Internet Applications on the Basis of the Built-In Dynamic Models: Description of the Program Implementation Technology

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Abstract [1]

The focus of this paper is construction process of internet applications and working out of architecture internet applications on the basis of the built-in dynamic models and XML. The idea of the built-in dynamic models is known for a long time. This idea was successfully used at the construction of control system by technical objects and electronic documents. This idea is used for organization of the process of functioning of the internet application. This approach supposes integration of dynamic model into a server script and interpretation in the process of functioning of the internet application.

1. Introduction

In article [1] the new class of Internet applications – on the basis of the built-in dynamic models is offered by authors. And questions of construction of such applications were discussed at conceptual level. However, questions of a choice of architectural model which should provide productivity, scalability and reliability of the offered solution remained. In current article the architecture, data structure and interpretation of the dynamic model controlling functioning of the Internet application is defined.

2. Architectural model of internet applications on the basis of the built-in dynamic models

Construction of the architectural model is based on choice of the main functional components of system, architectural solutions on each of levels of the projected internet application where the central place is occupied with interpretation processes.

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The important task process of construction of internet applications is correct splitting of a objective system of a subject domain. Solution of the given task depends on selected architecture, objects which can be executed on server, on the client or on both sides.

Constants, shared, linked to server resources, objects belong to a server layer. Objects for check of a correctness of the data, various controlling components of user interface, navigation elements, are objects for allocation in a context of the client side.

When designing internet applications of this class is supposed to share business logic, client/server parts, that in low-speed channels and limited resources of servers to receive optimal performance.

The basis of this class of internet applications there is the three-level architecture of client-server interaction dividing processing on three logically distinguishable segments: representations, business logicians and data storages.

At data presentation level it is necessary to provide interaction between user and internet application. Provide to the client the possibility to check the entered data, perform URL-requests, process the request results on the client side.

On the level of business logic it is necessary to determine the set of functional components, rules, principles of interpretation and dependencies of their behaviour.

Service data storage are presented by the various structured and unstructured information repositories, tools, which provide access to the data from various areas of application.

Generally the architecture includes three subsystems (fig. 1):

- client (web browser) is the software application for sending URL-requests on reception of web server resources and displaying received HTML-page;

- web server, which receives, processes client requests and also generates responses based on the executed scripts and requests to the server databases;
- server databases contain mechanisms to ensure the reliability and consistency of data and are geared toward multi-user applications.

Operation of applications on the basis of the built-in dynamic models is controlled by the built-in dynamic model, that is stored on the server side. Take a detailed look at distinctive features of these applications.

1) On the side of the database server that stores information between separate requests to the web application:

- The common for all users (clients) – hierarchical dynamic model (HSM).
- Copies of current state memory model for users (CSMU). CSMU stores information about the current state of the dynamic model for authenticated users between requests to the internet application. CSMU are created, updated and deleted by server-side scripting of internet applications.
- Copies of current state memory model for anonymous users (CSMA). CSMA stores information about the current state of the dynamic models for non-authenticated users within a session of internet applications. Copies of the CSMA are supported by using the standard mechanisms of session provided by means of PHP, ASP, ASP.NET, etc.

2) On the side of server page that execute the script of internet applications:

- Interpreter dynamic model that provides the functionality of internet applications. The interpreter handles the dynamic model based on current state models and received parameters of the user's request.
- Program objects (DOM-objects), in which the dynamic model and copies of the current state memory model of registered and anonymous users (CSMA, CSMU) are loaded from the database server.
- System program objects: POST is method for sending lengthy form data by user; SESSION is the global array to access session variable; SID is the unique value, allowing to compare the client with session variables.

Class of internet applications on the basis of the built-in dynamic models is multi-user – URLs-requests are received from various users in any order and are handled simultaneously. The multi-user mode is provided by saving of a copy of current states memory model for each user. For authenticated users storing copies of the current state memory is provided in the server database, and for anonymous – in session variables. For solution of the given task on the first step of client-server interaction, unique session identificator (SID) is assigned to the each client side. Thereafter temporary storage area (with a blank copy of the current state model) associated with this SID is created on the server side.

3. Interpretation built-in dynamic model

The process of interpretation of the built-in model is the server process and based on two-pass processing of model. In the course of interpretation two consecutive stages are executed. At the first stage (the first pass) control of the user's current state is fulfilled on the basis of processing of control elements – states, transitions, diving areas. At that pass the mechanisms of processing of the control elements are performed in accordance with logic of algorithm The algorithm is presented in the following.

In the beginning the type of control child elements are checked. If the control element is submodel, the model of the current states is formed for anonymous or authenticated user. If a control is active transition the model is translated in a new current state (based on the submodel, which belongs to the active transition). If the activity of the transition is not installed, dive into dynamic model continues. If a control is external or internal area dive is dive into submodel which corresponds to the area is fulfilled.

