ASSETS DATA INVENTORY BASED ON BUILDING INFORMATION MODELLING

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Background

Assets investigation and identification require assets management process. Commonly, assets management process still use conventional method. Assets are simply coded, recorded, and sketched. In the digital and modern technology, such method can be said as static because it cannot follow the dynamics of data changes.

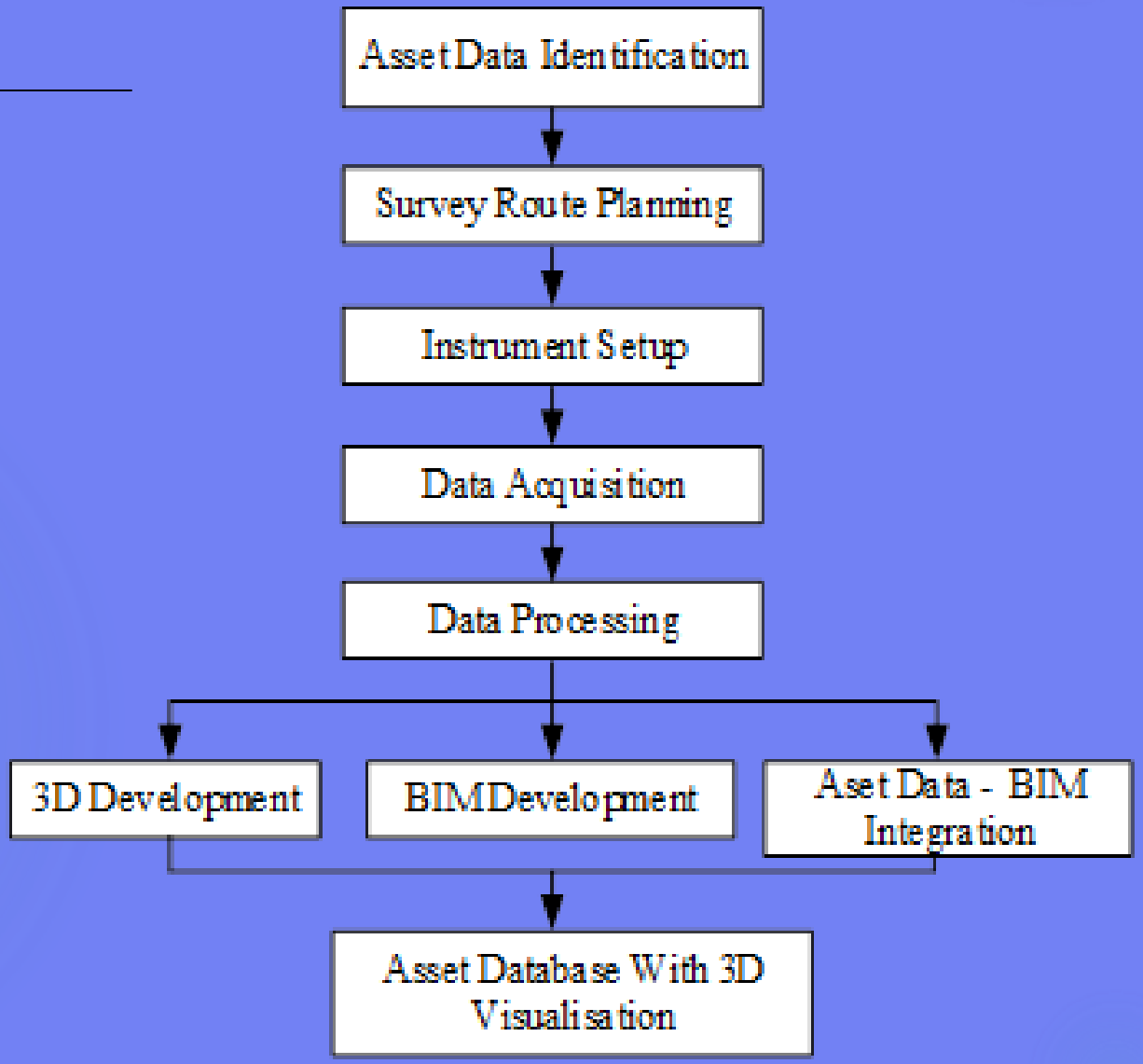
One of the technologies that have begun to be applied in asset management processes is *Building Information Modeling* (BIM).

Background

By integrating BIM into a building asset management process, any disadvantage in conventional asset management may be eliminated.

In this research, BIM was used to provide information on building shape, room situation, asset shapes and dimensions, and asset position that can be known precisely.

