

Development of VNU Virtual Campus Using OGC CityGML standard

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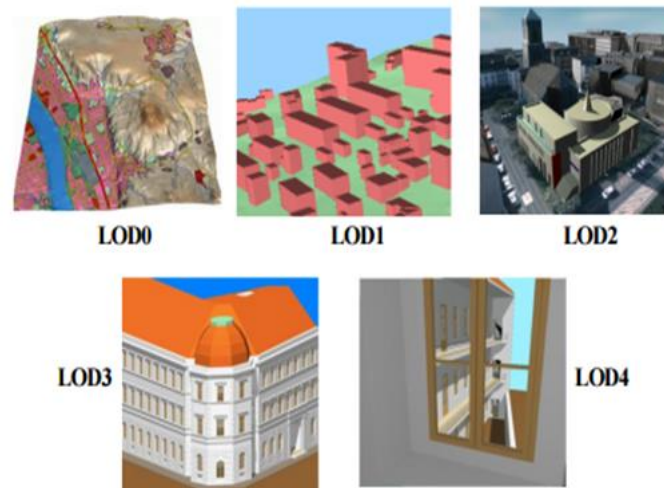
OGC[®]



- People who are interested in working/studying in Vietnam National University (VNU) may want to explore VNU campus before they actually come there but there is no such an existing system



- CityGML is an open standardized data model and exchange format to store digital 3D models of cities and landscapes.
- 3D features and objects found in cities are defined (such as buildings, roads, ...) with their relationships in CityGML
- In a 3D City Model, objects are represented in various Levels Of Details



Five levels of details in CityGML

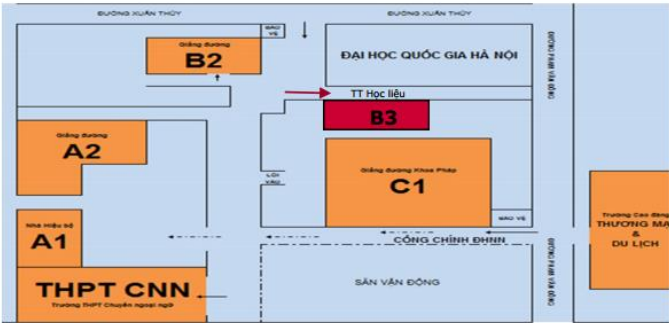
- Data:
 - Optical images (satellite images, aerial images, ...)
 - LiDAR data
- Method:
 - Stereo image triangulation
 - Un-Calibrated Structure from Motion (SfM)
 - 3D reconstruction algorithms from LiDAR data

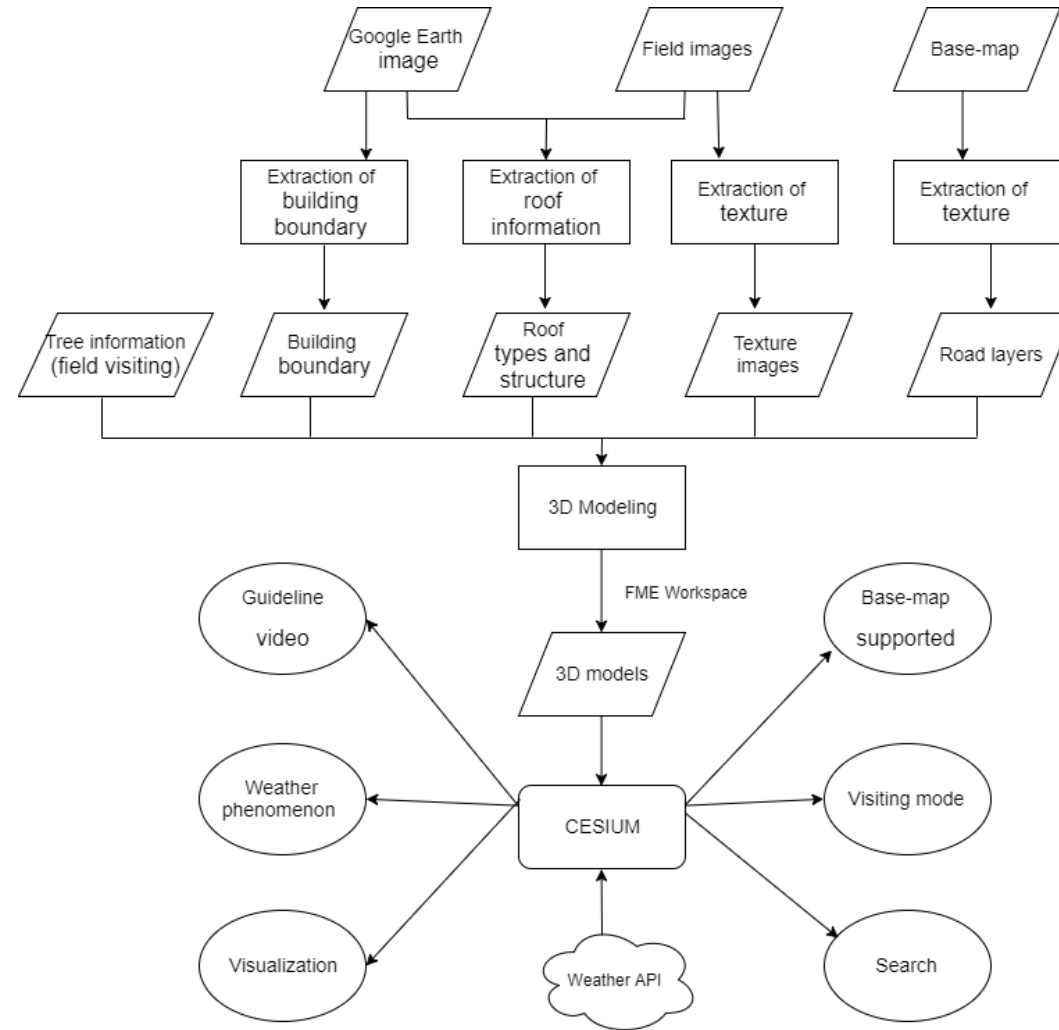
- Building 3D City Models for VNU Campus in LoD2
- Integrating time-dimension into the 3D-GIS system
- Developing an online 3D-GIS system for VNU



