

# The IMAP principle in Building Information Systems

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FIG Working Week 2007, Hong Kong, China  
TS 5F – Building Information Systems and GIS Applications – Commission 3 and 6  
Tuesday, 15 May 2007

## Agenda



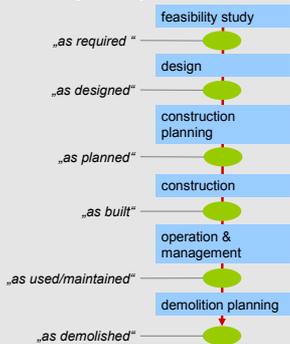
1. Motivation
2. Modeling approach
3. Input
4. Management
5. Analysis
6. Presentation

## Motivation



### Building Lifecycle

Eastmann, C.M. *Building Product Models*, CRC Press, Boca Raton, USA, 1999

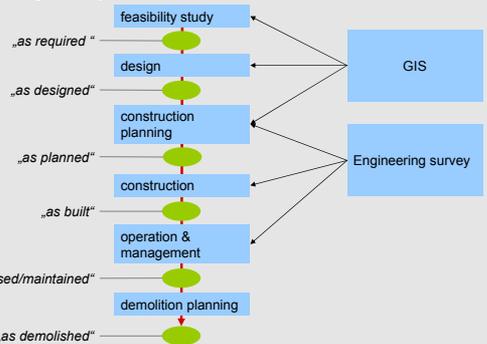


## Motivation



### Building Lifecycle

Eastmann, C.M. *Building Product Models*, CRC Press, Boca Raton, USA, 1999

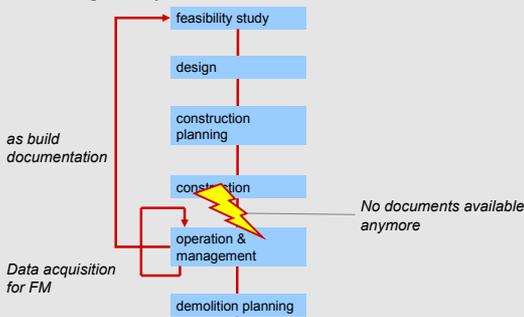


## Motivation



### Building Lifecycle

Eastmann, C.M. *Building Product Models*, CRC Press, Boca Raton, USA, 1999



## Agenda



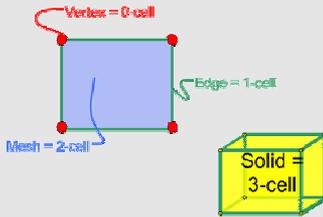
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## Modeling approach (3 main assertions)

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1. Topology is the leading information and is modeled as a cell complex

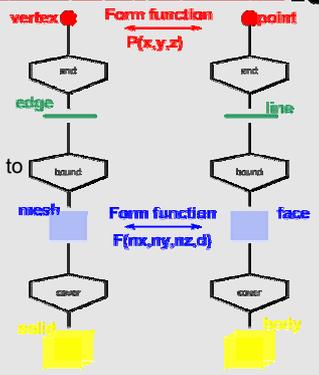


## Modeling approach (3 main assertions)

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1. Topology is the leading information and is modeled as a cell complex
2. Geometric Form Functions are assigned to 2-cells (meshes)

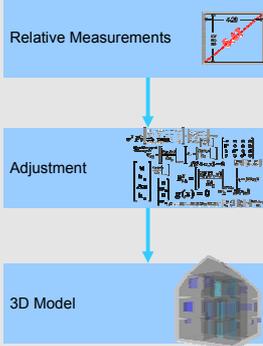


## Modeling approach (3 main assertions)

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1. Topology is the leading information and is modeled as a cell complex
2. Geometric Form Functions are assigned to 2-cells (meshes)
3. Relative Measurements specify the parameters of the functions indirectly



