior space. This design decision made by the architect gave the interior walkway a distinctive quality. While curved walls are not uncommon, the curves of each wall in this project is unique. There is a wide range of bends of different sizes and they are arranged in an almost arbitrary manner.

The bends in the walls that flank the walkways create an illusion of continuity and flow while making the space feel wider. The experience of walking through this path is a dynamic one as the space is constantly changing, just like how the tangent of a curve varies along the line.

The sizes of the fillet radii are also varied based on their functions: bigger fillet radii evoke a generous and welcoming feeling and are often used close to the entrances to a room, while the smaller ones are usually the corners of the room.
Applying a similar approach in analyzing bends, I extracted part of plan of the Parc de Colors in Mollet del Valles, Barcelona, for this experimental analysis. This particular element is a large-scale water feature in the park which spans roughly 40m by 25m. The geometry consists of multiple appendages protruding, resulting in many pockets of space being produced.

For this project, instead of investigating the quality of the internal spaces marked out by the curves, it is the reverse. Because of the type of space and the function of it, the analysis would be done on the exterior.

This large water feature of the park helps to cool down the environment during the hot Spanish summer days. By increasing the usable perimeter, Miralles was able to insert seatings in the little nooks he creating, providing protected little pockets of space for the users to enjoy the space.

Looking closer at the design, I analysed the bending radii of the geometry, similar like what I did for the Olympic Archery range. However for this case study, I decided to conduct an experimental analysis where I manipulated the bending radii of the geometry to observe the effect it would make on the spatial movements around it. This is visualised with the help of computational fluid dynamics simulation where I can derive information on the flow.

When I reduced the bending radii uniformly to a relatively small one, it shows that the directional changes around the bends are rather minimal and that the speed of flow experience a slight rise around the area.

On the other hand, when I increased the bending radii substantially and uniformly, there is a larger number of vectors around the bends that get redirected.

With this information, the geometry of the water feature then begins to make sense, as the bending radii in the nooks are generally smaller, while the ones at the ends of the appendages are usually larger to attract the flow into the pockets of spaces, encouraging the park visitors to use the resting seats and spaces created for their enjoyment.
The basis of the paths generated begins and ends at the entry points to the park, which I defined with the pink dots. They are the points where there are apparent openings as well as where the pedestrian crossings are aligned to. The plot of the park is defined with a mesh in the geometry of the polygon. The obvious direct paths from and to the other points across the site prior to the construction of the intervention is shown generated. They are easy, straight paths.

The mesh is reconstructed with considerations of the new contours (in grey) that the architects had designed. The park elements (in black) had to be cut out from the contoured mesh to eliminate the possibility of the paths crossing them. The shortest path generated here shows the flow of the path being fracturing and continuing to follow a different course due to the site conditions.

This section seeks to derive the shortest paths that require the least effort that could be taken by the users to walk through it, taking into considerations the contours and the new park elements which were introduced by the architects.

The shortest paths were originally straight and in the direction of the destination of the person. With new insertions of the park elements, visitors start to walk around them, deviating from their original shortest paths and creating new ones. The additional artificial contours added to the site heightens the fracturing of the paths, creating wiggly routes across the site, reminiscent of the oscillating curves that Miralles often made. Perhaps, this was their intention, shaping the paths of the visitors, almost specifically.

Fig 6.3.1 Entry points to the park
Fig 6.3.2 Direct paths across site
Fig 6.3.3 Shortest path across the site displaying fractures
Fig 6.3.4 Fracturing shown in higher definition
To constrain refers to the act of forcing something to alter its existing course and follow a new one, by providing a guided or a controlled environment. A project suitable for the studying of this aspect would once again, be the internal walkway of Miralles’ Olympic Archery Range.

As we recall, the corridor was flanked by curvilinear walls, where the resultant flow through the interior walkway is simulated with computational fluid dynamics to generate a three-dimensional visualization of movement in the space. Figure 6.4.1 shows a rather constant flow moving through the main entrance located close to the midsection and moving to the two lateral exits on the opposite ends of the walkway.

To understand the flow better, the experimental analysis here is to identify the effect of curved walls in an interior space through two-dimensional drawings. By comparing the laminar flow of this particular walkway against an altered plan of the same walkway without fillet edges, it is apparent that the flow is less turbulent in the case with the curvilinear walls as compared to the hard-edged ones. The diagrams show that the movement through the architecture is very much guided by the design of the walls, as the flow takes the shape of the interior space.

