Chapter 7 Visualization for Displaying & Accessing Urban Info

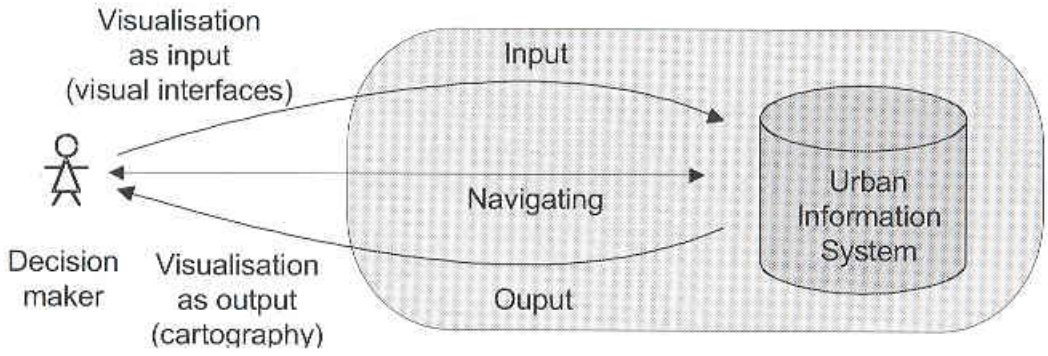


Figure 7.1 Visualisation is not only cartography; visualisation can also help the decision-maker as visual interfaces to access data, to navigate in the database, to display the results and to run applications.

7.1 Generalities

- visualization can help decision maker
  : as outputs of some computer applications
    as inputs visual interfaces to access DB & run applications

Cartographic visualization

- several visual variables to represent graphically the info
  size, grey value, texture, hue, orientation, shape, animation, simulated flight, links to other multimedia info
- dynamic variables
  display time, duration, frequency, order, rate of change, synchronization

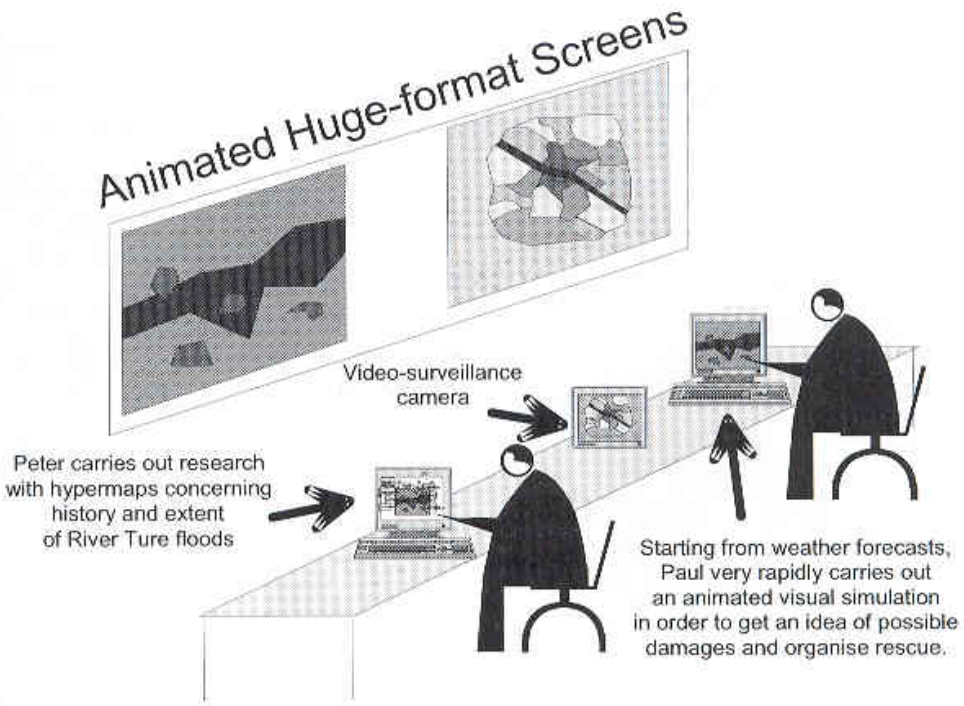


Figure 7.2 Examples of control centre working with a real-time visualisation system including animated visual simulation.

Real time visual animation

- new applications require the use of animated maps

  e.g. control of pollution, management of hazards & crisis

characteristics

a. info is captured by sensors & sent to a central server

b. speed of data acquisition varies according to the applications

c. from each sensor, procedures are triggered & visualization is performed

d. visualization is animated in real time & can be replayed

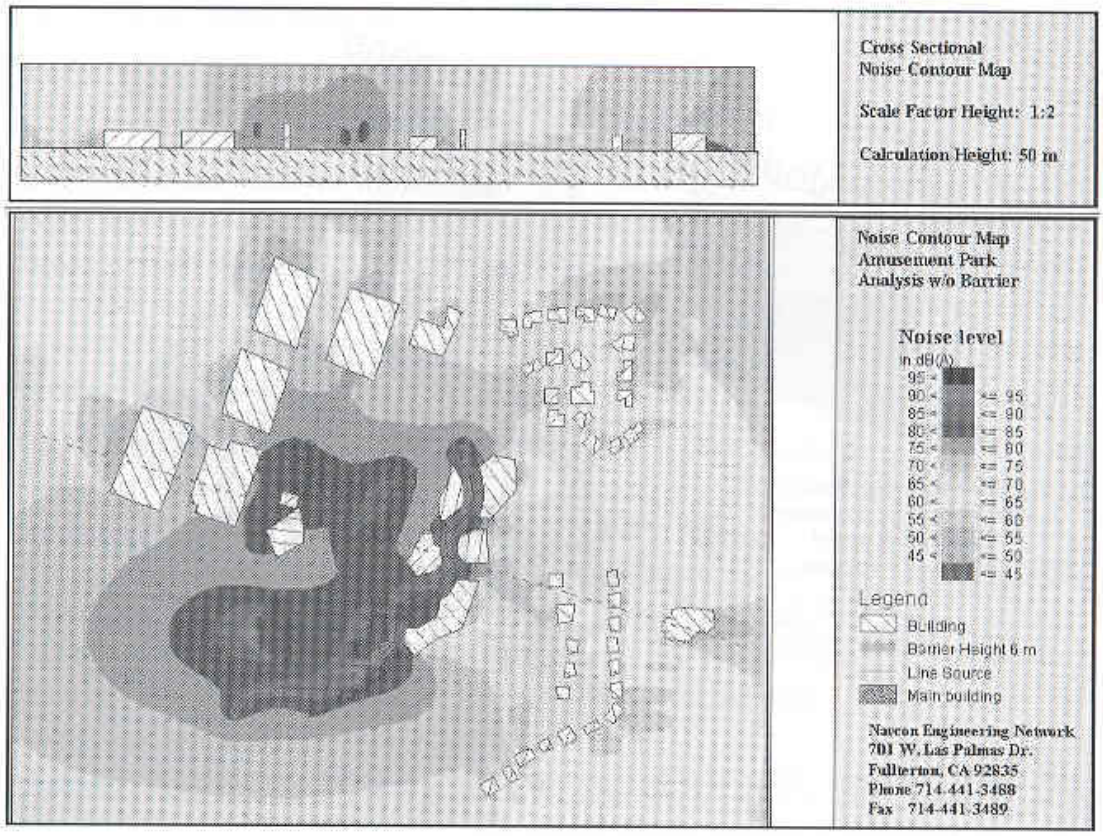


Figure 7.3 Example of noise contour map.
Source: Navcon Engineering Network http://www.navcon.com/splana7.htm #Cross Sectional Map Software: SoundPLAN Version 5.0.