## Agenda

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## IMAP - Input

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### Topology

CSG (constructive solid geometry)  
Sweep Volume

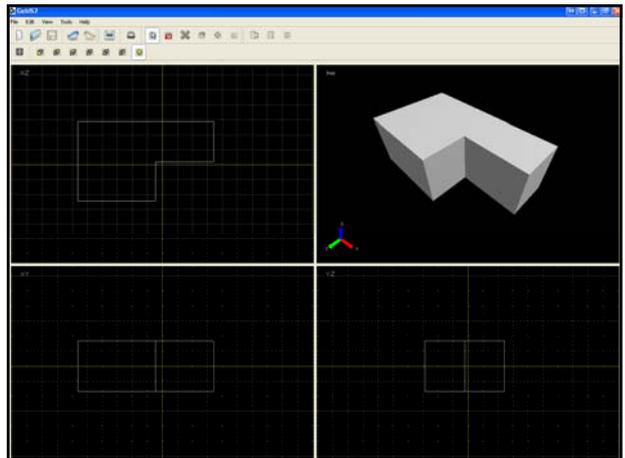
### Observations

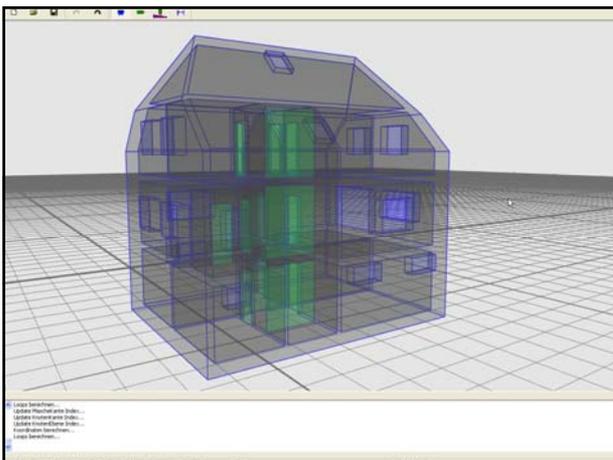
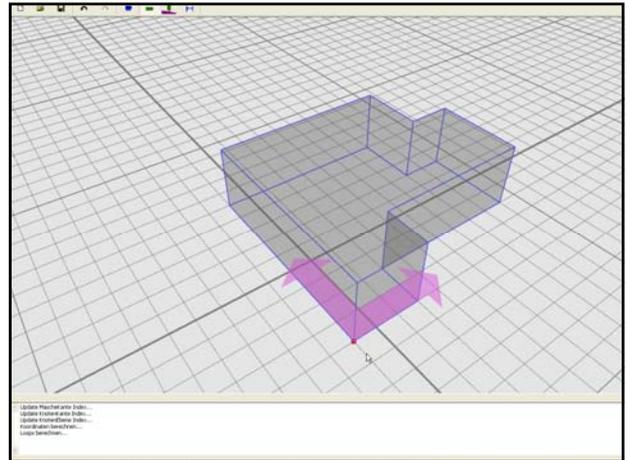
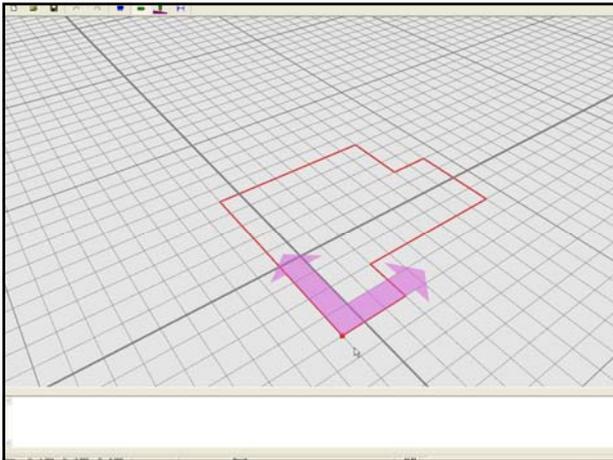
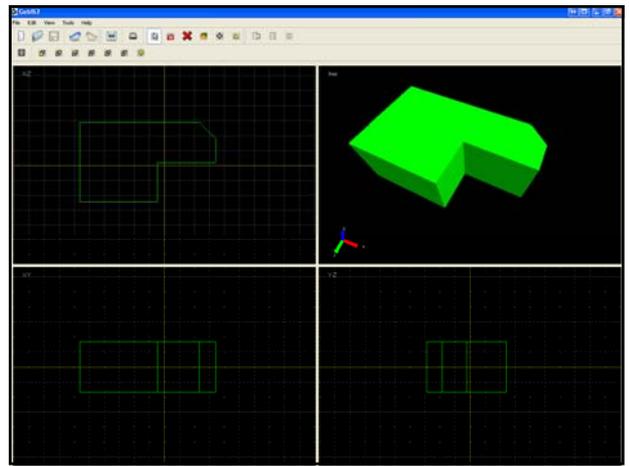
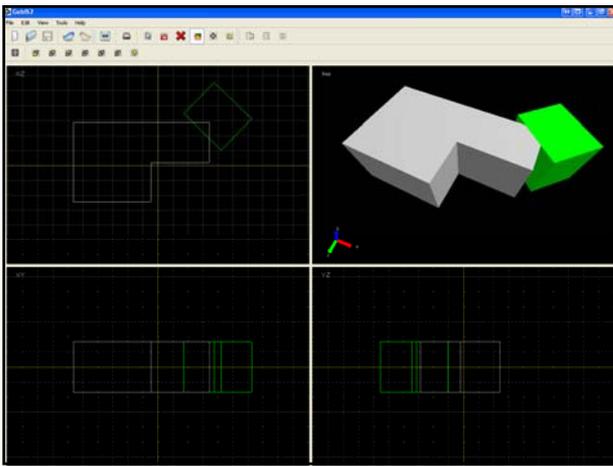
plane based vs. point based  
3D Interaction

