Describe in these sections the main scientific and technical competencies that is required to be known by you BEFORE starting the project.

Do not describe in details this knowledge but only abstractly. All the content of this section shall not be used, even partially, in the deliverable sections.

It is important not to include in this section all the knowledge you plan to acquire in order to produce the deliverable. It should only state the knowledge the student possessed before starting the project and that was mandatory to possess to be capable to produce the deliverables. It explicitly defines the technical and scientific pre-condition for the project. It is also useful to avoid project failures due to over or under complex subjects.

[5-10%] == 100 to 200 words

Construction plans are essential tools. They ensure the proper follow through of a planned establishment and are an efficient and quick way to gather information related to an establishment.

One can observe the different rooms, doors, windows, the direction of specific faces, the size of the different components and rooms, and many others.

Different data can be interpreted and used for a multitude of purposes, due to the graphical nature.

In my previous BSP, I used digital construction plans in a BIM format to extract specific data using Dynamo for Revit.

In this BSP, however, the reverse premise will be done. Standardized data will be transformed into a BIM construction plan automatically.

The process will be automated and generalized, such that the tool can generate a BIM from any input data so long as it follows certain restrictions.

As BIM models are exploited, the scientific part of the project will explore S-graphs. Following from the previous BSP2, S-graphs will be explored much more in depth. What they are, how they are made, their uses etc.

[Expand]This project explores the definitions, working principals, fundamentals, dynamics, and the theory of construction of S-graphs.

To achieve the task of exploring S-graphs in depth, certain tools and environments are necessary.

BIM models is the most fundamental aspect of creating S-graphs, in the methodology followed by me and the team behind this project.

Having some knowledge on S-graphs is helpful before reading the project, but not strictly necessary,

Although helpful, it is not strictly necessary. S-graphs will be explored from the beginning and will be the primary focus of the scientific research.

To complement S-graphs, knowing about the working fundamentals of robots and sensors is also helpful to get a broad understanding of why certain strategies are adopted when forming the S-graphs.

main scientific competencies that is required to be known by you BEFORE starting the project

Merge introduction with competencies

BIM MODELS

Sensors

Robots

S-graphs \*

[Expand]This project explores the definitions, working principals, fundamentals, dynamics, and the theory of construction of S-graphs.

Having some knowledge on S-graphs is helpful before reading the project.

Although helpful, it is not strictly necessary. S-graphs will be explored from the beginning and will be the primary focus of the scientific research.

To achieve the task of exploring S-graphs in depth, certain tools and environments are necessary.

BIM models is the most fundamental aspect of creating S-graphs, in the methodology followed by me and the team behind this project. An understanding of BIM models, their uses and basic functionalities is necessary.

To complement S-graphs, knowing about the working fundamentals of robots and sensors is not necessary, but definetly helpful to get a broad understanding of why certain strategies are adopted when forming the S-graphs.

main technical competencies that is required to be known by you BEFORE starting the project

BimVision

Revit

Bim models

Dynamo for revit

Python

In my previous BSP, I used digital construction plans in a BIM format to extract specific data using Dynamo for Revit.

In this BSP, which is a continuation of my previous BSP, the reverse premise will be done. Standardized input data will be utilized to alter an existing BIM or create a new BIM construction plan.

The process will be automated and generalized, such that the tool can generate a BIM from any input data so long as it follows certain restrictions.

To do this task, certain tools are used and consequently basic working knowledge of the uses of these tools is necessary.

The most fundamental tool is REVIT, which accumudates BIM models. However most of the manipulation will be done in Dynamo for Revit, as the name implies, it is a tool for Revit, which allows for manipulation of BIM models.

Dynamo is Python compatible, so Python scripts can be run inside dynamo scripts to do more specific tasks.

Finally BimVision, a visualising tool for BIM models, is helpful. It allows the user and client to see the changes in real time that the dynamo script actuates on the existing BIM.