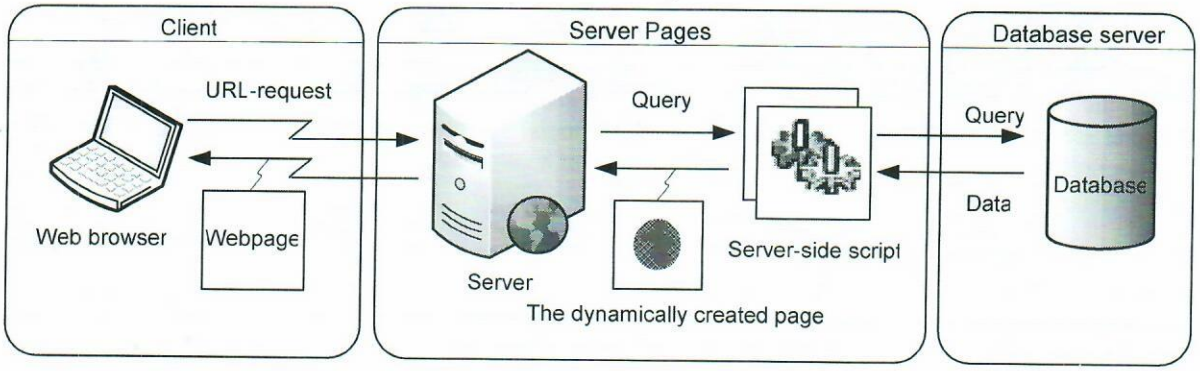

Fig. 1. Architectural model of dynamic internet applications

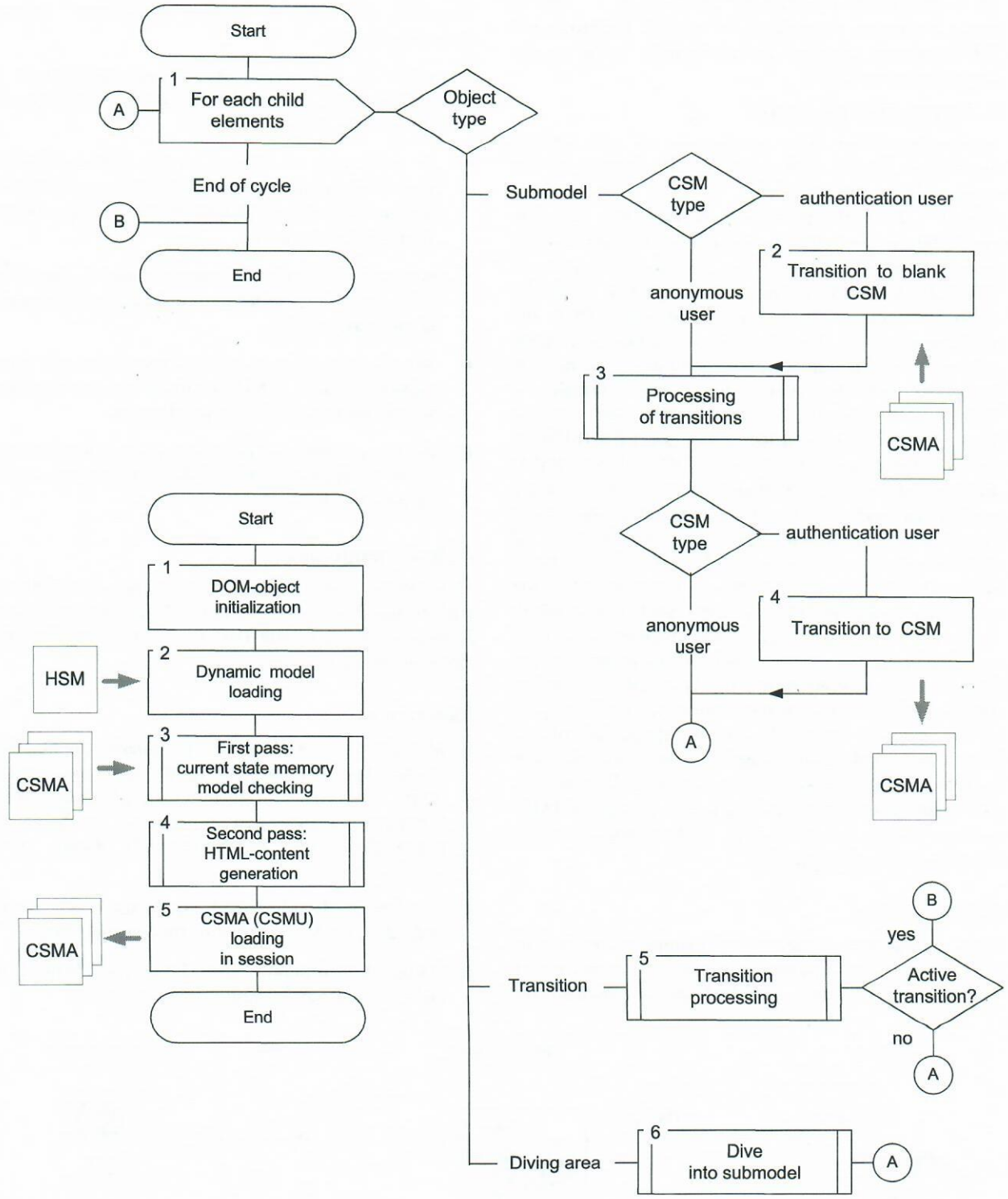

Fig. 2. General scheme of two-pass interpretation of hierarchical built-in dynamic model for the proposed class of internet applications