### Thematic Data

heterogeneous schema  
usability

**Out of scope:  
Secondary input  
data**





## IMAP - Input

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### Impact on Topology Input

Traditional: Topology is derived from drawn geometry

Now: Topology is specified in a **first** step.  
*Specification of Topology = Sketching*

## IMAP - Input

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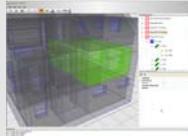
### Input of observations



Leica DISTO™ A6



BlueTooth™



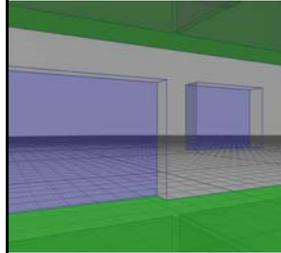
Application

## IMAP - Input

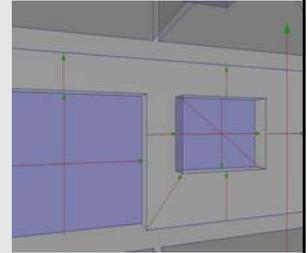
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### Input of observations



3D Selection



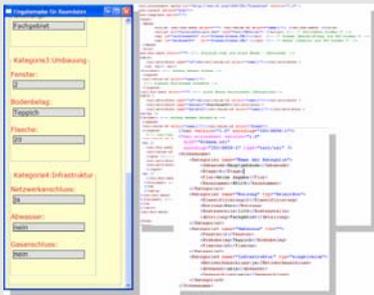
distance measures

## IMAP - Input

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### Input of thematic data (semantics)



Heterogeneous **data model**

**Integration** of data model (XML Schema), data (XML) and Forms (XForm, GUI)

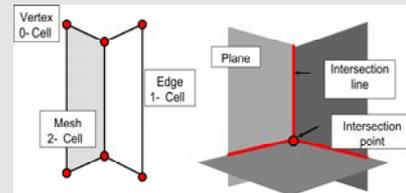
High demands on **usability** of input forms due to the need for efficient thematic data acquisition

## IMAP - Management

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Point coordinates are a "view" on the stored data



**Geometric Integrity:**

0-cell-approach: Coplanarity of polygons has to be assured by run-time algorithms

2-cell-approach: Coplanarity is assured by referential integrity (DBMS)

## IMAP - Analysis

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### Analysis:

Generation of new information by means of integration

#### Observation analysis:

Adjustment: consistency, correctness, accuracy, reliability

#### Geometric analysis:

surface areas, coplanarity of façade elements

#### Topologic analysis:

room adjacency, automatic escape route planning, denotation of building objects

#### Semantic analysis:

lodgers/room, lodgers/area, cleaning costs, network availability

## IMAP - Presentation

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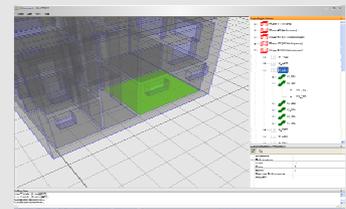


Visual presentation:



Visual Interaction (GUI):

3D-Selection/Input  
Tree-View  
Property-Grids  
Log-Windows





## Strategic Integration of Surveying Services !!!

Integration of engineering surveying and adjustment techniques to the building information system domain.

Integration of surveying knowledge to BIM.

Thank you

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