Introduction

The construction industry plays a crucial role in civilization, it not only provides residential housing, but it is one of the essential backbones for critical infrastructure for commercial and work-related settlements as well as any community services, transportation, utilities, etc. In the Grand-Duchy of Luxembourg, the housing market represents about 3% of GDP (gross domestic product) as of Mai 2020 [1] and 6% of the country’s PIB 2. Furthermore, it employs a sizeable 48’000 employees [2] without any signs of this trend slowing down. Building any one establishment requires planning, designing, constructing, and maintenance. In this project, the focus is placed mostly on the planning aspect. More specifically, the construction plans of the said structure are the target of this project. While erecting any one structure, its construction plans are constantly revised and addressed throughout the construction process. This project intends to automate this verification process. The overarching goal of this project is to present a new approach for verifying the correct implementation of construction plans in constructions using situational graphs and building architectural plans for robot localization. It aims to provide an automated, standard example, methodology implementation practice, which assures that a built structure, has correctly followed its respective construction plans. The digital construction plan information is formatted in BIM (Building Information Modelling). These plans contain crucial information, encompassing the construction’s geometric, semantic, and topological information. [3]Subsequently, this information is extracted and processed, to fabricate a SGraph’s metric-semantic and topological layers. The prospect of automating the verification of the wellexecution of construction plans in a constructed building using self-locating and moving robots is a very ambitious goal, as such, it is a team effort, and this project specifically, aims to provide a small but critical part of the overall goal necessary requirements, the automated extraction of specific construction plan’s information. Automating the verification of the well-execution construction plans is arguably, one of the most useful steps to automate. Most importantly, it promotes safety measures and mitigates risks in the work environment, it also reduces preventable money and labor losses and potentially speeds up the construction process, promoting productivity. It guarantees precise and accurate construction practices, streamlines collaboration among various stakeholders, enables more optimal utilization of resources, and assists in meeting legal and regulatory obligations. All these, aid in the reduction of the very high demand for the housing market in Luxembourg. It answers a need for quality, safety, and sustainable practices in the construction industry. By advocating for innovation and embracing technological advances, the construction sector is aimed toward future prosperity.

Introduction

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.