ĐẠI HỌC QUỐC GIA HÀ NỘI
TRƯỜNG ĐẠI HỌC NGOẠI NGỮ

Trung tâm Học liệu





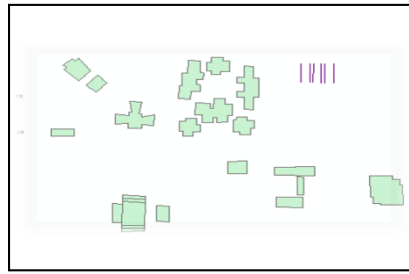
- Collecting data from satellite images and base-map
 - Building boundary
 - Roof information
 - Road layers data
 - Water bodies



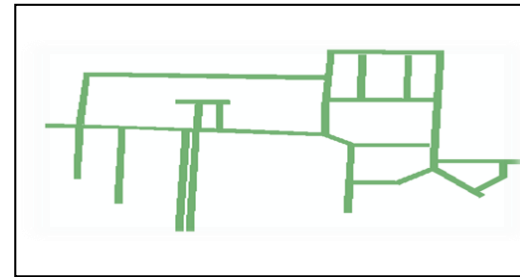
a)



b)

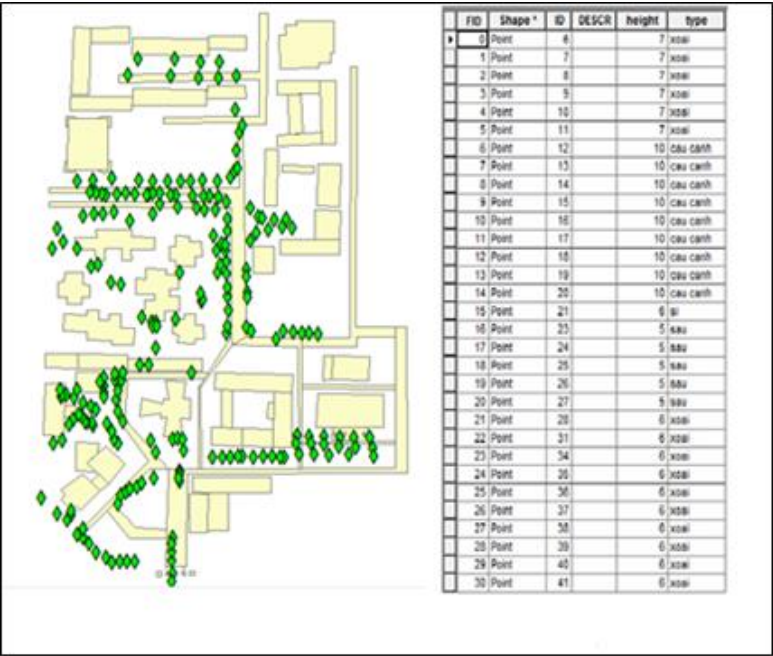


c)

