Parametric modelling between supputation and graphic descriptions in Antoine de Ville’s Les fortifications (1628)

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Michele RUSSO, Marta ACIERNO (Eds.)

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MISCELLANY

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Parametric modelling between supputation and graphic descriptions in Antoine de Ville's Les fortifications (1628)

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Abstract

This paper examines Antoine de Ville's *Les fortifications* (1628), a landmark of the French school of military architecture, notable for merging geometric constructions with tabular calculations, the "supputation par les Sinus." Using parametric and algorithmic modelling, the study translates de Ville's design principles into a modular digital workflow that employs historical units of measurement and dimensions to reconstructing both plan and section of regular fortresses. The method proceeds from data input to two- and three-dimensional construction and ends with Building Information Modelling (BIM) export. This approach validates the consistency of de Ville's values, identifies points of variation, and allows parametric control of elements such as the orillon. Beyond reconstruction, the models enable enriched analysis of bastioned systems and are made available through web-based BIM platforms. The research demonstrates how early modern treatises can evolve into interactive resources, bridging historical building knowledge with contemporary tools for study and dissemination.

Keywords: VPL, BIM, regular fortresses, Antoine de Ville.

1. Introduction

The research presented here is part of the two-year PRIN 2022 project entitled "INFORTREAT: Reconstructing the Early Modern Bastioned Front." This project aims to develop information models for the utilization of constructive knowledge in fortified architecture treatises from the 16th to 18th centuries.

The project's overarching objective is to facilitate access to constructive knowledge pertaining to military architecture, as elucidated in early modern treatises, by utilizing three-dimensional digital information models. These models are designed to be consulted and interrogated by scholars, practitioners, and the broader community.

The project's initial phase comprises an exhaustive examination of military treatises from the 16th to 18th centuries in Italy, France, the Netherlands, and Spain. This aims to identify the geometric constructions for profiling the bastion system and the technological, material, and construction indications for the sections of the system itself, as proposed by the different authors. The objective is to identify recurrent methodologies and techniques, explicit or implicit derivation relationships between one treatise and another, and elements of innovation and originality in fortification techniques.

In this context, the present contribution focuses on a critical analysis of the first book of the treatise on military architecture, *Les fortifications du Chevalier Antoine de Ville* (de Ville, 1628).

2. De Ville's treatises in the panorama of theories on military architecture

Born in 1596, Antoine de Ville was a member of a noble family from Toulouse, France. Educated by the Jesuits, he was trained in scientific topics, such as Mathematics, Geometry, and military architecture as well. After his studies, he undertook a career in the military field, serving in the French, Piedmontese and Venetian army, both as field officer and military engineer. The second service (in Piedmont) granted him the title of *Knight of the Order of St. Maurice and St. Lazarus* on 1626 (Pernot, 1987). During his life, he authored quite a few publications regarding military topics. Among them, his first one was *Les fortifications du Chevalier Antoine de Ville*, published in Paris in 1628, after his first return in France. This treatise was followed by the volume *De la Charge des Gouverneurs des Places*, published in Paris in 1639. Both treatises obtained a good success at their time, the second one being republished many times and still in use until the 60s of the 19th century (Pernot, 1987). He died in Paris in 1656.

His publishing activity positions de Ville among the founding fathers of the *alla moderna* fortified architecture of the so-called French School. His figure must be put next to those of Claude Flamand (ca. 1570-1626) and Jean Errard de Bar-Le-Duc (1554-1610), the very first representatives of this school, Blaise François Pagan (1604-1665), de Ville's contemporary and mentor of both Nicolas-François Blondel (1618-1686) and Sebastien Le Prestre de Vauban (1633-1707), who would have become the most important, and best known professional of the French school between 17th and 18th centuries.

De Ville's treatise has already been analysed, both for its structure and for its contents (Pavignano, Spallone 2025), but it is worth recalling that the *in-folio* volume counts to 441 numbered pages and it is illustrated with 55 copper engraved plates, 45 are on a single sheet, and 10 are on a double sheet. Still, it is important to remember that the succession of topics reflects de Ville's idea to define an all-inclusive discussion on fortification design and the management of sites and fields operations.