Methodology

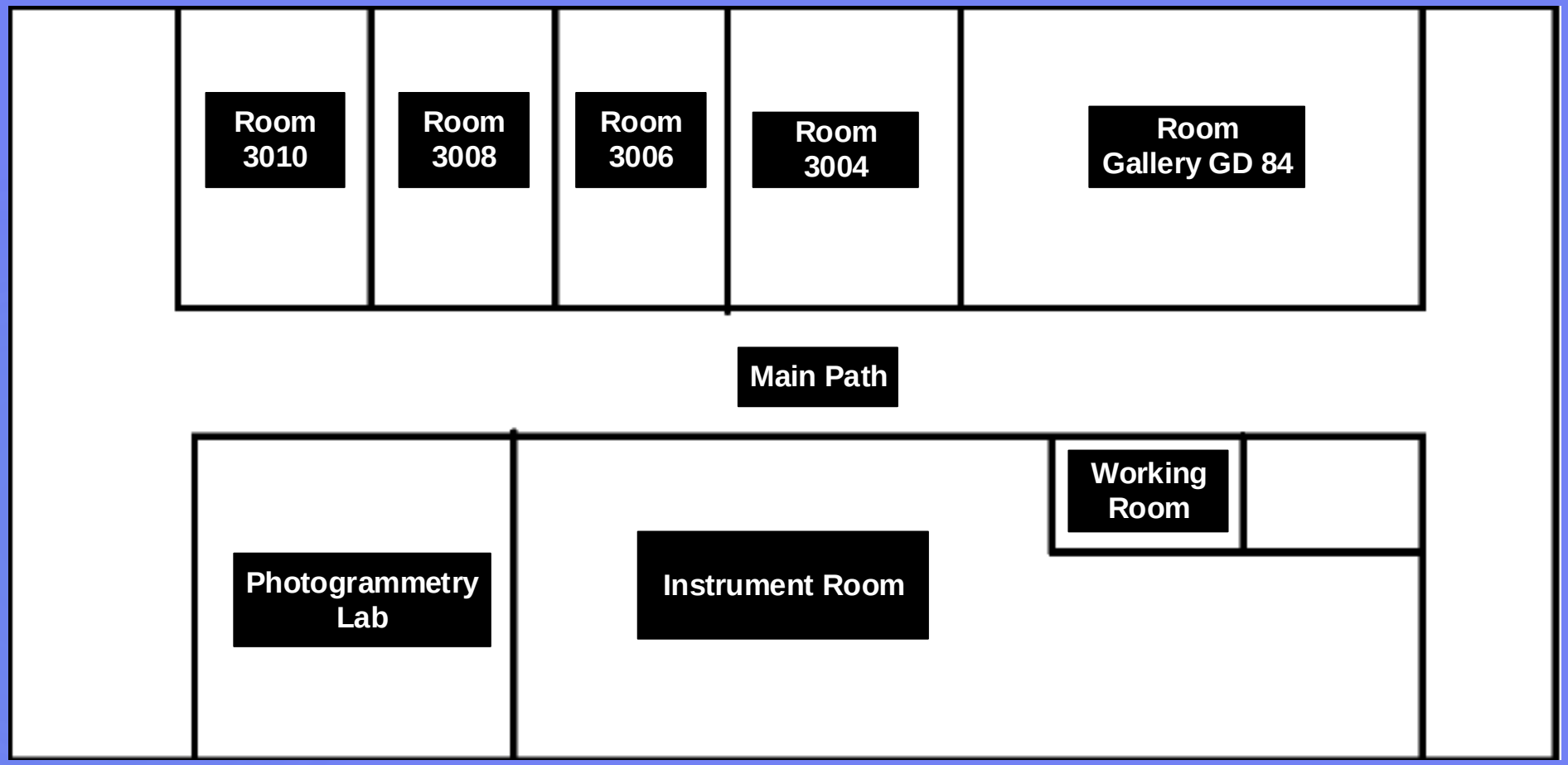


Methodology

Asset identification included asset initial data collection in forms of both asset textual data and asset position.

Since there where human intensive activities during data collection, it needed a comprehensive survey route planning, and thus the data collection activities did not interfere with the activities inside the building.

Methodology



Survey Area Layout

Data Acquisition

The acquired data :

a) The three-dimensional data in form of *point cloud* session was three-dimensional data collection each room and its asset carried out using TLS (Terrestrial Laser Scanning). The data collection was carried out on each space inside the room in 1st floor and outside the room. The device used was Topcon GLS-2000 laser scanner

b) The asset inventory data

Data Acquisition

Resolution (mm)	Scan Duration (hr : mnt : scd)		
	High Speed	Standard	Low Power
50	00 : 00 : 20	00 : 00 : 34	00 : 00 : 39
25	00 : 00 : 54	00 : 01 : 07	00 : 01 : 46
12.5	00 : 01 : 46	00 : 03 : 31	00 : 04 : 22
6.3	00 : 06 : 54	00 : 13 : 50	00 : 17 : 17
3.1	00 : 28 : 31	00 : 57 : 04	01 : 11 : 18

During data acquisition, 12.5-mm Low Power interval was used, Selected point cloud density could be used to identify small objects which were part of the existing assets.

Data Acquisition

- Important to consider the instrument stand selection according to how many objects can be recorded.
- Laser scanner cannot rocord the object covered behind the other object.
- In addition, Instrument heights may affects scanning range. The higher instrument position, the larger the blind spot located precisely below the device.

Data Acquisition

The instrument position has to be visible from previous stand and there should be any same object or area which can be recorded from both sites of stand (as control points).

This is required to integrate the scanning result (scan register). The more the control points, the more accurate the results of registration process.