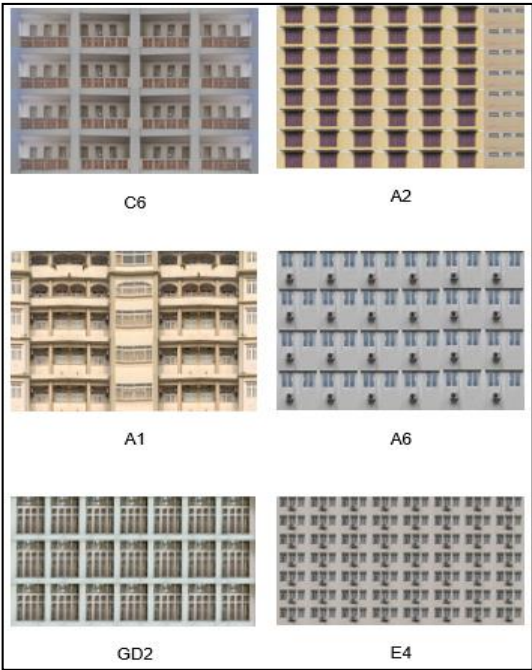


- a) Building boundary extraction from Google Earth satellite image
- b) Roof edges extraction of VNU Campus
- c) Road layers from OpenStreetMap

- Collecting data from field visiting
 - Tree information
 - Texture images



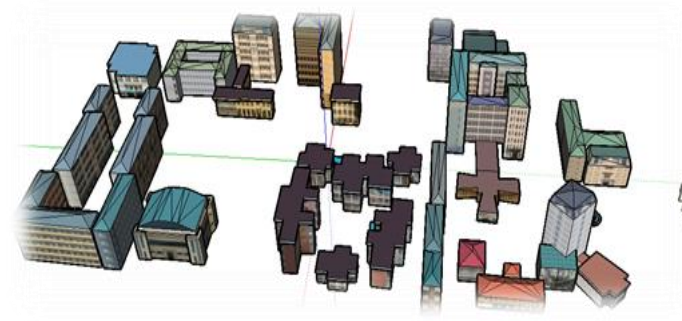
(a) Tree distribution in VNU campus and (b) tree attributes



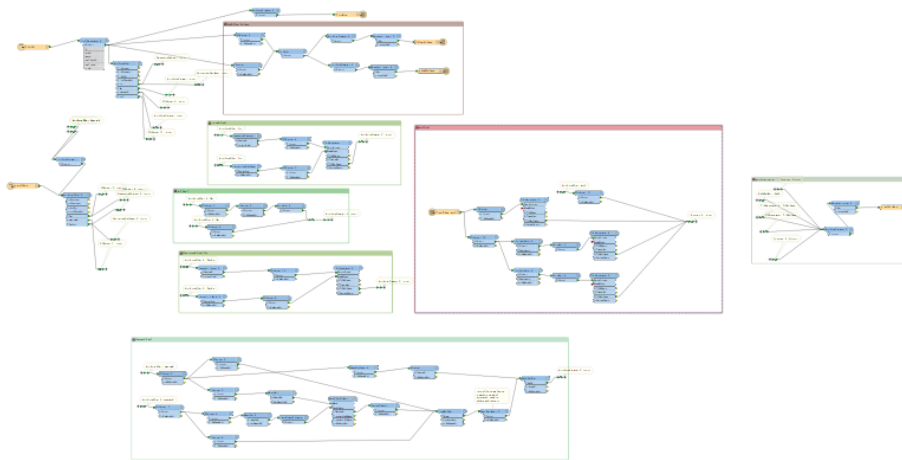
Texture images of some buildings in VNU campus



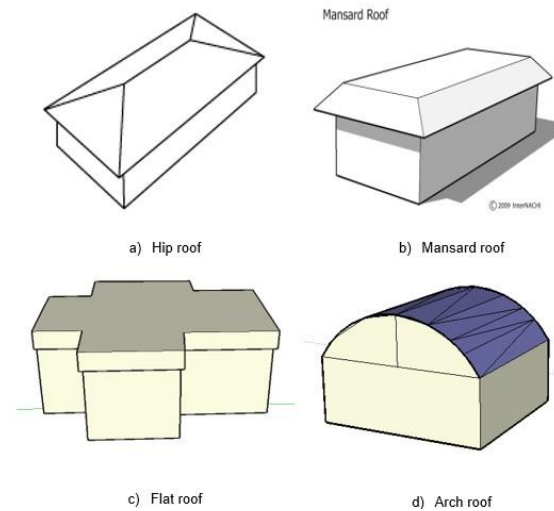
- Ground surfaces construction
- Walls surfaces construction
- Roof surfaces construction