As already highlighted, de Ville explicitly refers to previous works by Dürer (1527), Errard (1600), Marlois (1628) (Pavignano, Spallone 2025).

3. Fortification design of regular fortresses by *supputation*

As previously discussed, de Ville proposed his personal design methodology for the regular fortifications based on the inner polygons used to define the shape of the plan. To this extent, the sides of the regular figures were supposed to sustain both the half gorges and the curtains of bastioned fronts. De Ville used the King's foot as basic unit of measurement, which is equal to 0.32484 meters (Martini, 1883), and Geometric paces as its 5x multiple (de Ville, 1628). The Author also imposed two specific dimensions for sides, originating two main defensive systems (differing only in their sizes): Royal and Ordinary, as synthesized in Tab. 1. For reference, contemporary authors like Adam Freitag (1635) defined up to three different dimensions like *grand, moiene,* and *petit Royals* (for regular fortifications).

Regular fortification type	Polygonal sides length		
	Geometric paces	King's feets	Meters (approx)
Royal	180	900	292.36
Ordinary	150	750	243.63

Tab. 1- Main dimensions of regular fortresses sides equal to the sides of the polygons used to design the plans (elaboration by M. Pavignano).

De Ville related such dimensions to the ballistic aspects of defence conducted using firearms, primarily defining the range of the muskets as reference invariants of the defence, thus of the fortification design itself (de Ville, 1628). In fact, sides measuring 180 paces did consent muskets' flanking, since muskets' range was far superior (de Ville, 1628). We have already exposed his methodology via graphic analysis (Pavignano, Spallone, 2025). By redrawing de Ville's instructions, we obtained the generic geometric concatenation originating the regular fortification design of a regular polygon (with bastions and curtains). Still, we discussed the very novelty of de Ville's methodology – or better a consequence of this – being the *supputation par les Sinus* (de Ville, 1628) of each single geometric element of the plan of a regular fortress. In fact, the Author deconstructed the bastioned front into segments, listed in Fig. 1, and calculated each of them starting from the internal angle of the chosen regular polygon, proceeding from the hexagon up to the dodecagon (de Ville, 1628) then resuming all the calculations in a table (Pavignano, Spallone, 2025). This led de Ville to be the first to expose this kind of calculated tabular data, thus offering the readers both a graphic procedure and a numerical one, by mean of lines lengths and angular values (Mišic, Obradović, 2025).

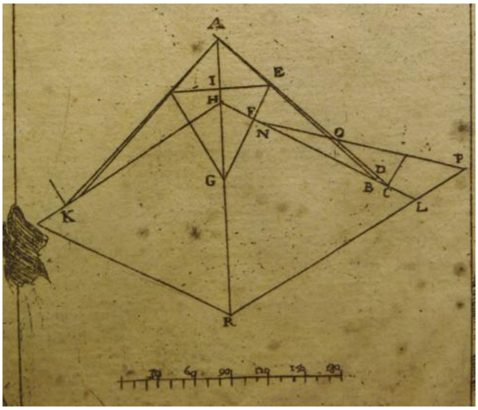


Fig. 1- de Ville's graphic deconstruction of the bastioned front. (de Ville, 1628, planche 32)

De Ville then applied both the geometric procedure and the *supputation* to the design of the planar development of regular fortification. He also provided a graphic procedure to define the *profil* or *orthographie* (cross section) of a bastioned front.