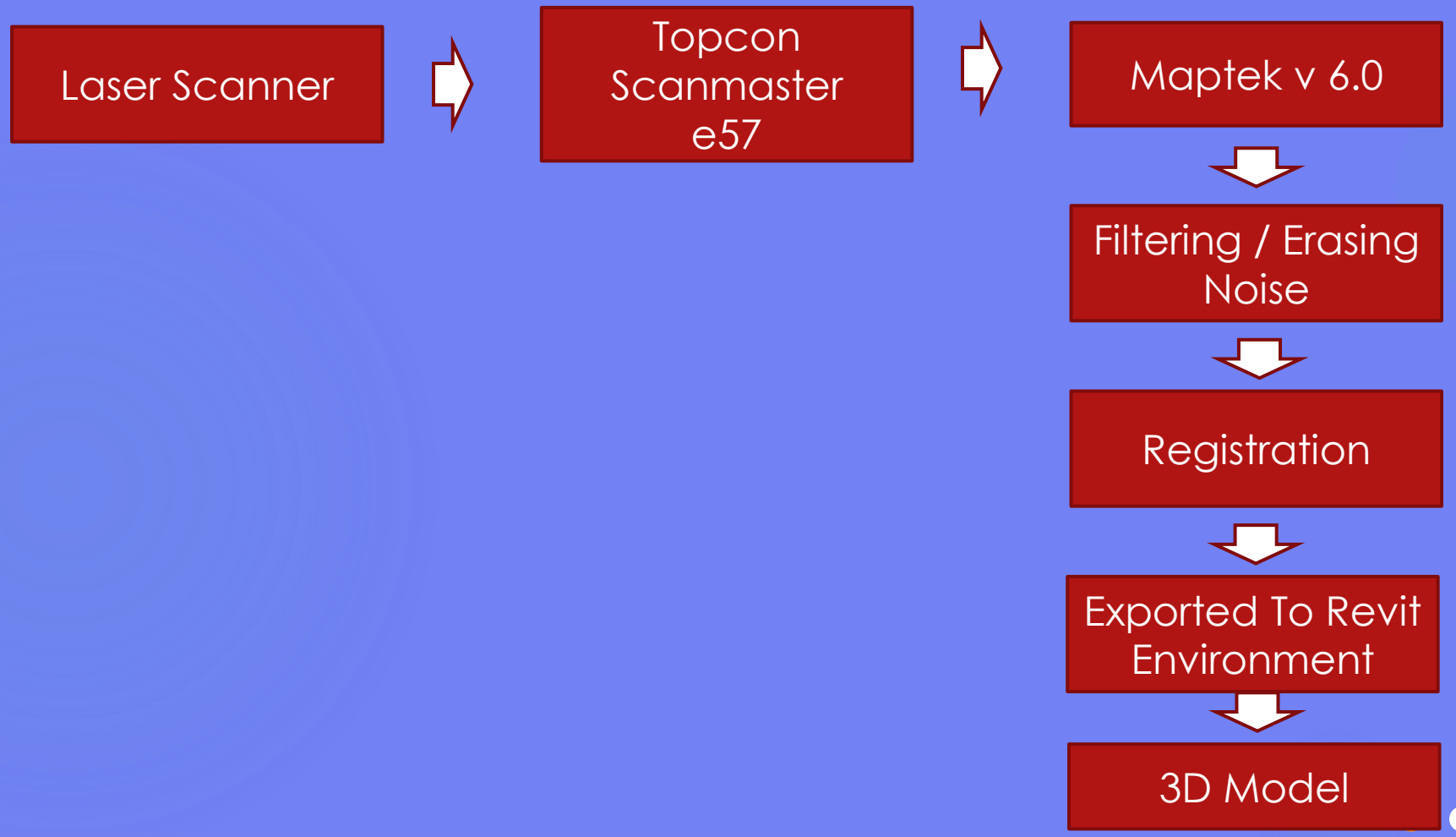
Data Processing

The data processing stage comprised three stages :

- Building a three-dimensional model of room and the assets inside.
- BIM Generation Process.
- BIM with asset integration process.