Another observation from the plan was that, with this primary flow through the building, the programmatic spaces are arranged along the flow, where curved walls then guide the users into the individual rooms. Without the use of formal, visible doors, the architect was able to create subtle suggestions of entrances to secondary spaces by constraining and guiding the movement of people with the designed walls.
In Miralles’ designs, there are typically multiple elements that are part of his composition. Everything amalgamated, works collectively as a whole. Also, it never neglects the relationship between the user and the design, always verifying the intimacy between the two.

The ability to create compositionally coherent works is a skill, and Miralles was very well-versed in this field. The way he organizes and arranges the individual elements in space results in their complementing of one another, and also how they relate to the environment.

In this chapter, we analyse how Miralles arrays, composes and connects his designs, giving order and familiarity to the new and foreign.

“Everything is a collection of artifacts that work by themselves, but together form something similar to an orchestra, in a continuous flow.”

Enric Miralles

Fig 7.0.1  Composition of Parc de Colors

THE ORDER
The repetition and ordered arrangement of a particular element is seen as an array. In Miralles’ projects, he often replicate one single element to create groups or clusters. In the Olympic Archery Range, the roof plan is telling of Miralles’ use of array in his design.

Instead of a big roof over the area, Miralles’ design comprised of multiple short roof segments. Although it is a repetition of elements, the architect varied the ways he arrayed the roof pieces. In order to create a less mundane shelter, he rotated the edges of the individual roof segments that contributed to a long continuous line to roofline that was almost always changing, creating an invisible threshold that was constantly negotiating with its surroundings. On elevation, the roofs were also rotated and arranged at a different angle from the one adjacent to it, as if the individual roof pieces were dancing.

In terms of sheltered area created, the area which housed the programmatic functions was allocated with the majority of it. Due to the placement of secondary openings of the building, Miralles extended the the shelters in the two directions, extending the reception and stretching the array of roof segments across the site. The non-programmatic areas were sheltered walkways and hence they were allocated less area in comparison.

The use of array here, coupled with the rotating and scaling functions, produced a roof that was like no other.

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**Fig 7.1.1** Photograph of Olympic Archery Range showing the array of roof

**Fig 7.1.2** Roof plan of Olympic Archery Range showing the rotated array of roof pieces

**Fig 7.1.3** Roof plan of Olympic Archery Range showing the sheltered area created
7.2

**TO COMPOSE**

This section is an extension of section 6.2 To Bend, where we look at the arrangement of bending radii in the interior space of the archery range as a whole composition.

Previously, we compared the occurrence of the bending radii to the function of the spaces, whereas here, we would look at it from a macro perspective and try to derive a pattern and rhythm to the arrangement.

After identifying the bending radii of the walls, the diagram above organizes them by size at any given point across the length of the building. At a glance, one can easily recognize the density in comparison to the range of radii.

The main entrance to the enclosed space is located slightly off centre, represented by a thick stroke on the x-axis, while the two other strokes represent the secondary entrances. The area close to the main entrance experiences a high density of curved walls as it is where most of the programme spaces are allocated. There is also a higher occurrence of them toward the left half of the building as compared to the right, possibly due to the spatial programming as well. However, they diminish in density as you move towards the two secondary openings.

There is also an obvious trend of having smaller fillet radii closer to the entrances, and a gradual increase in fillet radii as one moves away from there. This could be due to the fact that the smaller radii remove less usable area and hence creating a sharper bend that can provide more privacy to the functions within the interior of the building.

The diagram on this page attempts to visualise an estimate of the rhythm that the curvilinear walls deliver to the space across the length of the building. It is a curve derived from using the centres of the circles in the previous diagram as attractor points.

It effectively communicates what the previous diagram lacks, showing the trend of the increase and decrease in radii in a clearer form. The oscillations, although irregular, seem to have similar amplitudes as the crest and troughs happen within a small range of difference. Another regularly observed is a similar period length, which is essentially what defines the sinuous rhythm in this diagram.

The analysis of the bends in this project, followed by the attempt to establish a compositional rhythm seeks to provide a pattern that guides Miralles’ design decisions. This same set of analysis tools could be applied to other projects as well.
Another key feature of Miralles’ architecture is the ability to connect to its site and surroundings. Here, we study the project of the Poblenou Library, looking at the connectivity of spaces within the building and also, how the building seeks to extend itself to its surroundings.