The Author presented his idea at the very beginning of his treatise, as a complement to the graphic procedure used to design the regular plans visually described in *figure 2* of the *planche 1* of the treatise. According to the text, we can draw the entire cross section of a fortified front starting from the setting of the horizontal ground level CE, then we can proceed with drawing of the rampart, the parapet, the ditch and all the other elements by easily using dimensions provided (de Ville, 1628). Our graphic analysis of de Ville's *profil* is presented in Fig. 2. The figure contains also the dimensions of main elements and integrates some visual information on the structure of the wall, specifically on the presence of counterforts. To interpret the Author's design procedure, we must highlight that he provided dimensions while discussing the *profil*, then he might have provided other information within the punctual description of each element on the dedicated paragraphs. For example, he indicated the ditch width to be 26 paces (or 130 feet) at page 20, but he then described ditches' width to be ranging from 15 to 30 paces (75-150 feet) in the dedicated paragraph (de Ville, 1628), relating this 15-30 range to different types of terrain hosting the ditch. To better clarify this discordance, we resume in Table 2 the minimum and maximum dimensions found within the text, thus providing a complete lookout for possible variations. We can observe that such variations in dimensions of every element are common to all the treatises on military architecture, since each project should have been designed according to the building sites' orography and material characteristics. Data in Table 2 are used to define the parametric modelling presented in the next paragraph.

It is worth mentioning that de Ville did not enter the detail of the description of how walls must be built, except for the thickness of the structure and as well as the dimensions of reinforcing buttresses. In fact, he states to only describe shapes (geometries) of the elements and the materials to build them, not how the walls should be constructed (i.e. how to use bricks or stones blocks), since those aspects belong to civil architecture and to the art of masonry (de Ville, 1628).

Nonetheless, the Author discussion on buttresses provides some interesting hints on his structural conception. First, de Ville states that earth is the best material to counter gun shots, especially those of big cannons. It derives that the masonry structure of walls had to be used mainly as constraints for the earth-made ramparts, these lasts to be built with the earth excavated from the ditch (de Ville, 1628). Following the Italian tradition, de Ville highlights the possibility to build counterforts with different planar shapes and suggests the dimensions of the parallelepiped-shaped ones to be built approximately with a horizontal section of 7/8 by 4/5 feet and a vertical one of 35 feet (or 7 paces), basically the same height as the *chemin des ronde* upper level. Buttresses should be spaced 15-20 feet away from one another.

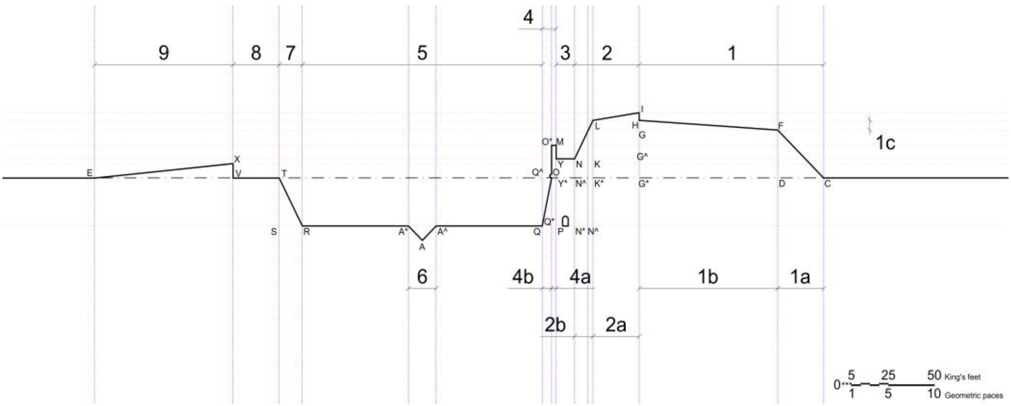


Fig. 2- *Profil* or *orthographie* (cross section) redrawing and reconstruction with elements nomenclature and elements' minimum and maximum dimensions both for widths and heights (graphic analysis and elaboration by M. Pavignano 2025)