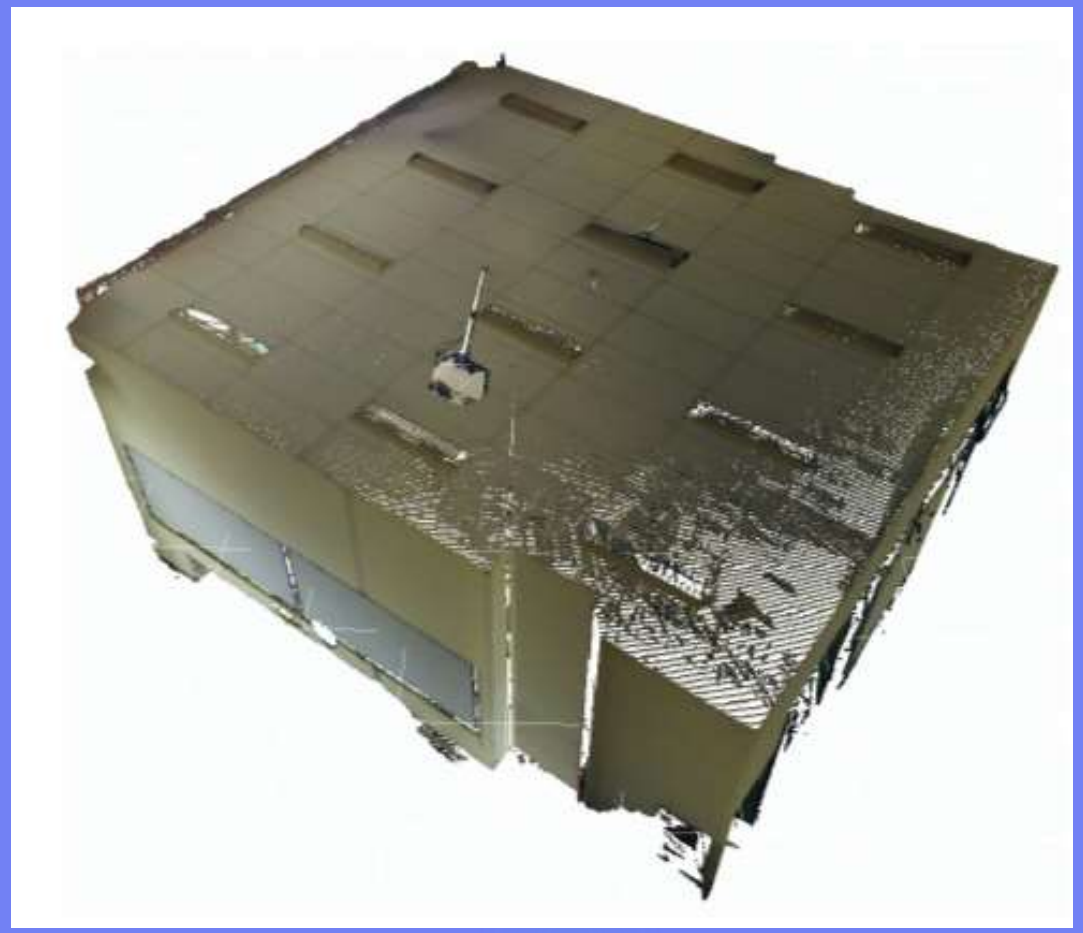
Data Processing

3D Modelling



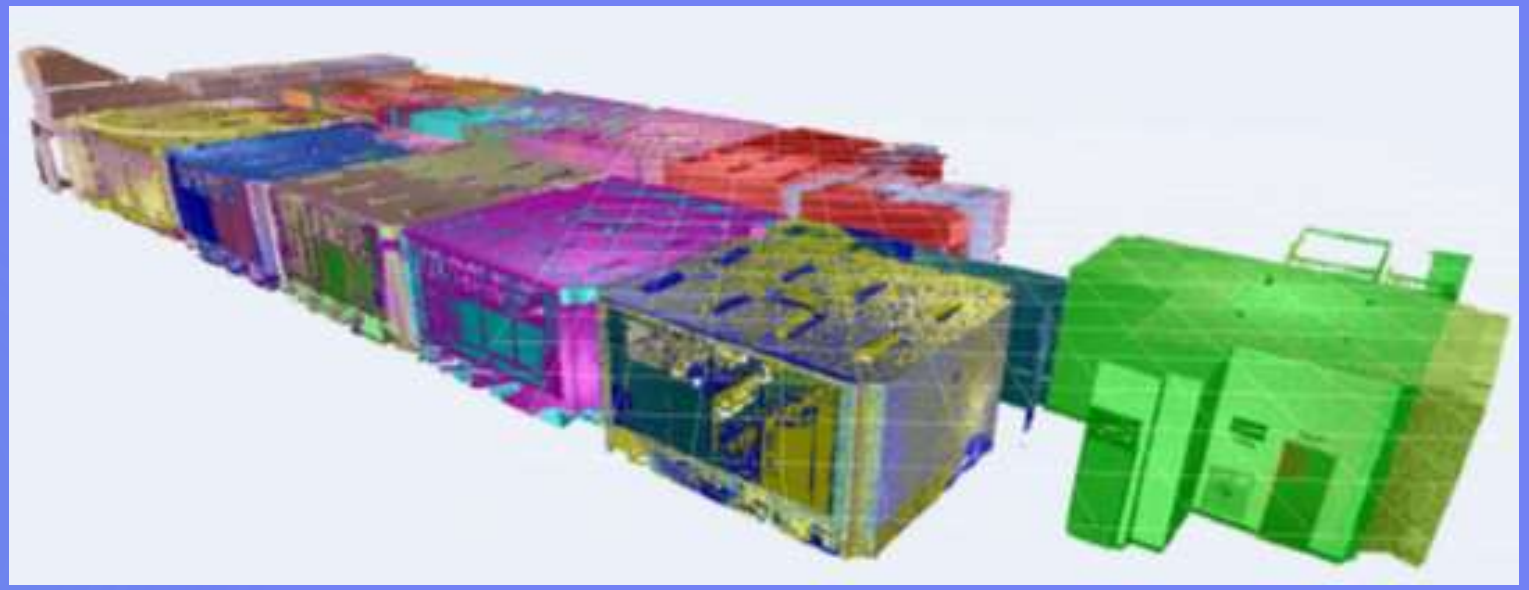
Data Processing

3D Modelling (Noise Cleansing)