Do not describe in details this knowledge but only abstractly.

not to include in this section all the knowledge you plan to acquire

state the knowledge the student possessed before starting the project and that was mandatory to possess to be capable to produce the deliverables.

explicitly defines the technical and scientific pre-condition for the project

avoid project failures due to over or under complex subjects.

\section{ Pre-requisites }

\subsection{ Scientific pre-requisites}

To complement the technical prerequisites, it is imperative to possess knowledge in specific scientific domains related to your deliverable.\\

Understanding BIM models is essential, as they form a core component of the project's scientific exploration. Being familiar with BIM models and their application in the construction industry will help readers grasp the concepts of elements, properties, spatial relationships, and attribute information.\\

In addition, having a basic intuition about how sensors work can greatly aid in visualizing why specific implementations are necessary. Robots rely on real-time sensor data to navigate successfully, and having a basic understanding of how sensors function and how the robot communicates with them will enhance readers' comprehension of the report.\\

By having this foundational knowledge of BIM models and a basic understanding of sensors, readers will be better equipped to engage with the scientific deliverable on the utilization of BIM models for autonomous robot navigation.

\subsection{ Technical pre-requisites}

To guarantee the successful completion of this project, it is imperative to possess a certain degree of knowledge in a multitude of software utilities. These utilities assume an important role in expediting and executing specific tasks associated with the project and enabling the seamless manipulation, visualization, and examination of data. \\

These essential software tools encompass Dynamo for Revit, BimVision, Revit, and Python. Each tool has a distinct purpose, each contributing to the multifaceted technical task to solve. Most of these tools, however, use the same supporting file type, BIM.\\

BIM is an acronym for Building Information Modelling, it is a digital manifestation of standard plans, such as architectural, engineering, operational, and in this case construction data.

It holds information regarding a structure for a multitude of services. It offers a common ground standard practice for various tools and users, for structure information. \\Consequentially, BIM offers interoperability with many software such as Revit and BimVision and allows for the manipulation and visualization of its inherent data. BIM supports 3D geometry, spatial relationships, properties, and other relevant information.\\ \\

Below, a concise explanation is provided for each tool utilized, delineating its importance regarding the context of this report:\\ \\

Revit : \\ \\

Revit is a widely used BIM software by Autodesk. It serves as a central repository for architectural plans, enabling the creation, modification, and management of BIM models. Revit provides tools for 3D modeling, coordination, and documentation. In this project, Revit holds the architectural plans and serves as the platform for loading Dynamo for Revit. It is essential as a tool as it loads construction plans and integrates other tools like Dynamo for Revit.

Dynamo for Revit: \\ \\

Dynamo for Revit is a visual programming platform that extends Revit, a popular BIM software. It enables custom workflows, task automation, and BIM data manipulation through a node-based interface. In this project, Dynamo for Revit is essential for data extraction and manipulation. Using Python scripts and a comprehensive list of node libraries, it allows selective data extraction from structures and components. Working knowledge of Dynamo for Revit is vital to effectively leverage its powerful capabilities and streamline data processing tasks.\\ \\

BimVision : \\ \\

BimVision is a BIM viewer with advanced visualization and analysis features. It offers a comprehensive view of the structure and detailed information about each component in the BIM model. BimVision enhances understanding of architectural plans through improved viewing capabilities and valuable geometrical and property information. Proficiency in BimVision enables better visualization and analysis of the BIM model, contributing to project success. BimVision has additional features compared to Revit’s, as it allows to retrieve specific information about specific a construction’s compartment or structure, such as geometrical information, inherent proprieties, and relations to other parts. The services offered by BimVision are optimal for visualization purposes and to verify the correct manipulation and extraction of data. \\ \\

Python : \\ \\

Python is a widely adopted programming language used in this project. It is utilized within Dynamo for Revit for scripting purposes. The dynamo files contain both Python 2 and Python 3 scripts, enabling customization and automation of data manipulation tasks. Familiarity with Python scripting is crucial for using the full potential of Dynamo for Revit and implementing complex data processing workflows.