Element *de Ville's terminology* English translation	ref. Fig. 2	ref. *Profil* – horizontal segment | vertical segment	Width min u	Width max u	Height min u	Height max u	Dimensional variations for parametric design – horizontal direction	min u	max u	| vertical direction related to ground line CE	*min u*	*max u*
Rempart ou contre-escarpe et pente Rampart including its counterscarp and its pente	1	CG* – DF | G*H |	20 paces 100 feet	25 paces 125 feet	5 paces 25 feet	6 paces 30 feet	CG* –	20 paces 100 feet	25 paces 125 feet	DF | and G*G |	5 paces 25 feet	6 paces 30 feet
Monté du rempart Counterscap of the rampart	1a	CD – DF |	5 paces 25 feet	5 paces 25 feet	5 paces 25 feet	5 paces 25 feet	CD –	5 paces 25 feet	5 paces 25 feet	DF |	5 paces 25 feet	
Rempart Rampart excluding its counterscarp	1b	FG – DF | G*H |	15 paces 75 feet	20 paces 100 feet	5 paces 25 feet	6 paces 30 feet	DG* –	15 paces 75 feet	20 paces 100 feet	DF | and G*G |	5 paces 25 feet	6 paces 30 feet
Pente du rempart vers la place Inclination of the upper level of the rampart	1c	FG – GH |	15 paces 75 feet	20 paces 100 feet	1 paces 5 feet		FG –	15 paces 75 feet	20 paces 100 feet	G*H |	6 paces 30 feet	
Parapet ou contre-escarpe Parapet including its counterscarp	2	HILN – HI |	7 paces 35 feet		0,8 paces 4 feet		G^N –	7 paces 35 feet		KL | G*I |	6 paces 30 feet	6,8 feet 34 feet
Parapet Parapet excluding its counterscarp	2a	HL – HI |	5 paces 25 feet				G^K–	7 paces 35 feet		KL | G*I |	6 paces 30 feet	6,8 feet 34 feet
Contre-escarpe du parapet Counterscarp of the parapet	2b	KN – LK |	2 paces 10 feet		0 paces 0 feet	4 paces 20 feet	KN –	2 paces 10 feet		N^N | K*L	2 paces 10 feet	6 paces 30 feet
Muraille Wall including the Chemin des ronde	4	NYMO*OQP	5 paces 15 feet	5,6 paces 18 feet	2 paces 10 feet	7 paces 35 feet						
Chemin des ronde Chemin des ronde	3	NY –	2 paces 10 feet		2 paces 10 feet		NY –	2 paces 10 feet		N^N |	1,6 paces 8 feet	2 paces 10 feet
Parapet du chemin des ronde Parapet of the chemin des ronde	4a	MO* –	0,5 paces 2,5 feet		1,4 paces 7 feet	1,6 paces 8 feet	MO* –		0,5 paces 2,5 feet	Y*M |	3,4 paces 17 feet	3,6 paces 18 feet
Chemise Mantlet wall	4b	QQ* –	1 pace 5 feet		5 paces 25 feet		Q*Q –	1 pace 5 feet		Q*O |	-5 pace -25 feet	
Fossé Ditch (excavated in earth)	5	QR –	25 paces 125 feet	30 paces 150 feet	5 paces 25 feet	7 paces 35 feet	QR –	25 paces 125 feet	30 paces 150 feet	Q^Q |	-5 paces -25 feet	-7 paces -35 feet
Fossé Ditch (carved in stone)	5	QR –	15 paces 75 feet	20 paces 100 feet	5 paces 25 feet	7 paces 35 feet	QR –	15 paces 75 feet	20 paces 100 feet	Q^Q |	-5 paces -25 feet	-7 paces -35 feet
Cunete ou petit fossé Small ditch	6	A*A^ – A |	3 paces 15 feet	4 paces 20 feet	1,5 paces 7,5 feet		A*A^ –	3 paces 15 feet	4 paces 20 feet	A	6,5 paces -32,5 feet	
Contre-escarpe du fossé Counterscarp of the ditch	7	RS – ST |	2,5 paces 12,5 feet		5 paces 25 feet	7 paces 35 feet	RS –	2,5 paces 12,5 feet		ST |	-5 paces -25 feet	-7 paces -35 feet
Chemin couvert ou Corridor Walkway	8	TV – ST |	5 paces 25 feet	6 paces 30 feet	0 paces 0 feet	0 paces 0 feet	TV –	5 paces 25 feet	6 paces 30 feet		0 paces 0 feet	0 paces 0 feet
Esplanade Slope	9	VE – VX |	15 paces 75 feet	20 paces 100 feet	1,5 paces 7,5 feet		VE –	15 paces 75 feet	20 paces 100 feet	VX |	0 paces 0 feet	1,5 paces 7,5 feet

