

Evacuation Route Calculation of Inner Buildings

Shi Pu and Sisi Zlatanova

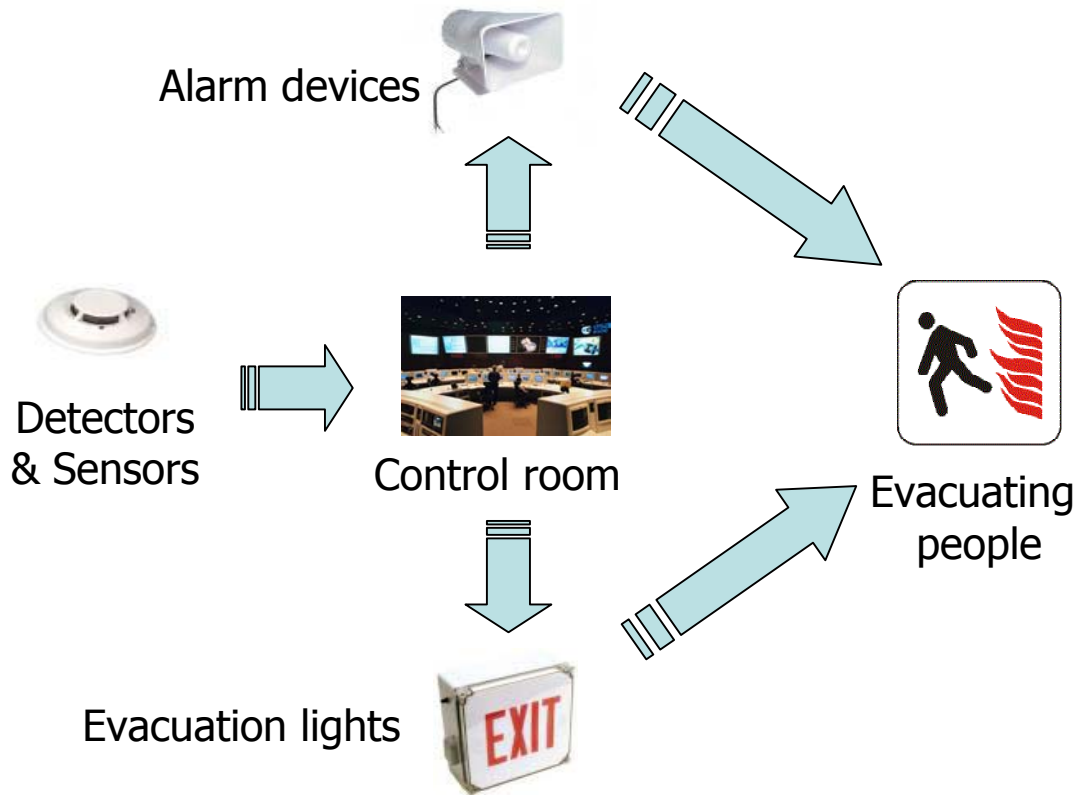
May 18, 2005

1

Contents

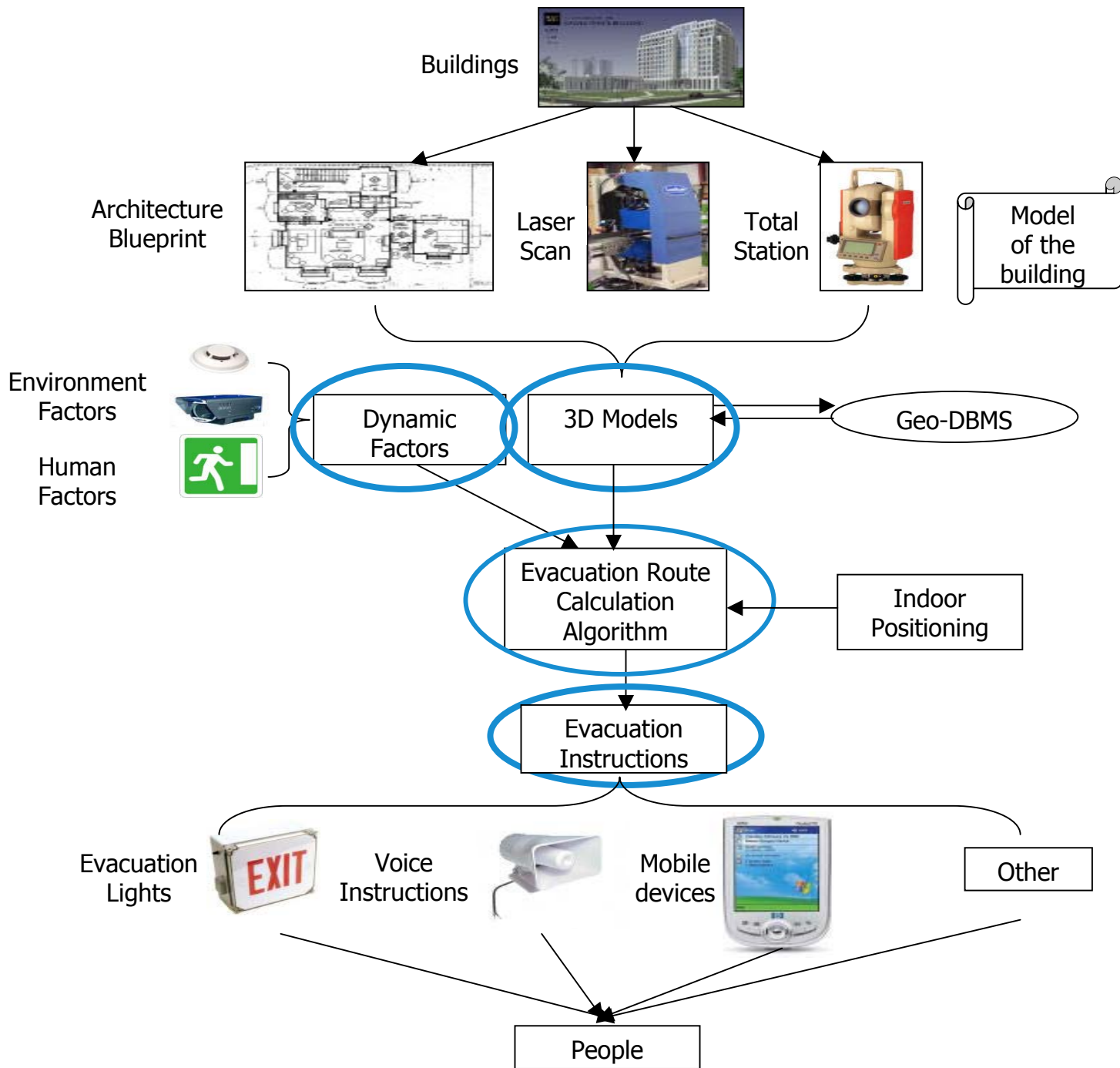
- Current systems
- A new approach
 - Overall architecture
 - 3D model of buildings
 - Dynamic factors
 - Route calculation algorithms
 - Evacuation instructions
- Summary
- Future research