Multimedia variables

- semiology of auditory variables
  : location, strength, pitch, register, timbre, duration, sequential order, attack

- sound may be considered in two ways
  : as spatial info e.g. mapping of urban noise – isoline maps
  as meta info

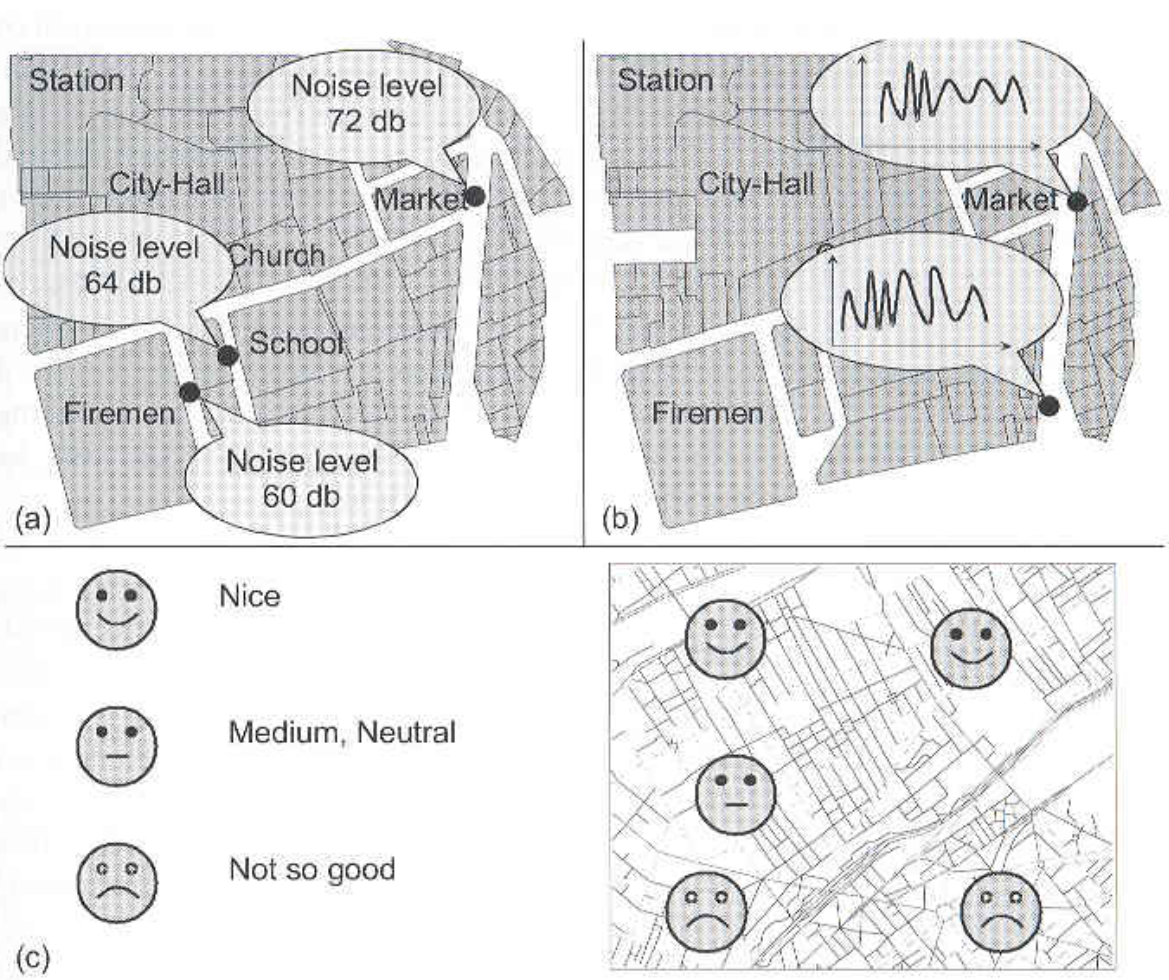


Figure 7.4 Example of visualisation of auditory information. (a) Using balloons to locate where the measures were made. (b) Location of the tape recorded auditory signal. (c) Using smiling faces.
From Laurini and Servigne (1999).

- another display of the location

  : balloons, auditory tape recording, smiling faces

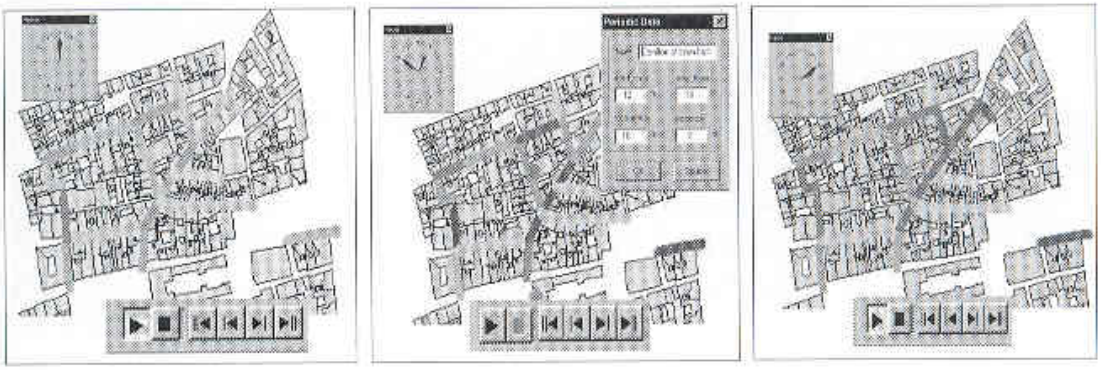


Figure 7.5 Noise animation.
From Kang and Servigne (1999).

Animated visual simulation

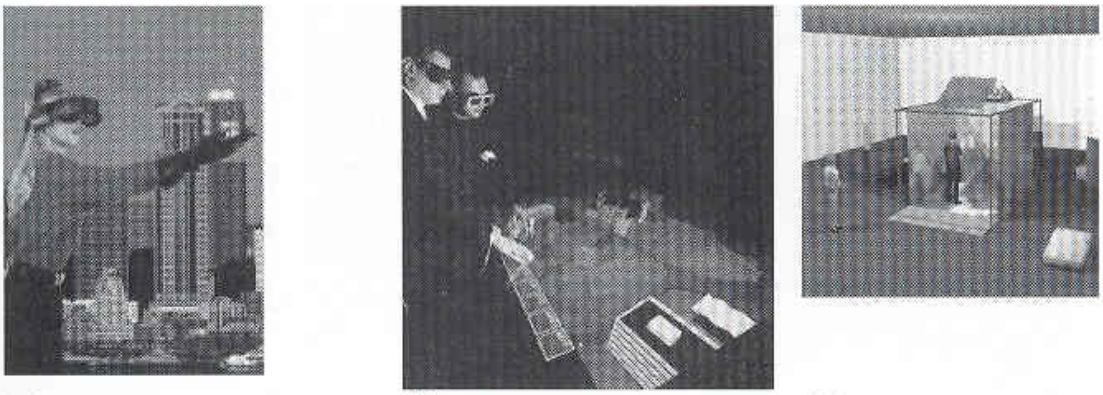
- animation is naturally well suited for representation of dynamic process

- several types of visual simulations
  a. realistic visual simulation
     vs. symbolic visual simulation
  b. real-time visual simulation
     vs. differed time visual simulation

Metaphors

- extending the map metaphor using delivered multimedia

- 9 metaphors for displaying geo info
  : story teller, navigator, guide, sage, data store, fact book, game player, theatre, toolbox



(a) (b) (c)

Figure 7.6 Different systems for virtual reality. (a) Example of an head-mounted display (HMD) model CyberEye™ the General Reality Company. Source: http://www.ireality.com/. General Reality Company is a subsidiary of iReality (b) virtual workbench. Source: http://viswiz.gmd.de/IMF/rw.html. Published with permission. (c) surround projection in a cave. Source: http://www.cica.indiana.edu/ (Verbree *et al.* 1999) Eric Wernet, © 1999, Indiana University. See also Figure 9.4.