– this sign indicates an horizontal segment

| this sign indicates a vertical segment

min and max values for the entire *fossé*

min and max values are related to the rampart's

min and max value to be related to different levels

min value derived from graphic analysis of pl. 1

Tab. 2- Synoptic table of elements' dimensions and their identification in de Ville's *profil* (cross section) (analysis and elaboration by M. Pavignano 2025). Columns contain: elements' names; letters to identify them on the graphic analysis of the *profil* (cross section) presented in Fig. 2; width and height (minimum and maximum) as described by de Ville; dimensional variations for parametric design elaborated based on de Ville's dimensions referred to the ground level

4. Parametric Modelling and Algorithmic Procedures

This research utilizes a visual algorithmic approach to digitally model the de Ville's fortification system. The methodology is based on a unitary visual algorithm that integrates the entire construction process, from input data to output generation and export to other software.

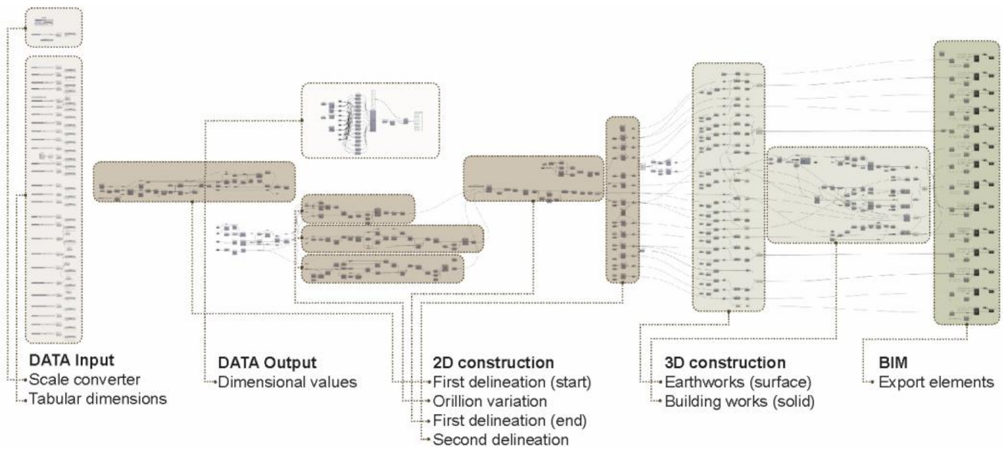
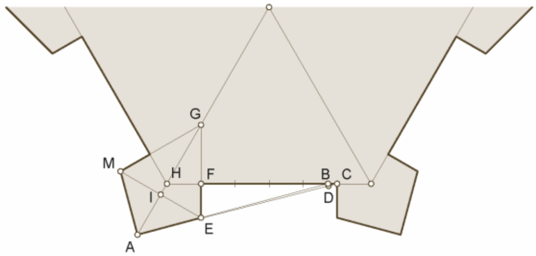


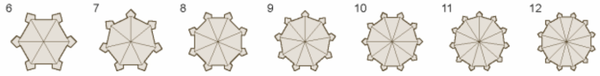
Fig. 3- Visual algorithm of A. de Ville's fortification system (graphic elaboration by F. Natta)

The workflow is meticulously divided into distinct modules for data input, two-dimensional and three-dimensional construction, and final data export to other software platforms (Fig. 3). This modularity is key to the system's flexibility and transparency, making it possible to trace the digital model's lineage directly back to de Ville's original geometric principles. A critical aspect of this modelling process is the direct integration of de Ville's historical units of measurement. The input data, which serves as the foundational control for the entire model, rigorously adheres to de Ville's geometric system. Specifically, the geometric pace is employed for defining the base polygon of the fortification, while the King's foot (pied du roi) is used for all remaining dimensions. By using these units, the model not only faithfully reproduces de Ville's designs but also provides a powerful tool for analyzing his design logic. The parametric nature of the algorithm allows for the continuous control of the model, enabling researchers to test and verify the geometric relationships and dimensions outlined in de Ville's treatise. The model directly incorporates the dimensions and variations (Tab. 2) to establish a verifiable link between the historical text and its digital reconstruction.