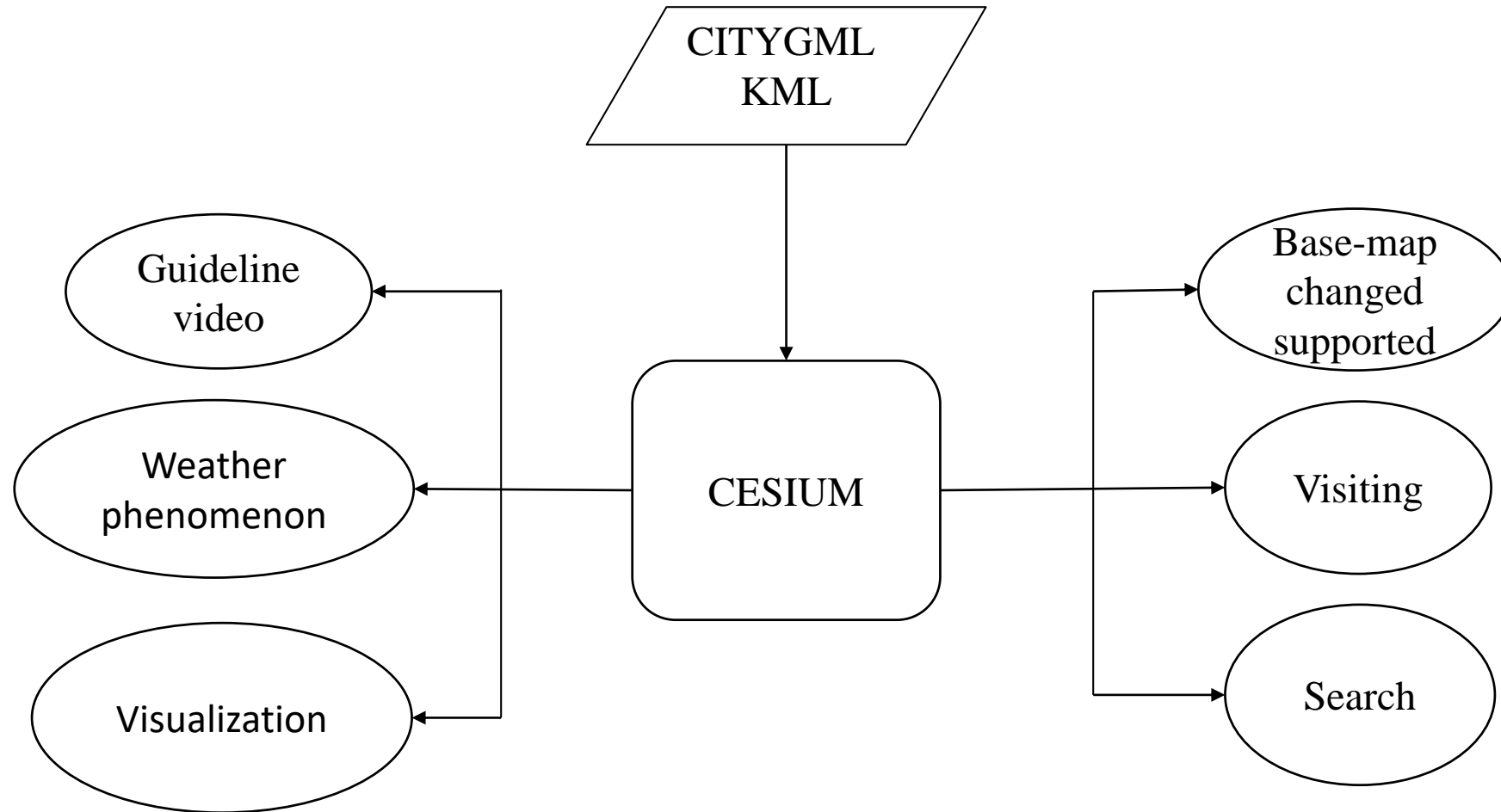
VNU buildings with texture and roof



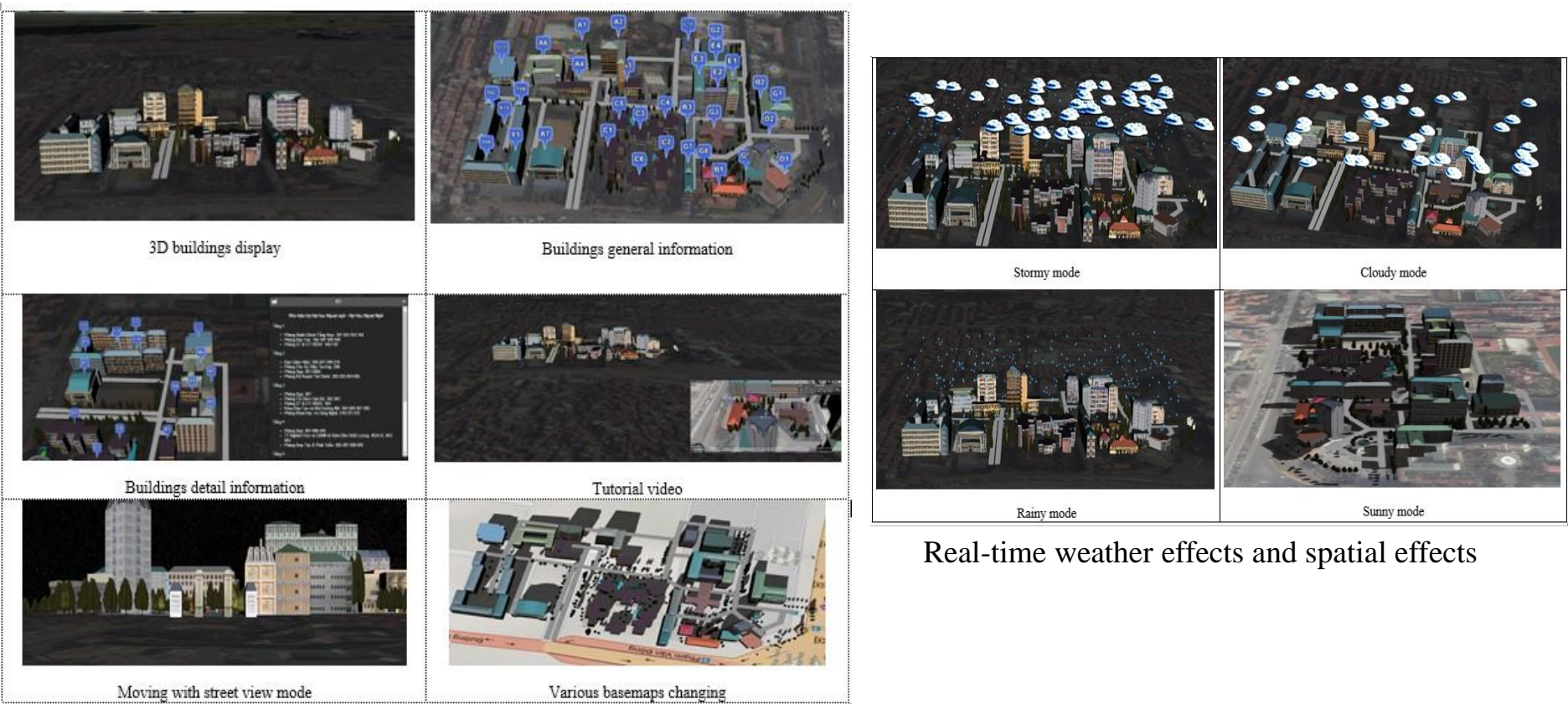
FME workspace



Roof types in VNU campus



- 3D-GIS system of VNU Campus
 - Data visualization
 - Visiting mode
 - Base-maps supported
 - Guideline video
 - Time dimension is integrated into the system
 - Real-time weather effects
 - Sunny, cloudy, rainy, stormy
 - Real-time spatial effects
 - Day-night light changes



Real-time weather effects and spatial effects

The main views and functions of the system

Experiment Result

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12 : 45 : 87
FEB - 05 - 3254
167 78 894



MAX - 34 - 685
KL - IT - 3678 - 986

2095

4583

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- Developing VNU Virtual Campus Using 3D GIS Technology
 - Present the procedure and method to build a 3D GIS system at scale of Vietnam National University Hanoi
 - Collect GIS data of VNU from Google Earth satellite images at high spatial resolution, Open Street Map base map and field study.
 - GIS data using to model 3D VNU Campus at LoD2 according to CityGML data standard.
 - The system is deployed base on Cesium platform with the functions of visualizing data, interacting user-system, integrating time dimension to synchronize weather phenomenon and day-night effects in the real life.
- Achievements
 - An online 4D-GIS system for Vietnam National University
 - CityGML and KML data for 3D buildings in VNU campus.
- Limitation
 - Requires a powerful hardware for satisfied experiment
- Future works
 - Develop 3D GIS system VNU campus at higher level of details
 - automatic techniques for GIS data generation are focused to reduces cost when larger models are developed.



Thank you for your attention