Data Processing

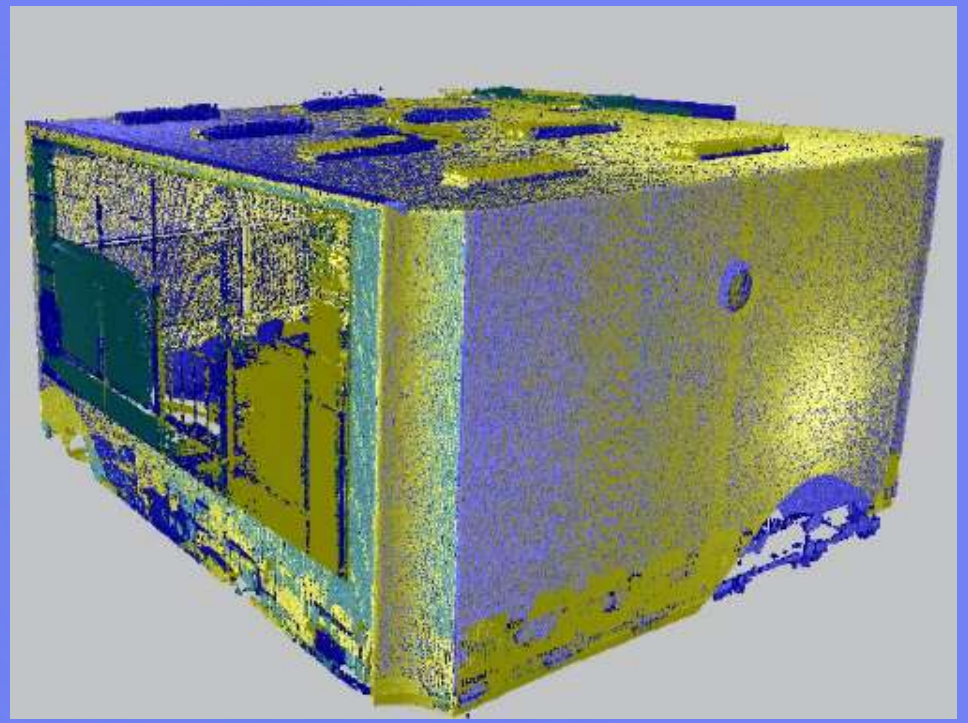
3D Modelling (Registration)



Data Processing

3D Modelling (Registration Quality)

1. Viusally



Colour Show Different Scanning Session

2. RMS (Root Mean Square) Value

Scan Data	Number of Fit Match Points	RMS Jarak (m)
GDLT1FRE_SCN0001	1084	0.002
GDLT1_SCN0001	1084	0.002

Data Processing

3D Modelling

Registration procces using automatic registration (global) with Iterative Closest Point (ICP) algorithm.

Iterative Closest Point (ICP) Algorithm will try to fix match two point cloud data with one point cloud data as refference.

One point cloud data as refference set to be fix place and other point cloud arranged to be in refference point cloud system