The power of the algorithmic approach is further demonstrated by its ability to generate a bidimensional development of the fortress. This procedural step is essential for systematically verifying the tabular dimensions of individual elements as the base polygon changes. De Ville himself addresses a range of polygons, from a hexagon to a dodecagon, in *Les fortifications* (de Ville, 1628; Mišic, Obradović, 2025). Our model automates the generation of these variations, extracting all relevant values algorithmically. The results provide a direct comparison between de Ville's original values and those produced by the digital model (Tab. 3). The analysis of this data reveals a consistent and controlled delta of variation across most elements, except for one specific value that shows a more significant deviation. This finding not only validates the accuracy of the algorithmic reconstruction but also highlights potential points of interest for further historical or technical investigation within de Ville's original work.

The digital dialogue between the historical calculations (*supputation*) and our parametric model confirms the consistency of de Ville's design principles. Beyond mere reproduction, the visual algorithm provides a fertile ground for design analysis and variation. A specific example is the parametric control over the orillon a distinctive feature of the bastioned front. Following the guidelines and drawings in de Ville's *planche 1*, the algorithm allows for the dynamic variation of the orillon's geometry. This functionality (Fig. 4) demonstrates how algorithmic modelling can move beyond simple representation to become a tool for exploring the design possibilities and variations inherent in historical architectural treatises. This approach aligns with similar research on other treatises, such as those by Sardi and Guarini, where parametric modelling is used to verify and interpret historical dimensions (Rechichi et al., 2024; Spallone et al., 2025).





