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**DYNAMO:
an on-line collection
of architectural precedents in construction**

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Introduction

Teaching in architecture relies heavily on the study of precedents. Precedents are the repository of experience and design knowledge from the past and therefore the necessary condition for architects to function as competent practitioners in today's society. Information and communication technology (ICT) offers new opportunities to store, accumulate and disseminate precedents.

Learning from design precedents is the essence of Case-Based Design (CBD), a theory and technology in the domain of Artificial Intelligence. Firmly rooted in the Theory of Dynamic Memory (Schank, 1982), the CBD approach propounds that people's knowledge does not only consist of abstract, generally applicable principles, but also of specific experiences, so-called cases (Riesbeck & Schank, 1989; Kolodner, 1993). Moreover, it claims that human memory is dynamically changing with every new experience. Several years of observing and analysing people's reminders have nurtured the hypothesis that experiencing, understanding, remembering and learning cannot be separated from one another. Our understanding grows by trying to integrate new things with what we already know. As a result, understanding causes us to come across old experiences as we process new ones. A significant side effect of this process of understanding is that memory never behaves exactly the same way twice, since it changes as a result of its own experiences. As experiences are recalled and used, memory gets an opportunity to try out the knowledge associated with them. This allows memory to re-organize and re-define itself dynamically, in other words to learn from its experiences (Kolodner, 1993).

Learning from experience can occur in various ways (Riesbeck & Schank, 1989). New episodes are stored in terms of old expectations generated by previous experiences. Eventually expectations that used to work may have to be invalidated. Indices to unique experiences that were once useful will cease to do so because similar experiences have been encountered. In short, memory learns from experience by acquiring new cases, grouping similar cases, or re-indexing cases stored improperly at first.

A dynamic architectural memory on-line

In order to provide students and teachers in architecture with cases at any time of the day and the night, we have built a growing case collection conceived as a dynamic memory on-line (Segers, 1998; Heylighen & Neuckermans, 2000). This collection, called DYNAMO and developed during the past seven years at the CADLAB of the K.U.Leuven, contains almost 600 projects, documented with photos, plans, source material, texts, ...represented by all together more than 7350 files and indexed by 1680 keywords. Projects have been introduced in the collection depending on the pedagogical needs of our school, related to the design studios as well as to the courses and seminars on architectural theory (Heylighen et al., 2004). From a technical point of view the collection is structured as shown in Figure 1.

The access to DYNAMO is free, but controlled by a system of passwords for copyright reasons. Users automatically receive their password via e-mail after registering on-line. The interface is written in English and today version VI is on-line. The address

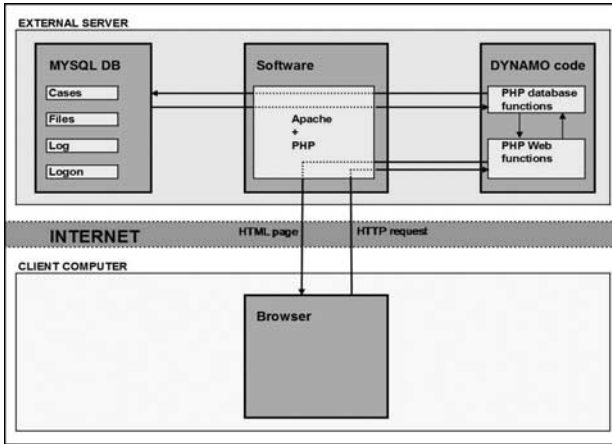


Figure 1: DYNAMO from a technical point of view.

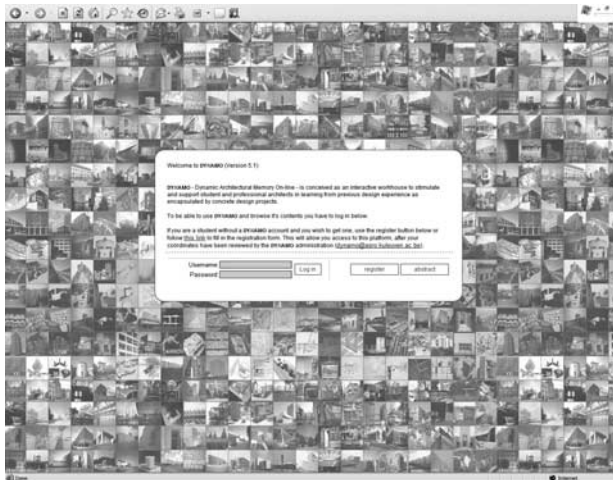


Figure 2: DYNAMO's log on screen



Figure 3: DYNAMO's main navigation screen

is <http://dynamo.asro.kuleuven.be> and the opening screen shows all projects in the collection, plus a dialog box to log on or to register as new user (Figure 2).