Data Processing

BIM Generation

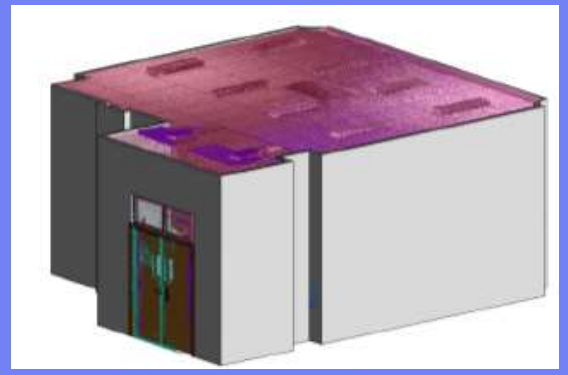
Registered Model

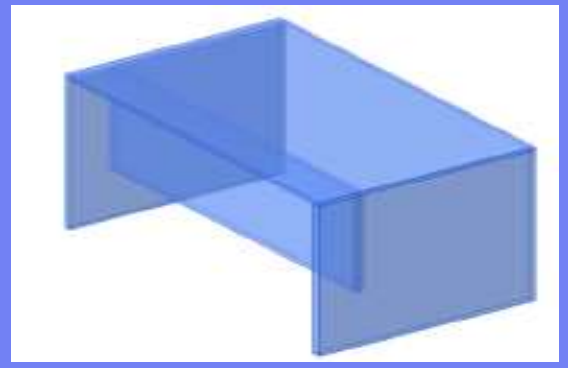
Revit Environment

Extracting Object

Room Modelling

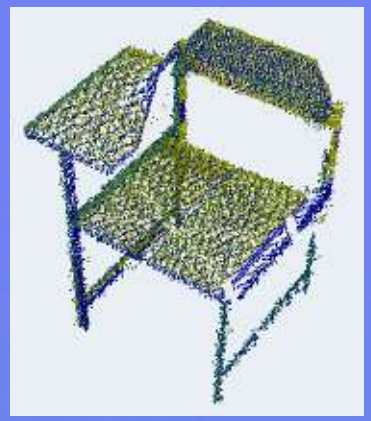
Asset Modelling

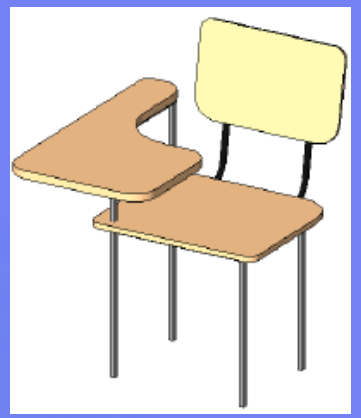




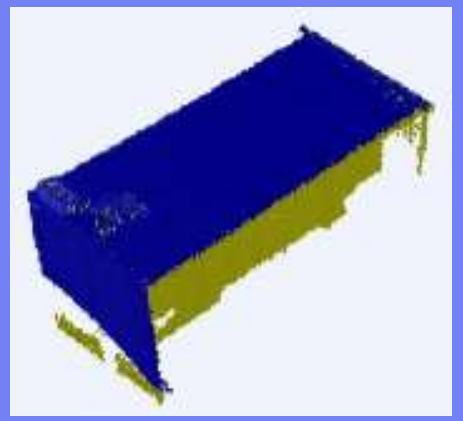
Data Processing

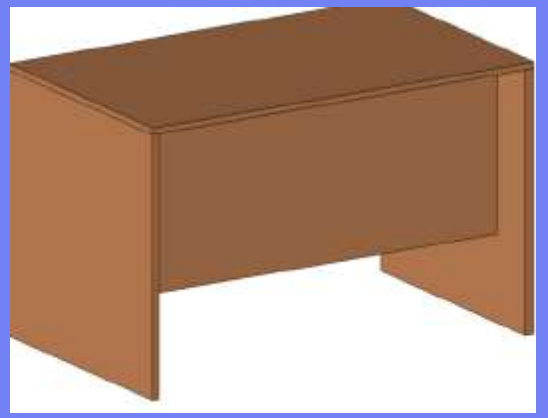
Assets Point Extraction





Chair

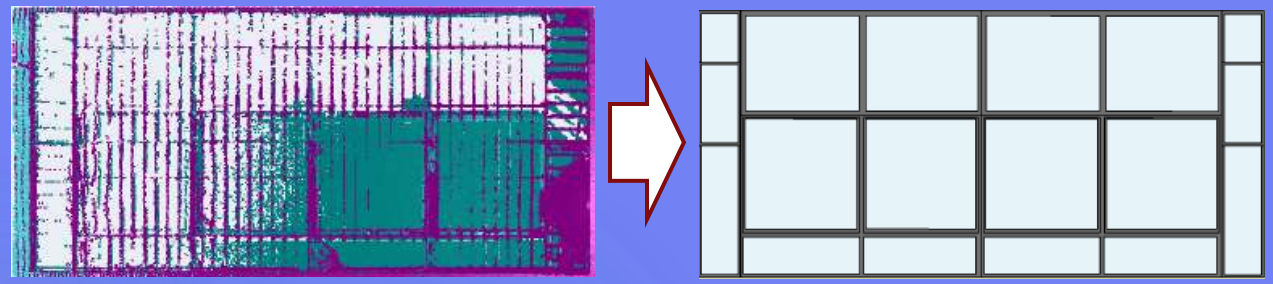




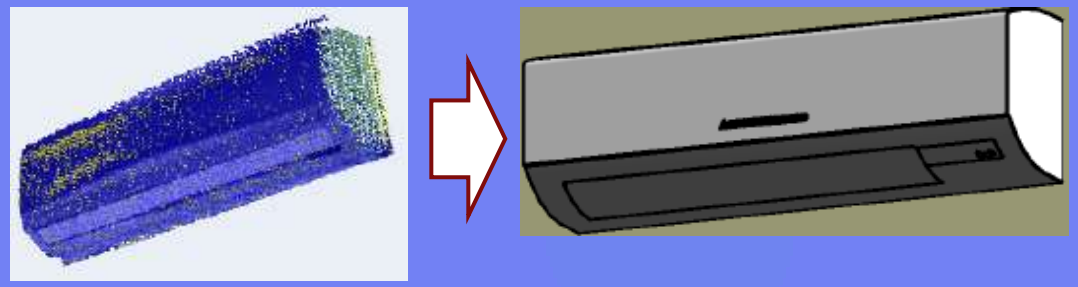
Teable

Data Processing

Assets Point Extraction



Window



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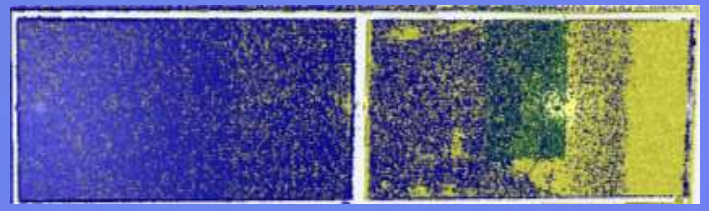
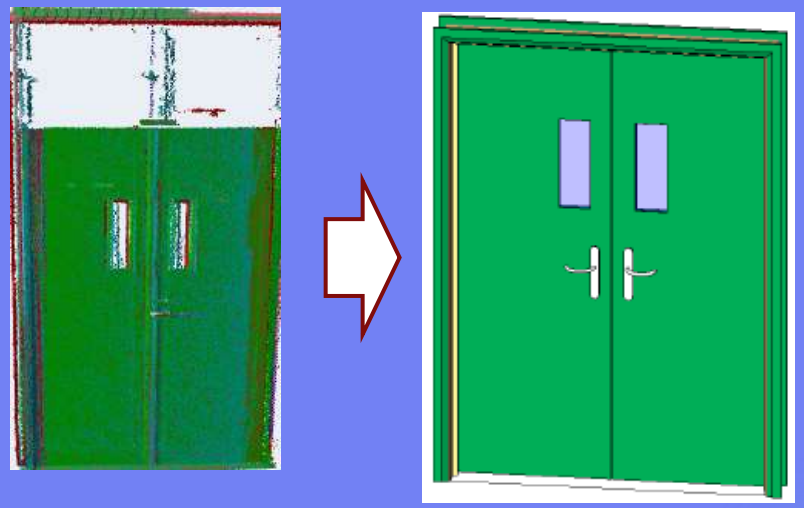