7.2 Visualization as output

- visualizing urban planning info is much more than cartography
- examples : 3-D rendering of cities, photo-based navigation

3-D rendering means :

a. realistic rendering, 3-D view of the actual city

b. urban project rendering (visually representing new development)

c. prescriptive rendering (visualization of effects of certain planning rules)

d. symbolic rendering

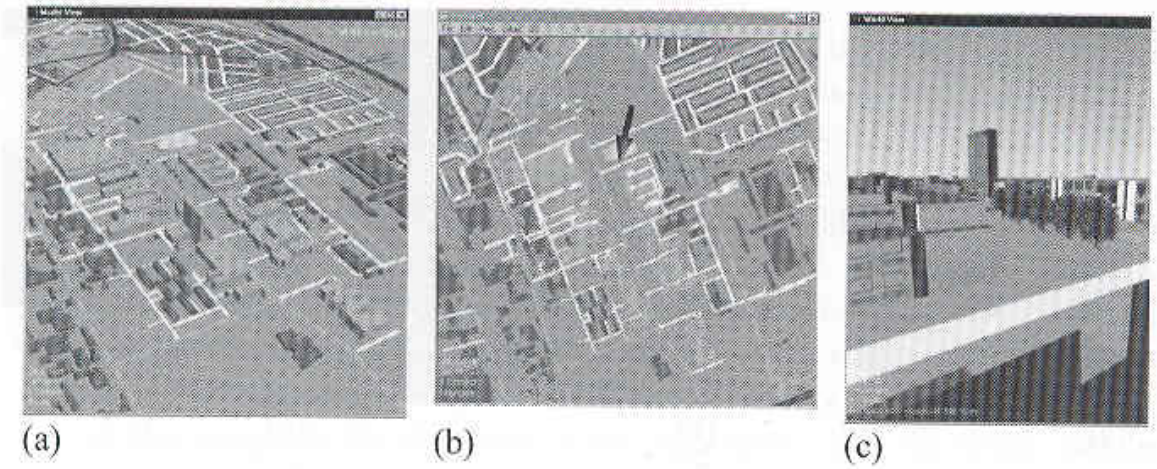


Figure 7.7 Different view nodes visualising a part of the centre of the city of Utrecht in the Netherlands.
Source: http://karma.geo.tudelft.nl (Verbree *et al.* 1999), published with permission.

Virtual reality & urban planning

- virtual reality(VR) tracks a user in real time

- different types of immersions
  a. full immersion VR systems : the highest sense of presence, supply users w/ auditory, visual & force feedback sensations, makes use of head-coupled viewing device (e.g. head mounted display)
  b. semi-immersion VR systems : use screens t display the images, systems varies from single screen installation to room-like installations

- architectural VR applications
  a. VR modeling
  b. VR walkthroughs
  c. virtual archaeology
  d. urban planning

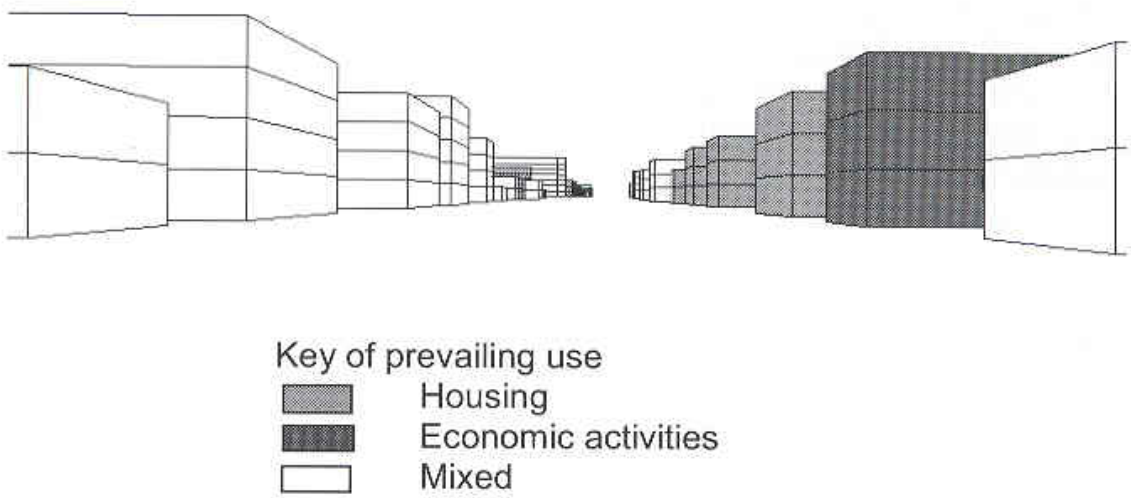


Figure 7.8 Symbolic rendering: Example of 3D visualisation together with activities. After Vico and Rossi-Doria (1997).

- an attempt is made to add some other info to the reality

  e.g. symbolic rendering

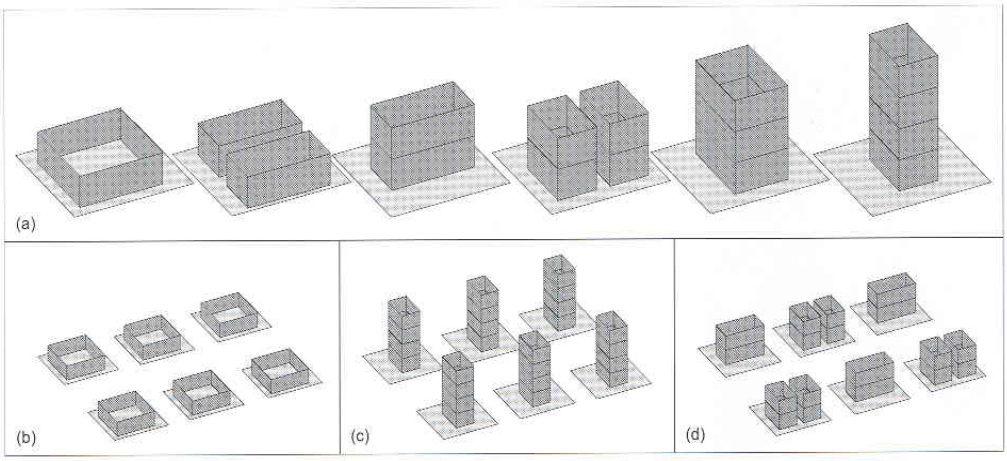


Figure 7.9 Several possibilities of land use built forms derived from the rule 'maximum prescriptive floorspace ratio = 50 %'. (a) Some of the possibilities. (b) Example with one-level building per parcel. (c) A tower per parcel. (d) Mixed area.