After logging on, the user is confronted with the main navigation screen as shown in Figure 3. The main features are home / browse / search / feed / check / help. Besides this, there is a dialogue box left from the search command allowing direct access to the requested data by typing a keyword related to the searched item.

DYNAMO in action

In order to show the potentialities of the collection and especially its search capabilities, we describe briefly the < BROWSE > and < SEARCH > functionalities. The best way to learn about DYNAMO is and remains to log on and explore its features.

The BROWSE function allows wandering in the collection without a specific request in mind; it is conceived as “a dive in an architectural bath”. The browse button opens three possibilities: project list / quick browse / slideshow.

- *Project list* provides a list of all projects in DYNAMO sorted alphabetically, by id (i.e. chronological order in which the projects entered the collection) or by rating (i.e. frequency of consultation).
- *Quick browse* presents a completely random list of projects, providing the user a refreshing view on DYNAMO's contents or a foretaste of what the collection has to offer. Each time the quick browse function is started, the projects are reshuffled. Flipping a page, however, will not change the order.
- *Slideshow* automatically displays on-line images of projects one after the other, which can be further explored by clicking on the image itself. This action leads to the main screen of that specific project.

The SEARCH button gives way to two possibilities: *category search* and *advanced search*. Both rely on a dynamic indexing system that allows retrieving cases in multiple ways. Every project is indexed with various features that serve as filter criteria during retrieval and as links to projects with analogous characteristics. These features are grouped into three windows*, which represent three different ways of looking at the project collection: ID (identification), design, theory (see also Section 4). In order to avoid confusion, a clear distinction should be made between categories and values. The term category refers to the name of an index, e.g. *spatial configuration*. Each category provides a place for a case to characterise itself with one or more values, e.g. *cluster, linear, radial, 'plan libre'*. A value thus refers to the concrete realisation of a category for a certain project. It characterises a specific project but can, and in many cases will be the same for several projects. In other words, whereas categories are chosen generally and shared by all cases, the values for these categories are assigned to each case specifically. For some categories, *materials* for instance, a single case can have multiple values.

- The category search shows a screen where 20 categories can be chosen: e.g. *building programme* (i.e. current function or use) (Fig. 4). The number of programs displayed in the list can be chosen as well as the number of projects shown at once on screen. Clicking on *museum*, for example, will produce five screens with 18

museums each (Fig. 5). Clicking on an image leads to the main screen of that particular case as shown in Figure 6.

- The *advanced search* allows combined search. It allows a user to select various values from different categories and combine them with < and > or < not >. To start such a search, select a window* and then a category. This action results in the values popping up in the scroll box to the right. Select the desired value and use < and > or < not > to search for it. In the same way multiple values can be combined. Up to three values of categories even belonging to different windows* can also be selected (Fig. 7).

In all basic navigation screens, the dialogue box allowing direct search remains available.

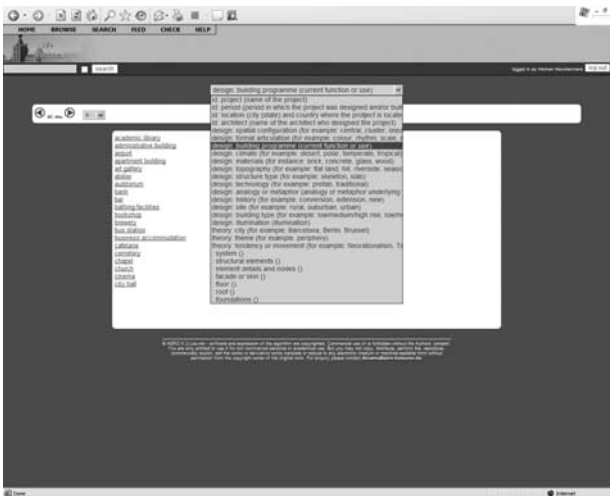


Figure 4:
category search



Figure 5:
search result when
looking for projects with
building programme
'museum'