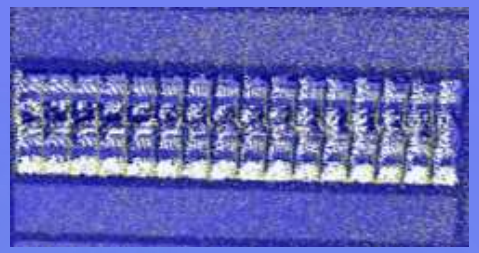
White Board

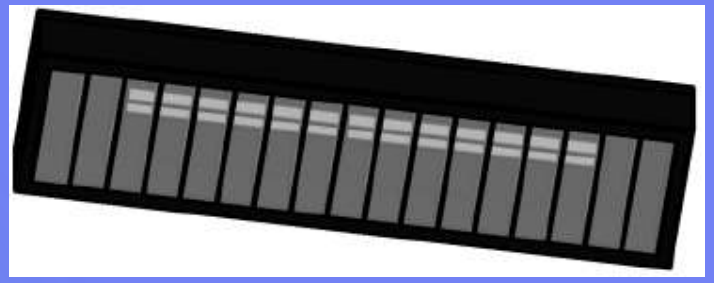


Door

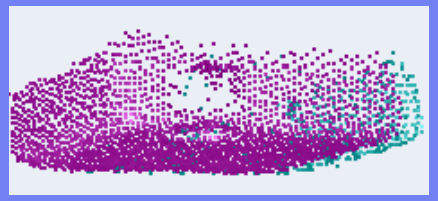
Data Processing

Assets Point Extraction





Light



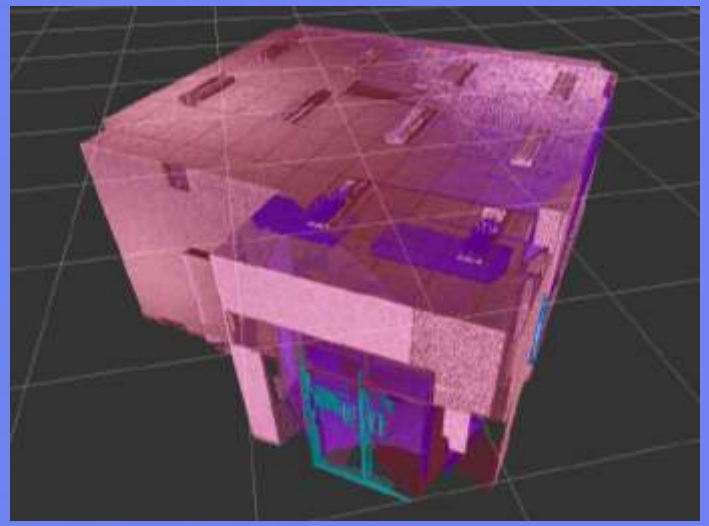
LCD Projector

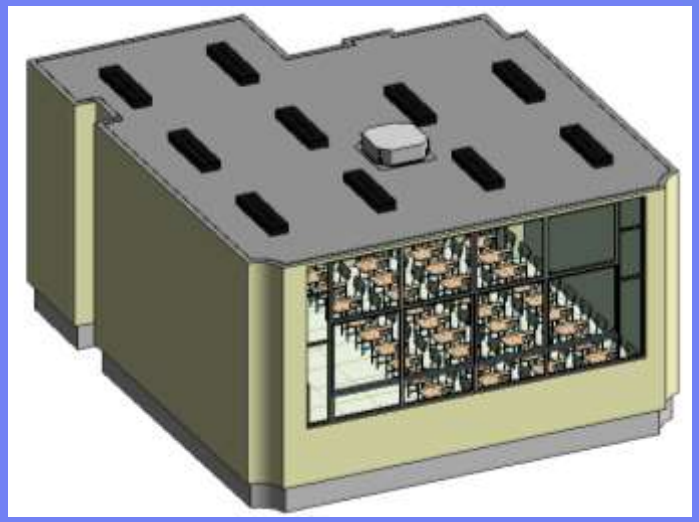
Clock

Data Processing

Integration

The model then imported to the room model. To be able of placing the furniture model at a same position as the real condition in the field, the aid of point clouds data was used.





Data Processing

Small size objects with high geometric complexity, like survey instruments, could not be modeled. This was because the scan resolution used was 12.5 mm.

The positions of the objects were very close to the wall so that could only be recorded from one side only.

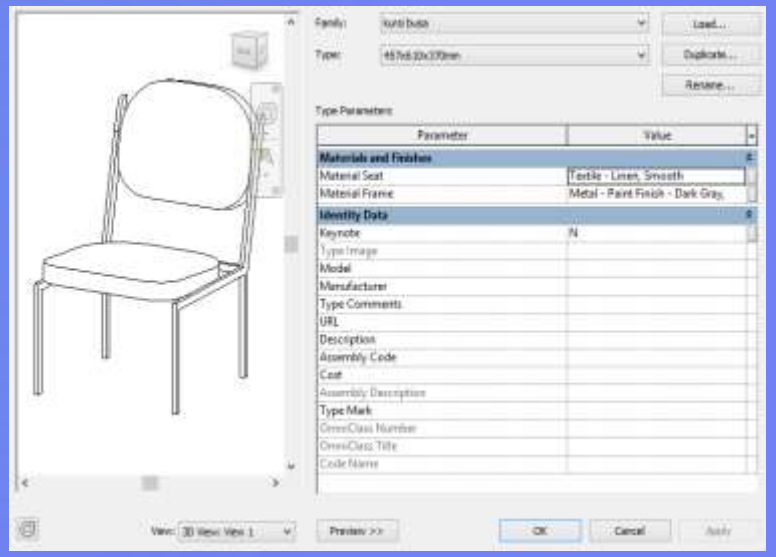
Many objects covered one another, so that the covered objects could not be recorded