Prescriptive rendering

- visualization of planning laws

  e.g. prescriptive max floor-space ratio

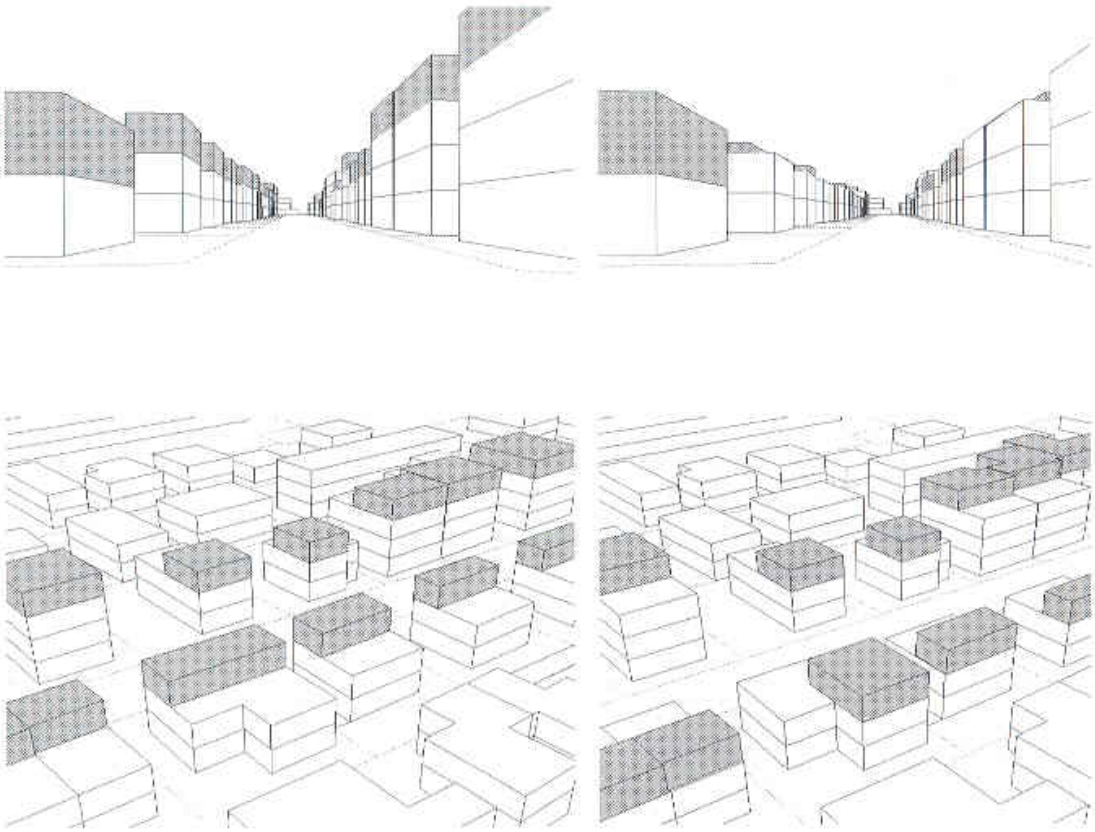


Figure 7.10 Example of land built forms from different viewpoints and different planning rules. Upper row, pedestrian view; lower row, helicopter view. Left column, max hypothesis: buildings extension lining street line; right column, likely hypothesis: make uniform the building height.
According to Vico and Rossi-Doria (1997), Laurini and Vico (1999).

- more complex display : various possibility of the same plot

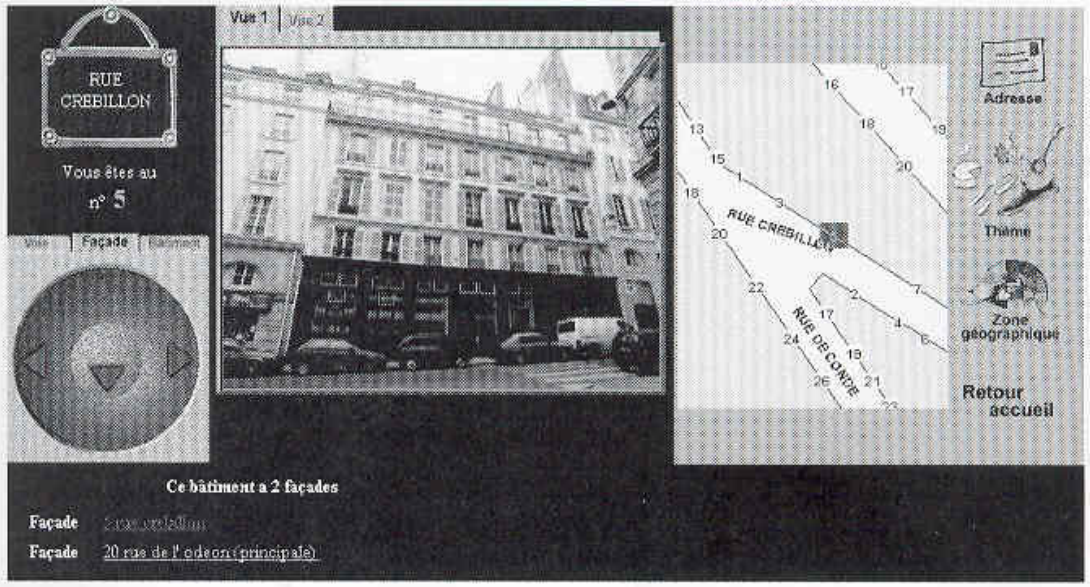


Figure 7.11 Example of an interface of a system for storing, retrieving and displaying building façades.
Source: http://www.snv.fr. Used with kind permission of Société Numérisation de Ville.

CityView

- a system name developed by French company SNV
- goal : to store the facades of all buildings

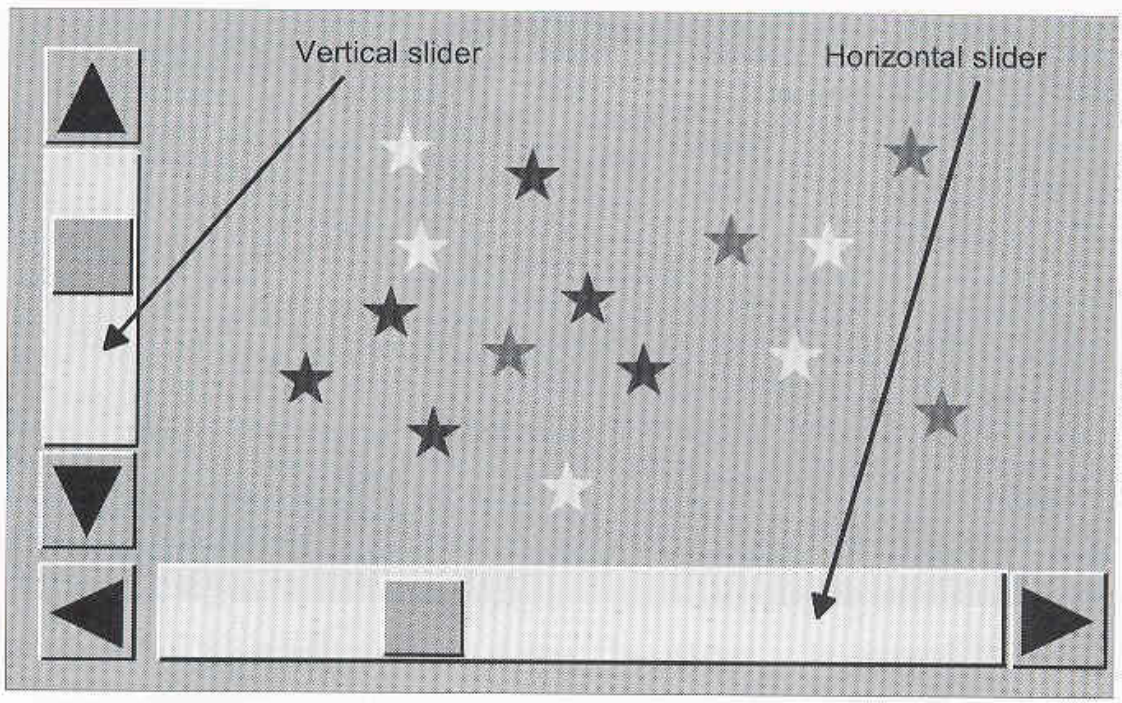


Figure 7.12 Principles of the starfield approach, one attribute for the *x*-axis, one for the *y*-axis, and a third one as colour for star points.