	6	7	8	9	10	11	12
EB	115p, 4pi 188,26m -0,18m	90p, 4pi 147,54m -0,06m	78p, 2pi 127,34m 0,00m	71p 115,30m 0,01m	66p 107,34m -0,14m	62p, 3pi 101,68m -0,01m	60p 97,46m -0,01m
FB	111p, 4pi 181,85m -0,26m	85p, 4pi 139,26m 0,10m	72p, 2pi 117,64m -0,05m	64p,2pi 104,50m 0,10m	58p, 4pi 95,64m -0,14m	53p 89,24m -3,16m	52p 84,40m 0,05m
BC	8p, 1pi 13,05m 0,26m	34p, 1pi 55,65m -0,10m	47p, 3pi 77,26m 0,05m	55p, 3pi 90,40m -0,10m	61p, 1pi 99,27m 0,14m	65p 105,66m -0,09m	68p 110,50m -0,05m
HF=FE	30p 48,72m 0,01m	30p 48,72m 0,01m	30p 48,72m 0,01m	30p 48,72m 0,01m	30p 48,72m 0,01m	30p 48,72m 0,01m	30p 48,72m 0,01m
HG	60p 97,44m 0,01m	69p, 1pi 112,29m 0,11m	78p, 2pi 127,31m 0,02m	87p, 4pi 142,45m 0,15m	97p 157,67m -0,12m	106p, 1pi 172,94m -0,45m	116p 188,25m 0,16m
GF	52p 84,40m 0,06m	62p, 2pi 101,18m 0,17m	72p, 2pi 117,64m -0,04m	82p, 2pi 133,87m -0,04m	92p, 1pi 149,96m -0,21m	101p, 4pi 165,95m 0,60m	112p 181,85m 0,06m
GE	82p 133,12m 0,06m	92p, 2pi 149,91m 0,17m	102p, 2pi 166,36m -0,04m	112p, 2pi 182,60m -0,04m	122p, 1pi 198,69m -0,21m	131p, 4pi 214,67m 0,60m	142p 230,57m 0,06m
IG	71p 115,29m 0,03m	83p 135,06m -0,25m	94p, 3pi 153,70m -0,05m	105p, 3pi 171,59m -0,07m	116p, 4pi 188,96m 0,42m	126p, 4pi 205,98m -0,03m	137p, 1pi 222,72m 0,12m
IH	11p 17,85m 0,02m	13p, 4pi 22,77m -0,36m	16p, 1pi 26,38m -0,07m	17p, 4pi 29,14m -0,22m	19p, 3pi 31,30m 0,54m	20p, 3pi 33,04m 0,42m	21p, 1pi 34,47m -0,03m
IE=IA	41p 66,56m 0,03m	40p 65,04m -0,07m	39p, 1pi 63,66m 0,01m	38p, 2pi 62,45m -0,08m	37p, 4pi 61,40m 0,00m	37p, 1pi 60,48m -0,06m	36p, 4pi 59,68m 0,09m
AH	52p 84,41m 0,05m	53p, 4pi 87,81m -0,43m	55p, 2pi 90,05m -0,07m	56p, 1pi 91,59m -0,31m	57p, 2pi 92,70m 0,53m	57p, 4pi 93,52m 0,36m	58p 94,14m 0,06m
AE	58p 94,13m 0,07m	56p, 2pi 91,98m -0,38m	55p, 2pi 90,03m -0,05m	54p, 1pi 88,32m -0,29m	53p, 2pi 86,83m -0,10m	52p, 3pi 85,53m -0,10m	52p 84,40m 0,06m
AB	173p, 4pi 282,40m -0,11m	147p, 1pi 239,52m -0,44m	133p, 4pi 217,37m -0,05m	125p, 1pi 203,63m -0,28m	119p, 2pi 194,17m -0,24m	115p, 1pi 187,21m -0,10m	112p 181,86m 0,05m
DC	7p, 4pi 12,65m 0,02m	32p, 4pi 53,57m -0,30m	45p, 3pi 74,02m 0,04m	53p 86,27m -0,19m	58p, 1pi 94,44m 0,09m	61p, 4pi 100,27m 0,11m	64p, 2pi 104,64m -0,04m
AD	173p, 4pi 282,38m -0,09m	147p 239,05m -0,29m	133p, 1pi 216,24m 0,10m	124p, 1pi 201,83m -0,10m	118p 191,74m -0,09m	113p, 1pi 184,22m -0,36m	109p, 4pi 178,36m -0,02m
AC	181p, 3pi 295,02m -0,07m	179p, 4pi 292,62m -0,59m	178p, 4pi 290,26m 0,15m	177p, 1pi 288,10m -0,29m	176p, 1pi 286,18m 0,00m	175p 284,49m -0,26m	174p, 1pi 283,00m -0,06m

From A. de Ville's table – *values of magistral line elements (p = Pas géométrique; pi = Pied de Paris)*
From algorithmic model – *values obtained via geometric construction following A. de Ville*
Difference – *table value (converted to metric units) minus algorithmic model value*

Tab. 3- Values of magistral line elements according to A. de Ville's system (elaboration by F. Natta)

The foundational algorithmic model, which is independent of orillon variations, is fully functional for any base polygon ranging from a hexagon to a dodecagon (Fig. 5). It systematically divides the fortification into its constituent parts, reflecting the meticulous detail found in de Ville's treatise. This includes the individual 'parametrization' of elements such as the counterforts and the vaulted corridor, as explicitly depicted in de Ville's *planche 13* and meticulously integrated into our algorithm. This modular approach ensures that each component can be studied and analyzed individually, providing an unprecedented level of detail in the digital reconstruction.