Windows

The collection can be consulted via three windows*, each containing an elaborated set of indices: ID (identification), design and theory. Each window allows to approach and select cases from a specific point of view. ID comprises basic characteristics that allow identifying a project. By contrast, the design window adopts a designer's perspective and approaches cases through aspects of form and space, construction, function, etc., while the theory window enables theoreticians to select projects by tendency or movement. Future addition of extra windows for other perspectives (e.g. conservation or reuse) is still possible.

In order to give a flavour of these windows* currently available, we list here the categories (search keys or indices) in each window*.

- ID:
 - project (name of the project)
 - architect (who designed the project)
 - period (in which the project was designed and/or built)
 - location (city (state) and country where the project is located)
- design:
 - form: formal articulation, spatial configuration, illumination
 - function: building programme, building type
 - construction: materials, structure type, technology
 - context: climate, topography, history, site
 - concept: analogy or metaphor
- theory: city, theme, tendency or movement

A window on construction

The presentation at the workshop shows DYNAMO at work on-line and proposes a new window* that focuses on construction. Figure 8 shows how it could be structured along the following lines: structural systems, technology, detailing and materials. A 'dummy' version of this new window* is presented in Figures 9, 10, 11,12 and 13.

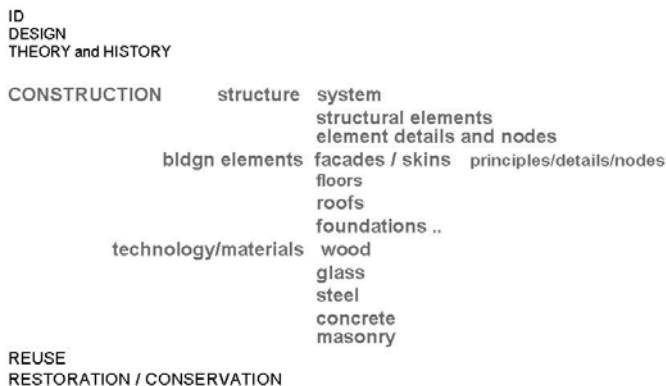
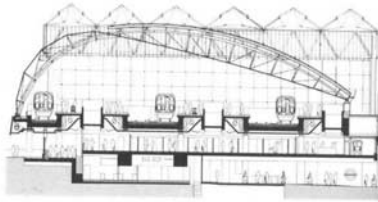
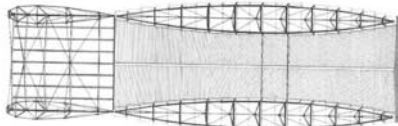


Figure 8

PROJECT:
WATERLOO
INTERNATIONAL
TERMINAL
LOCATIE:
LONDEN
GROOT-BRITANNIË
ARCHITECT:
NICHOLAS GRIMSHAW
AND PARTNERS

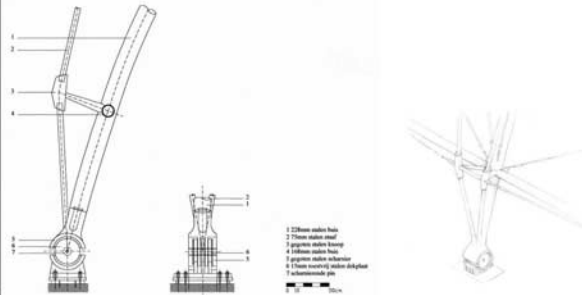


De 400 meter lange constructie bestaat uit 36 gebogen dakspanten, asymmetrisch van vorm. Zowel de kleine spanten (links) als de grote spanten (rechts) zijn prismatisch. De 2 buitenste stalen bogen van de grote spant zijn belast op druk, de binnenste boog is belast op trek. Omwille van de asymmetrie is de krachtwerving in de kleine spant omgekeerd: buitenste boog belast op trek, de binnenste op druk. Ze bevindt zich ook volledig aan de buitenkant van het glas, in tegenstelling tot de grote spant.