7.3 Visual interfaces for accessing, navigating in, urban data

Global visualization systems

- research of Univ of Maryland, College Park

  systems based on various global sequential facilities

  e.g. overview, zoom & filter, details-on-demand

- key steps on this procedure

  a. once a DB is opened, a global visualization is made available

  : starfield approach, space-filling treemap

  b. objects of interest are zoomed & filtered

  c. respective attributes are presented

- starfield

  3 attributes to represent: x & y axes, colors of objects

  usually x & y axes : ordinal variables colors: nominal variables

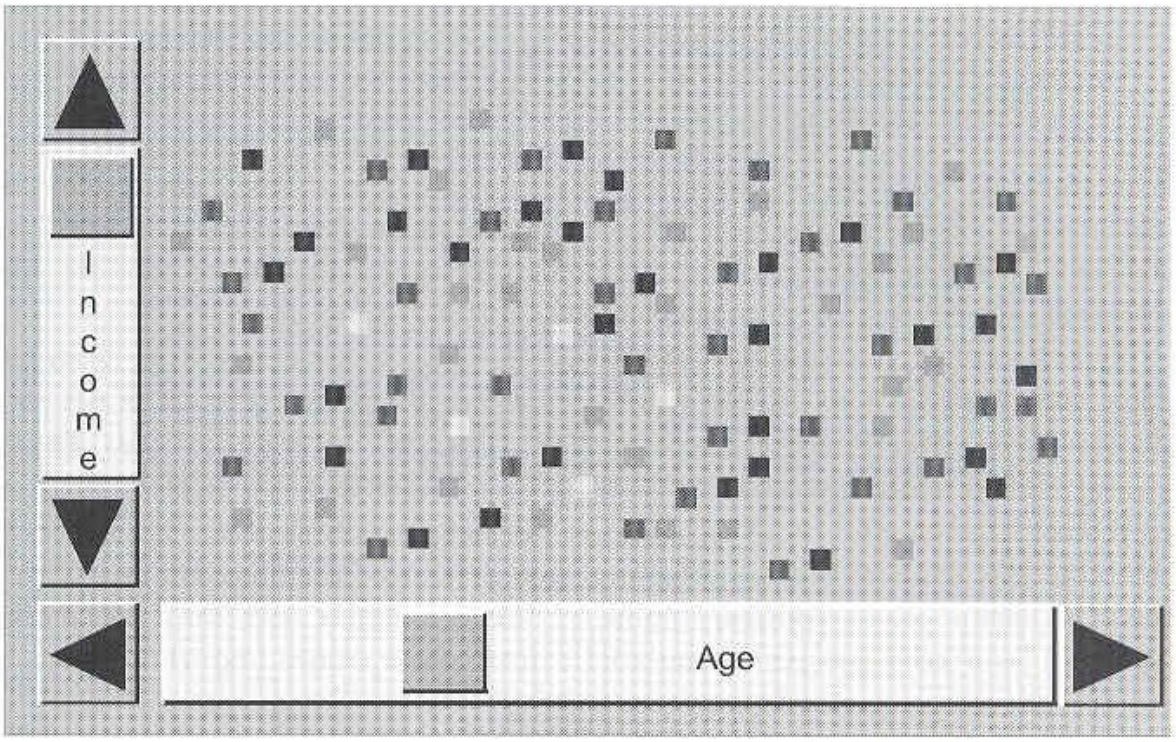


Figure 7.13 Example of a starfield visualisation for persons.

- starfield example: a DB of persons

PERSON(Person-ID, last-name, first-name, middle-name, date-of-birth, annual-income, degrees, SEG, etc..)

Age: x-axis, annual income: y-axis, colors: SEG(socio-economic groups)

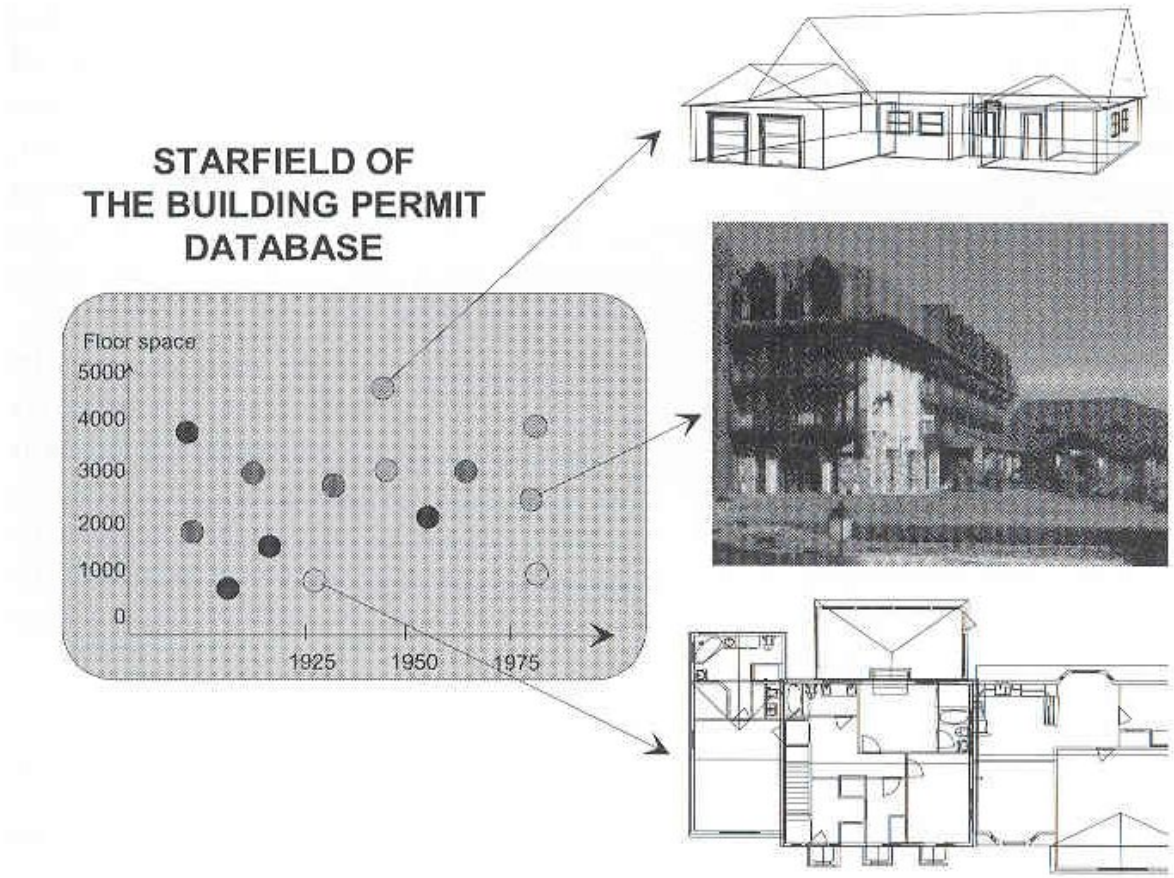


Figure 7.14 Starfield visualisation of the building permit database allowing access to various types of multimedia information; the circles act as anchors.