By studying Miralles’ preliminary sketches for this project, it was clear that he was trying to develop a relationship with the surroundings with extension of lines, which were also interpreted as exterior low walls in the landscape. Hence, by extrapolating the lines of the plot, a pattern grid is derived and the intersection points were highlighted.

When observing the building in its context, it was clear that although it is subterranean, which makes it seem isolated from the surroundings, it is very much still connected with its exterior. The converging points of the imaginary lines end up on possible views which the architect aims to direct, avoiding the built-up areas and focusing on the green, the pedestrian path and the parking lot. This fosters the creation of a dialogue between the interior and the exterior.

The interior of the library is also very well connected. Designed as a series of open-concept classrooms in a linear arrangement, the affinity of the spaces is emphasised with a view into the next room and beyond as long as you’re on the central circulation path. The main space lies in the area between the two main doorways, which is visible from almost wherever you are. It is also where the flow from the ramps down and through the entrances converge, establishing a relationship with the original ground level on the exterior.

![Fig 7.3.1 Connectivity within the building and also from the openings](image)

![Fig 7.3.2 Extrapolation of lines on plan to derive pattern grid](image)

![Fig 7.3.3 Connectivity with the surroundings](image)

![Fig 7.3.4 Connectivity within the building and also from the openings](image)
TO NEST is the insertion of a building into its existing landscape
TO LIFT is the raising of the land to create new topography onsite
TO ROTATE is the orienting of the building based on the site topography
TO OBLIQUE is the leaning of walls to alter the experience of a path
TO CONSTRAINT is the shaping of the flow with the design of interior boundaries
TO BEND is the creation of a curvilinear edge to aid with the flow
TO FRACTURE is the deviation of an otherwise straight path
TO ARRAY is the repetition of a single element to form a series
TO COMPOSE is the organisation of elements to create a rhythm
TO CONNECT is the relation between the spaces within and the exterior

Derived with parametric logic and tools, the collection of operations allows me to analyse architectural precedents in a systematic manner and also view design with a different approach. Equipped with this collection of geometrical grammar, I am able to apply and reference them when I move onto the design stage of my thesis.

Toni Kotnik, 2013
REPLICA

The architecture world tends to reject replicas of any sort, dismissing copies as the rip-off work of unimaginative plagiarists who are hindering the natural progress of design.

From Shanghai’s Thames Town to Hangzhou’s Venice Water Town, China’s duplitecture craze is no exception. These residential developments modelled after famous cities of the West have prompted negative reactions from the rest of the world, rejecting these themed communities as ‘kitschy’ and ‘fake’, or simply ‘trash’.

However, copying was the means by which architecture was disseminated historically. The copy, which is considered the enemy of progress, is also fundamental to architecture’s mode of production and source of inspiration. Therefore, the copy can be seen as the evil twin but the idea of originality remains a disciplinary foundation.

In fact, Urtzi Grau and Cristina Goberna from Fake Industries Architecture Agonism believe that “architecture has resisted to openly embrace copies and in so doing, it has hindered its potential.” In this modern age and time where digital media and contemporary design technologies are rampant, replicas emerge as a matter of clicks.

For the second half of the thesis, I would focus on creating a replica of one of Miralles’ buildings. With the little library of operations that I have compiled, with digital tools and simulations, I will redesign one of the buildings by the architect, with his own design language and grammar.

The taxonomy of operations would be applied to the design like shape grammars, to generate the building’s form in close relation to the ground, the flow and the order.
OUTLOOK

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<table>
<thead>
<tr>
<th>Week</th>
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<tbody>
<tr>
<td>WK 01</td>
<td>select building and gather information, concept exploration</td>
</tr>
<tr>
<td>WK 02</td>
<td>concept exploration, site study - ground exploration</td>
</tr>
<tr>
<td>WK 03</td>
<td>concept development, landscape/terrain - ground exploration</td>
</tr>
<tr>
<td>WK 04</td>
<td>concept development, programmatic planning - flow exploration</td>
</tr>
<tr>
<td>WK 05</td>
<td>design development, produce drawings/presentation materials</td>
</tr>
<tr>
<td>WK 06</td>
<td>mid-term presentation</td>
</tr>
<tr>
<td>WK 07</td>
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