Bovenaanzicht van de structuur

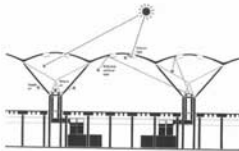
Figure 9



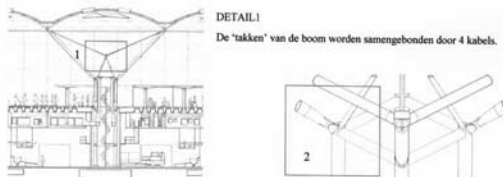
Details Waterloo station - London

Figure 10

PROJECT:
STANBLED
LUCHTHAVENTERMINAL
LOCATIE:
STANBLED
GROOT-BRITANNIË
ARCHITECT:
NORMAN FOSTER AND
PARTNERS

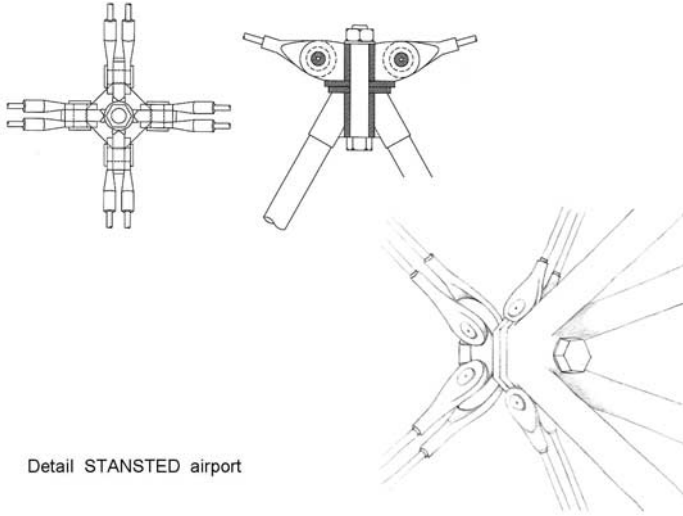


De structuur van de luchthaven bestaat uit structurele 'bomen' die gepositioneerd staan op een grid van 36x36 m. Vanaf de stam van de bomen, 3m x 3m, gevoerd door 4 stalen kolommen, vertrekken diagonalen die het dak ondersteunen. De uitrusting voor verwarming, ventilatie en airco bevindt zich binnenin deze cluster van kolommen.



Bevestiging van de diagonalen aan de kolommen.

Figure 11



Detail STANSTED airport

Figure 12

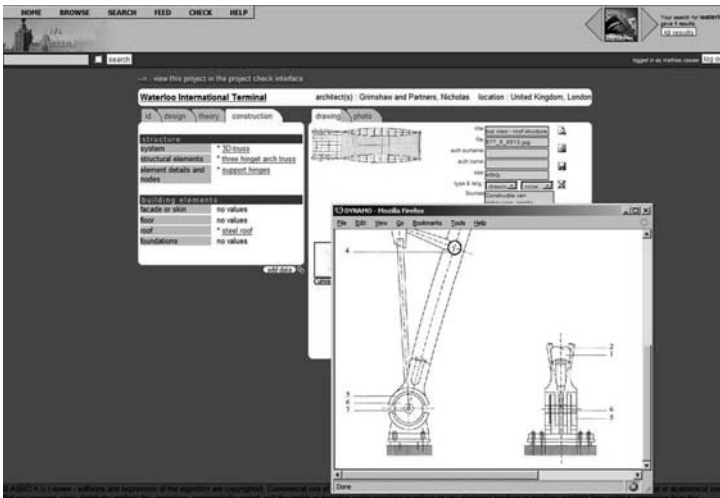


Figure 13

Figures 9-13: 'dummy' screenshots of a possible construction window

The number of windows* in DYNAMO depends on the number of users interested in such a view on DYNAMO.

It is the idea to build a didactic instrument for teachers as well as for students and to invite interested schools to contribute to this common source of information in a collaborative effort. All schools, as well as all users, subsequently will have free access to all precedents. Doing so, each user will benefit from the effort of each other, knowing that the whole is more than the sum of all parts.

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