- starfield example: a DB of building permits

  PERMIT(Permit-ID, parcel-ID, permit-address, applicant-name, applicant-address, floorspace, date, draft-ID, dossier-ID, state, etc.)

  dates: x-axis, floorspace: y-axis, construction category: colors

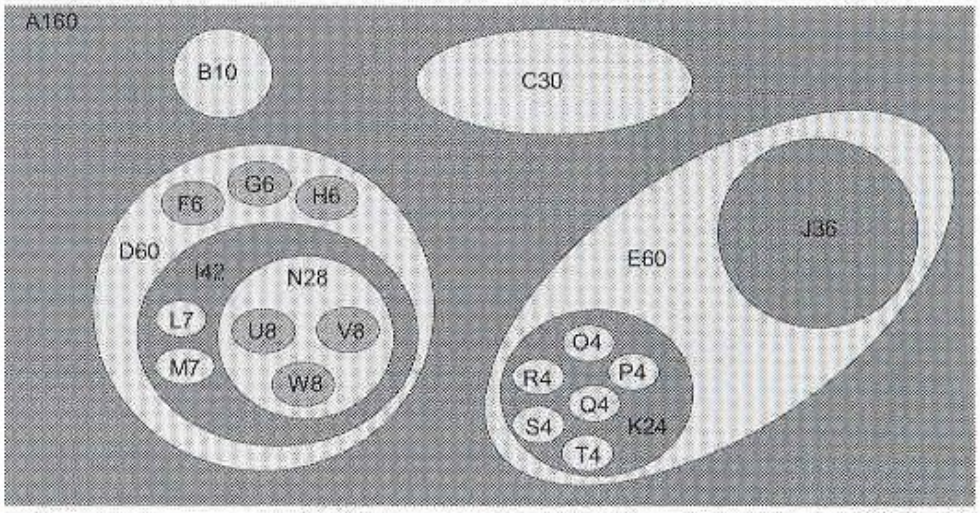


Figure 7.15 Venn diagram.
From Johnson and Shneiderman (1991).

- treemaps (space-filling treemaps)sd

  an elegant way to visualize objects organized hierarchically

  mixture of two metaphors: Venn diagram & shelves for books

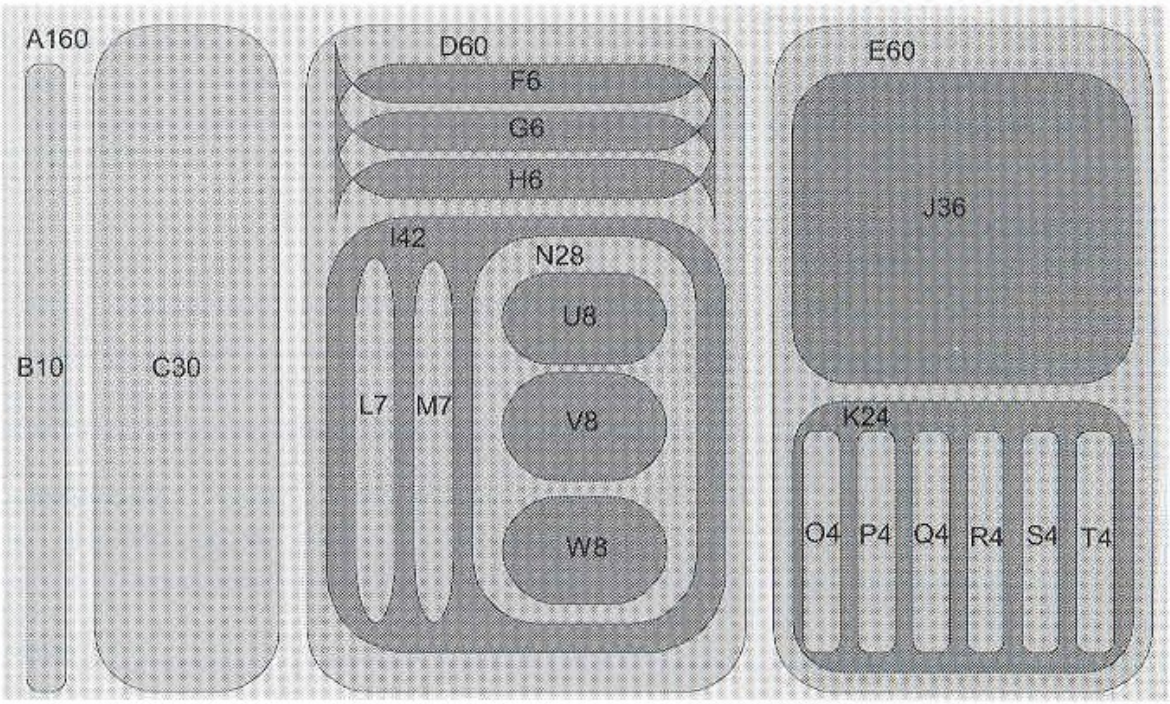


Figure 7.16 Nested treemap.
From Johnson and Shneiderman (1991).

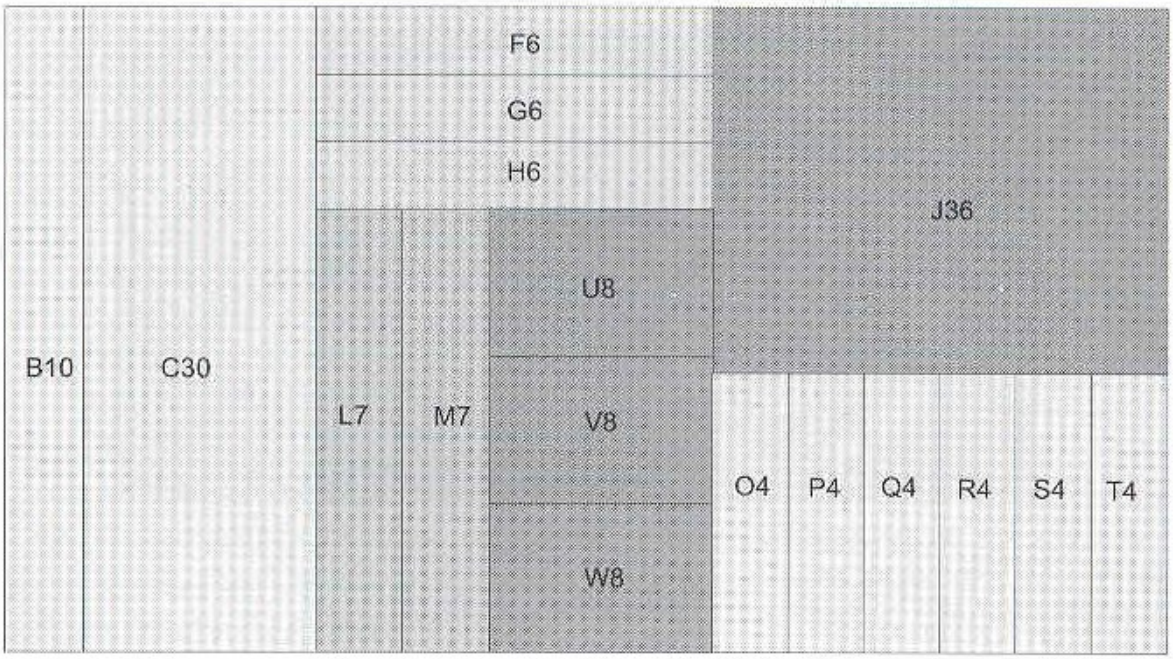


Figure 7.17 Space-filling treemap.
From Johnson and Shneiderman (1991).