Current system

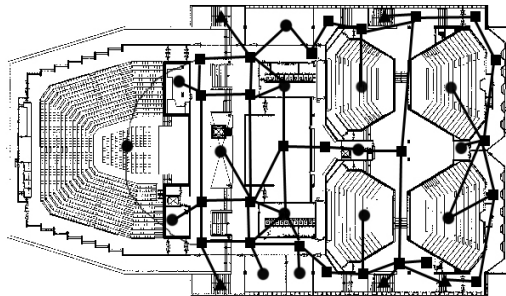
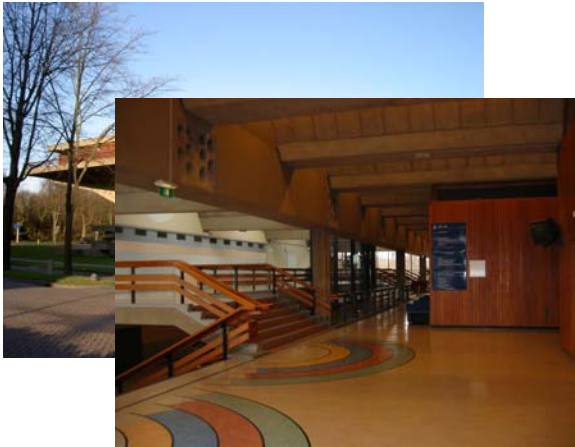


Problems

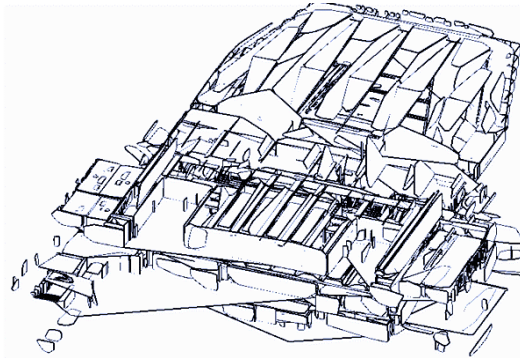
- Flexibility?
- Intelligence?
- Sufficient evacuation information?



3D model of buildings



2e etage
Schaal 1:400



Geometry model

+



Logical model

Hybrid model

3D model of building

A hybrid model:

Oracle's Network Data Model

Name	Type	Example
NODE_ID	NUMBER	3
NODE_NAME	VARCHAR2(200)	'Meeting Room A'
NODE_TYPE	VARCHAR2(200)	'Room'
ACTIVE	VARCHAR2(1)	'Y'
GEOMETRY	MDSYS.SDO_GEOMETRY	MDSYS.SDO_GEOMETRY (2003, NULL, NULL, SDO_ELEM_INFO_ARRAY (1, 1003, 3), SDO_ORDINATE_ARRAY (100,200, 500,700))

An example of the *Node table*

Name	Type	Example
LINK_ID	NUMBER	2
LINK_NAME	VARCHAR2(200)	'Corridor 2'
NODE_TYPE	VARCHAR2(200)	'Corridor'
START_NODE_ID	NUMBER	3
END_NODE_ID	NUMBER	5
ACTIVE	VARCHAR2(1)	'Y'
GEOMETRY	MDSYS.SDO_GEOMETRY	MDSYS.SDO_GEOMETRY (2003, NULL, NULL, SDO_ELEM_INFO_ARRAY (1, 1003, 3), SDO_ORDINATE_ARRAY (500,2100, 550,3500))
COST	NUMBER	6

An example of the *Link table*

Dynamic Factors

- Environment factors
 - Damage status, toxicity status, power status, capacity of the routes, and etc.
- Human Factors
 - Population density, age and gender, level of disability, terrain effects, and etc.

Route calculation algorithms

- Basic route calculation
 - Breadth-first search, depth-first search, depth-limited search, iterative deepening search, bi-directional search, Dijkstra's algorithm, and etc.
- Advanced (evacuation) route calculation
 - Accurate timeline
 - Intelligent
 - Multiple solution

Evacuation instructions



Evacuation lights
(Normal)



Pre-recorded voice
(Normal)



Live voice
(Good)



Mobile devices
(Excellent)



Summary

- 3D Models
- Dynamic factors
- Evacuation route calculation algorithm
- Evacuation instructions

Future research

- Which dynamic factors are most important?
- How to make more accurate timeline for evacuation process?
- Which way to be used for evacuation instruction via mobile device?

Thank you!