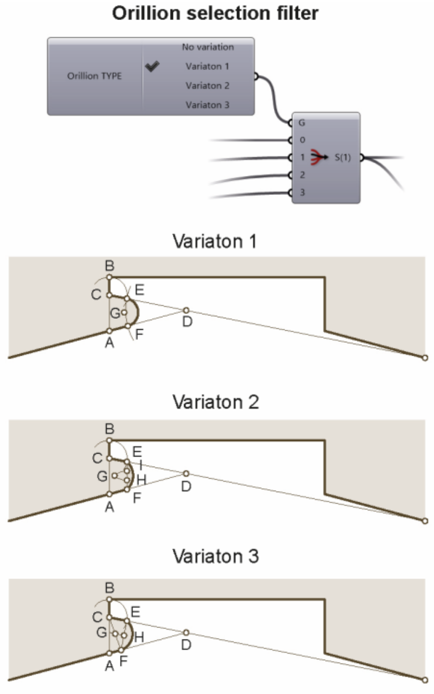


Fig. 4- Orillion variation and visual algorithm control nodes (graphic elaboration by F. Natta)

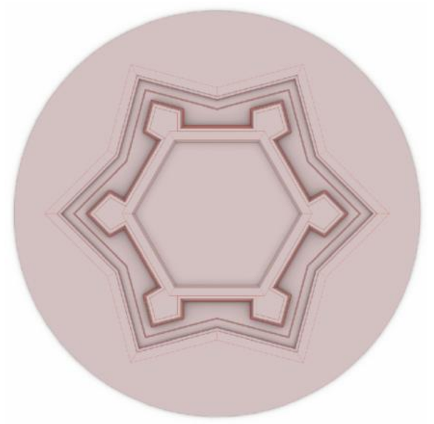


Fig. 5- Parametric model of A. de Ville's fortification system (graphic elaboration by F. Natta)

5. Algorithmic Modelling of De Ville's Fortifications

The culmination of the algorithmic modelling process is the export of the generated data into a Building Information Modelling (BIM) environment. This step is a crucial transition from purely geometric representation to a semantically enriched, information-based model. BIM provides the framework for organizing and classifying the digital assets, transforming historical plans into a modern, usable database. The models are exported with a clear hierarchical structure, primarily divided into two main families: 'Base Wall' and 'Topographic Solids'. The 'Base Wall' family is a comprehensive collection of all masonry components, including the main curtain wall, the cordon, the parapet, the patrol path, the counterforts, and the 'void' that represents the vaulted corridor. The 'Topographic Solids' family, on the other hand, comprises all the earthworks and stone foundations, such as the glacis and other ground-level elements. This division facilitates the management and analysis of the different material and structural components of the fortification (Fig. 6) (Rechichi et al., 2024; Spallone et al., 2025).

Fig. 6- BIM section (extract from Revit) and BIM viewer interface (extract from BIMViewer) of de Ville's model (graphic elaboration by F. Natta)

The final and arguably most impactful potential of this research is the export of the model to a web-based BIM application (Rechichi et al. 2025). This functionality allows for the online consultation of the model (Fig. 6), democratizing access to the rich historical content. By creating an interactive, web-based platform, this project makes it possible for a global audience to explore de Ville's fortifications in a 3D environment, gaining a deeper understanding of the design principles and construction techniques of the 17th century. This digital dialogue between historical sources and modern technology not only preserves cultural heritage but also transforms it into a dynamic, educational, and research-oriented tool.

6. Conclusions

De Ville's graphic and tabular approach set a standard for technical presentation of fortification design in the early 17th century. Data provided in the treatise can act as a solid base for three-dimensional verification of numerical values defined by *supputation* and by graphical and textual analysis of the book and its illustrations.

This work benefits from the scientific approach defined in previous studies and continues with the validation and verification of the scalability of the method of model implementation through parametric modelling and information enrichment through BIM.

The method is under development by the research group of the broader PRIN project, and sheds light on possible future developments in relation to the efficient interoperability between the two systems.

Acknowledgement and credits

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This contribution, whose authors shared the methodological framework, was written by M. Pavignano (par. 2-3), F. Natta (par. 4-5), R. Spallone (par. 1). Par. 6 was written by all the authors.

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