- overview step from the concept of

  Overview-Zoom&Filter-Details-on-Demand

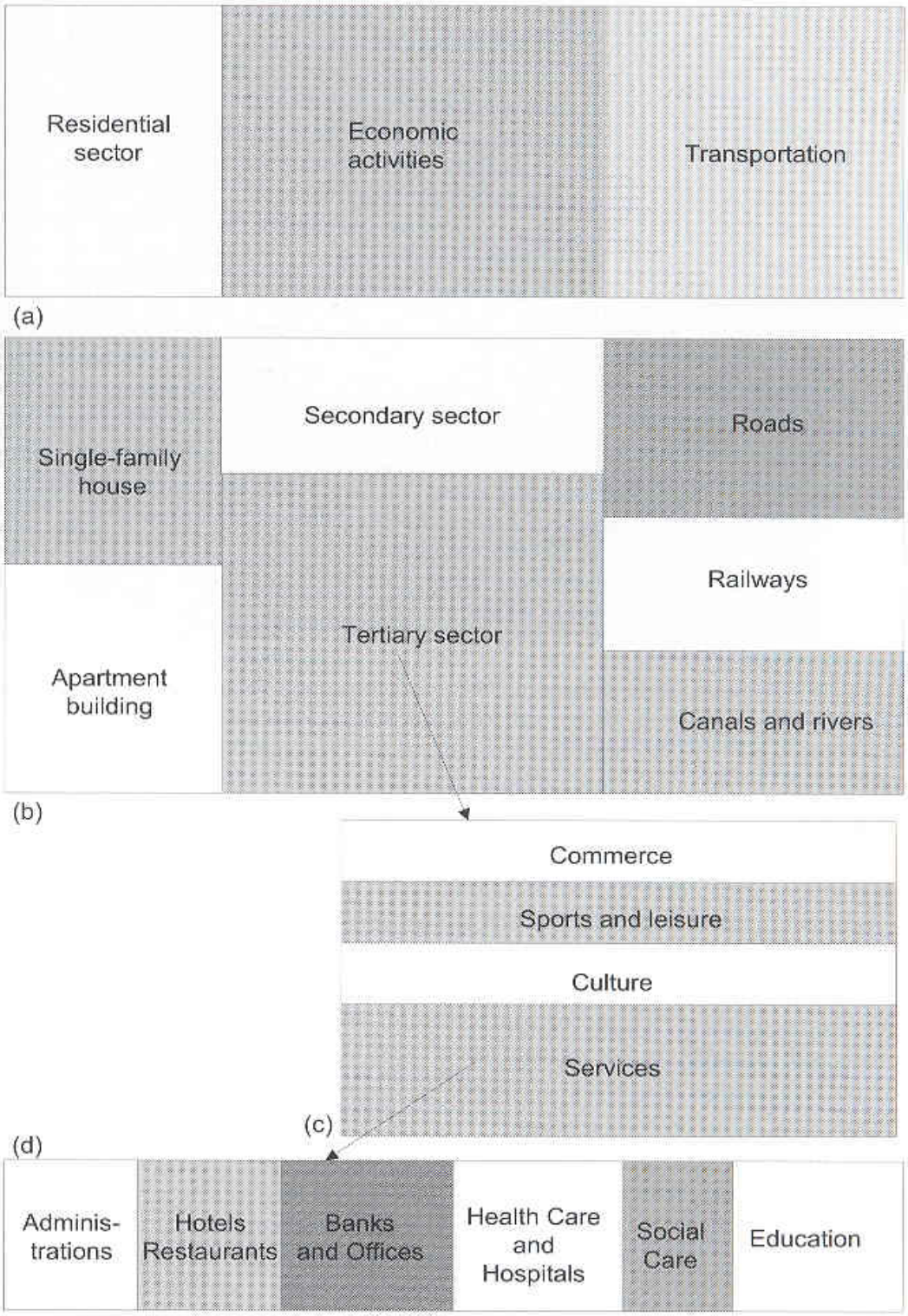


Figure 7.18 Example of a global visualisation system based on treemaps for accessing some documentation for urban planning. (a) Initial screen for the overview. (b) Screen after the first details. (c) Zoom on the tertiary sector. (d) Zoom on Services.

Table 7.1 Chen visualisation model of key-elements

Visualised objects	Geometry	Visual attribute	Semantics
Document	Sphere	Radius	File size
		Colour	Year of publication
Link	Cylinder	Radius	Document-to-document similarity
		Length	Minimal semantic distance
Query hit	Cylinder	Height	Query-document similarity
		Colour	Distinct keyword

Navigating in the info space

- another important issue

- Chen's model(1998,99)

  represent each document as a planet in space

  document w/ similarities must be adjacent in this space

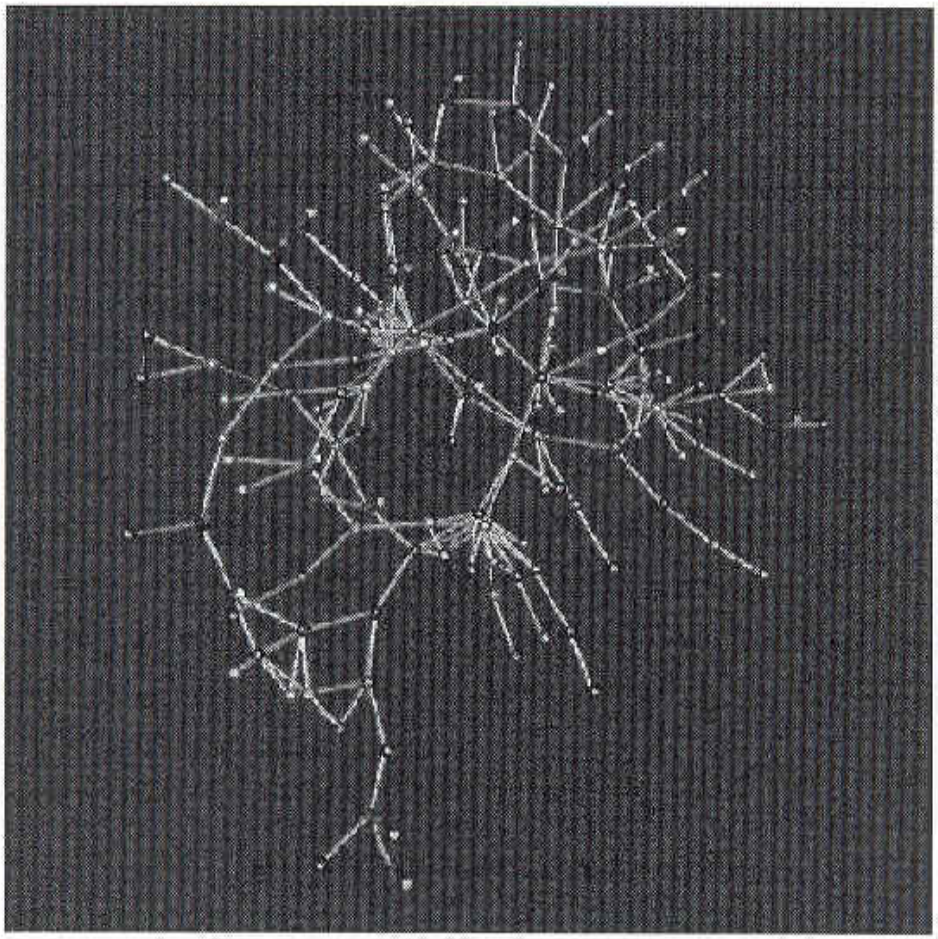


Figure 7.19 Overview of an example of the entire collection of documents (Chen 1998). Published with permission. Reprinted from *Journal of Visual Languages and Computing* 9 3, C. Chen 'Bridging the Gap: the use of Pathfinder networks in visual navigation' 267–86 © 1996 by permission of the publisher Academic Press.