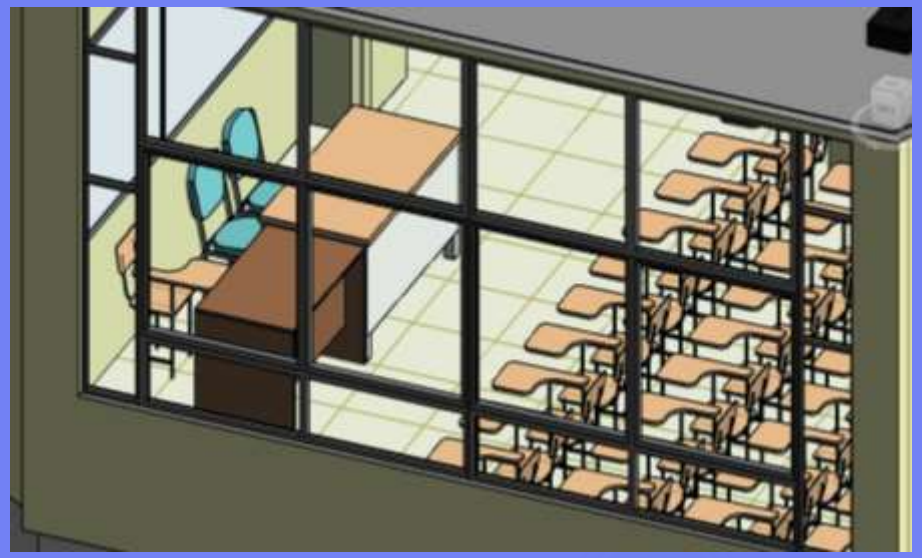
Data Processing

Asset Point Cloud of ETS

Asset Database

Asset database was developed using other component/add-in, i.e., dblink. The Dblink used was 2016 version. In dblink database, assets are grouped into some family. Each family consists of sub-group which defined the data of each asset.





Asset Database

Room : 3010

ID	Item	Category	Condition	Purchase Price	Current Price	Owner	Acquired Date
KM-3010-01	Kursi Mahasiswa 1	Kursi	Bagus	200,000	150,000	ITB	22/07/2015
KM-3010-02	Kursi Mahasiswa 2	Kursi	Rusak ringan	200,000	100,000	ITB	23/07/2015
KM-3010-03	Kursi Mahasiswa 3	Kursi	Bagus	200,000	150,000	ITB	24/07/2015
KM-3010-04	Kursi Mahasiswa 4	Kursi	Bagus	200,000	150,000	ITB	25/07/2015
KM-3010-05	Kursi Mahasiswa 5	Kursi	Bagus	200,000	150,000	ITB	26/07/2015
KM-3010-06	Kursi Mahasiswa 6	Kursi	Rusak berat	200,000	50,000	ITB	27/07/2015
KM-3010-07	Kursi Mahasiswa 7	Kursi	Rusak ringan	200,000	100,000	ITB	28/07/2015
KM-3010-08	Kursi Mahasiswa 8	Kursi	Bagus	200,000	150,000	ITB	29/07/2015
KM-3010-09	Kursi Mahasiswa 9	Kursi	Bagus	200,000	150,000	ITB	30/07/2015
KM-3010-10	Kursi Mahasiswa 10	Kursi	Bagus	200,000	150,000	ITB	31/07/2015
KM-3010-11	Kursi Mahasiswa 11	Kursi	Bagus	200,000	150,000	ITB	01/08/2015
KM-3010-12	Kursi Mahasiswa 12	Kursi	Bagus	200,000	150,000	ITB	02/08/2015
KM-3010-13	Kursi Mahasiswa 13	Kursi	Bagus	200,000	150,000	ITB	03/08/2015
KM-3010-14	Kursi Mahasiswa 14	Kursi	Bagus	200,000	150,000	ITB	04/08/2015
KM-3010-15	Kursi Mahasiswa 15	Kursi	Bagus	200,000	150,000	ITB	05/08/2015
KM-3010-16	Kursi Mahasiswa 16	Kursi	Bagus	200,000	150,000	ITB	06/08/2015
KM-3010-17	Kursi Mahasiswa 17	Kursi	Bagus	200,000	150,000	ITB	07/08/2015
KM-3010-18	Kursi Mahasiswa 18	Kursi	Bagus	200,000	150,000	ITB	08/08/2015
KM-3010-19	Kursi Mahasiswa 19	Kursi	Bagus	200,000	150,000	ITB	09/08/2015
KM-3010-20	Kursi Mahasiswa 20	Kursi	Bagus	200,000	150,000	ITB	10/08/2015
KM-3010-21	Kursi Mahasiswa 21	Kursi	Bagus	200,000	150,000	ITB	11/08/2015

Conclussion

The data of initial identification of the assets to be visualized in BIM model has to be accurately collected. This is related to the density points to be recorded by laser scanner, so that there is no asset left unrecorded due to insufficient point density.

In scanning with TLS device, one should be paid attention on the visibility of not only the objects to be scanned but also other objects that can only be seen from one side.

Measurement route must be arranged by taking into account the distribution of control points distribution or overlap points to be used in combining the scanning result from one session to next session or registration process.

Acknowledgement

1. DIKTI as research fund provider
2. PT. Asaba Indonesia, for TLS Topcon GLS 2000 and Maptek i-Site versi 6.0 software Support
3. Autodesk, for free license Autodesk Revit version 2016 and dblink version 2016

Terima Kasih