As a result of the first pass of the model of the current states is formed. Assemblage of applied fragments and HTML-content creation are performed at the second stage (the second pass).

4. Interaction of clients

Interaction of the main components of each internet application begins with sending URL-request to the server-side by the client (fig. 3, 1). At once from the request attached information is extracted (2). The application is controlled by the built-in dynamic model, therefore, action interpreter begins with the creation of DOM-object (HSM) for all user groups (3). Then, the dynamic model is loaded in DOM-object from the database server (4). Also platform of internet applications supports session interaction. Within session, the interpreter provides access to session variables – SESSION, which are also loaded from the database server (5) on the basis of the session identifier (SID). In addition, the interpreter creates the DOM-object CSMA, and is download the current state memory model for the anonymous user from session variables (6). After completion of processing the client request copy of CSMA is stored in session variables (7), which is stored in the server database (7). If the user is authenticated, the interpreter creates the DOM-object CSMU (8), in which loads the copy of current state memory model of registered user (9). after completion of processing the client request the copy of CSMU is stored in the server database (10). The interpreter performs the recursive pass of the dynamic model, based on information of the CSMA and CSMU and on the assembly associated with the dynamic model of the fragment of code and generates the resulting HTML-code. Then the resulting HTML-code is sent to the client (11), to form answer in the window of the user agent (12).

5. Conclusion

Thus, architecture of internet applications on the basis of the built-in dynamic models base on 3-layer scheme of "client-server database", standard session mechanisms, and transmission of parameters in URL-requests. However, this class of internet applications possess following features:

- work of this class of internet applications is controlled by built-in dynamic model, located on the side of the database server.
- for each type of element of the built-in dynamic model: states, transitions, diving areas, application of action, the rules of interpretation making uniform algorithm are inputed.
- processing of built-in dynamic model is based on tracing of copies of the current states memory model in multi-user mode;
- for the registered users of copy of current states memory model (CSMU) stored on the database server side using methods script pages.
- for the anonymous user memory model of current states memory model (CSMA) stored in session variables in the session.

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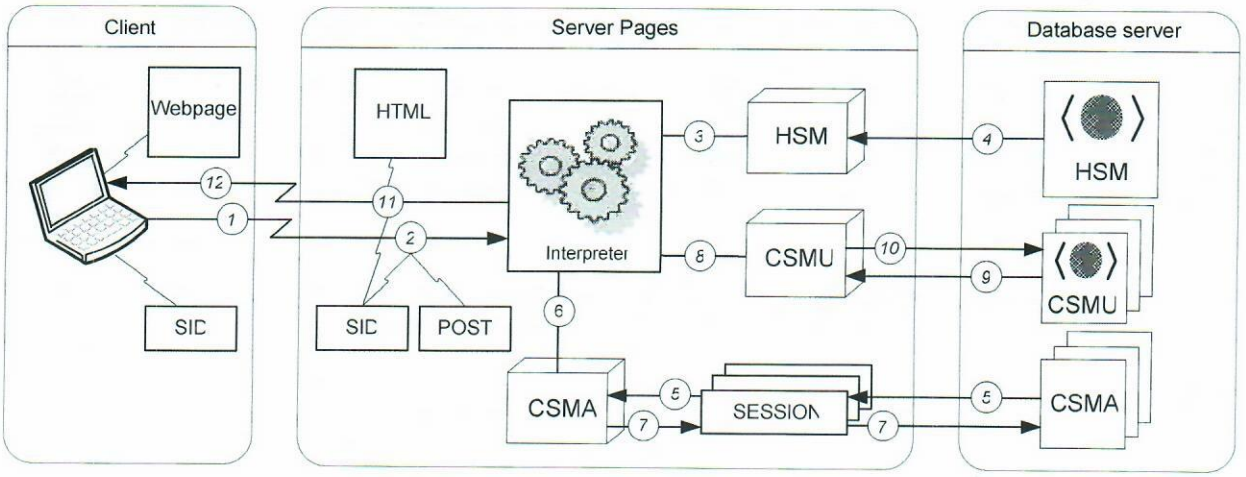

Fig. 3. Architectural model of internet applications on the basis of the built-in dynamic models