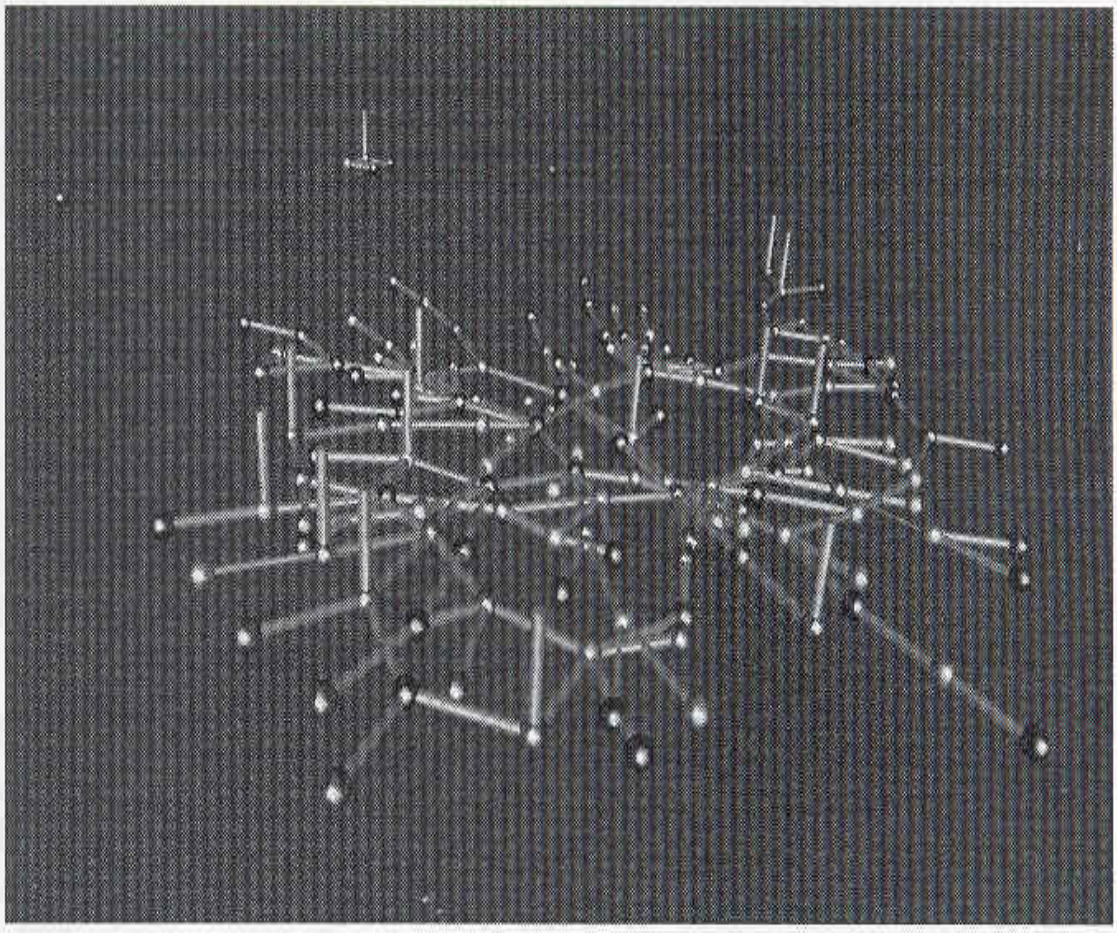


Figure 7.20 Landscape view with keyword search hit bars (Chen 1998).
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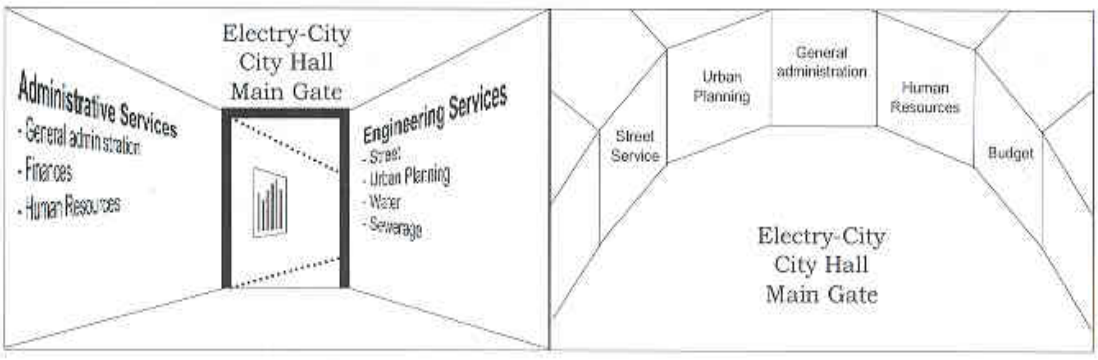

Figure 7.21 Two submetaphors in the information city. According to Dieberger-Tromp, 1993). (a) The linear structure and the door metaphor leading to another information room. (b) The fisheye view. Source with modifications: http://www.mindspring.com/~juggle5/Writings/Publications/VRV.html

City as a metaphor for organizing info

-> info city

buildings: containers for info

landmarks: special non-access / public access buildings

rooms: containers inside buildings

paths: connect two locations

intersections (of paths)

walking, driving, flying: ways of connecting one building to another

e.g. info within a building : linearly structured vs. fisheye view

Figure 7.22 The virtual city of Bologna, Italy as an entry point in the web system. Source: http://www.nettuno.it/bologna/frame-mappa.com. Published with permission.

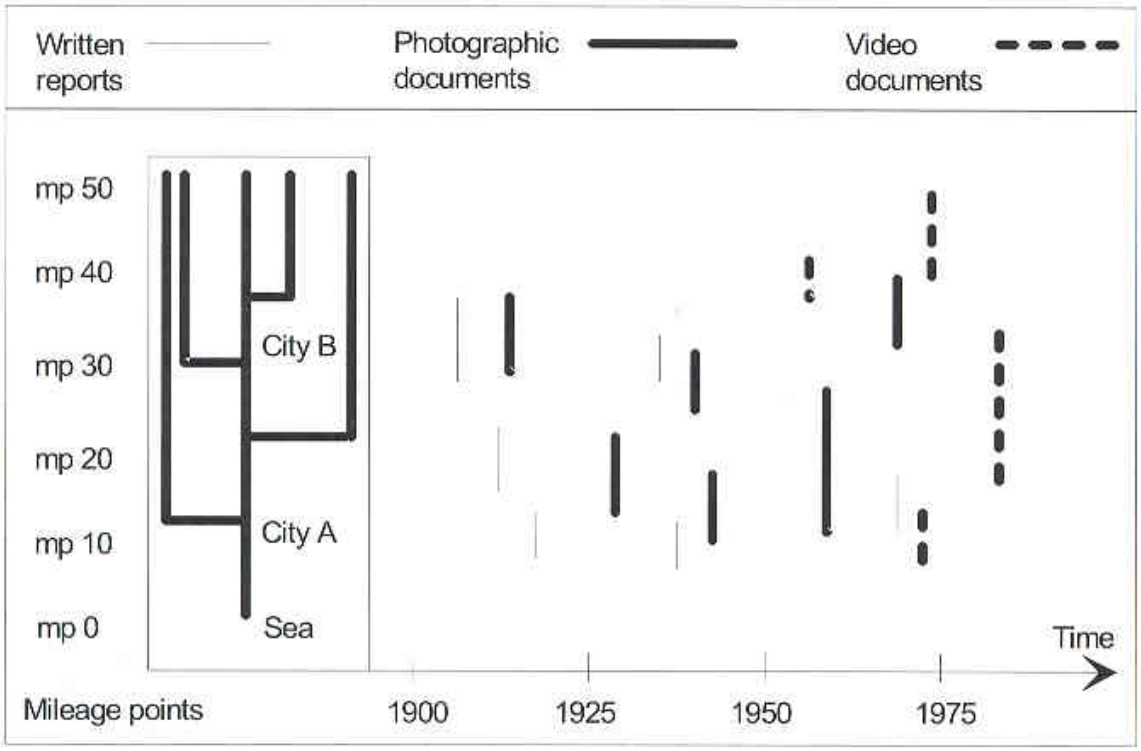

Figure 7.23 Example of entry display for flood history allowing access to documents of several media.

- example on organizing info for flood history & prevention