A Dynamic Content Generator for Adaptation in Hypermedia Systems

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Abstract. The heterogeneity problem (in terms of different types of access devices, network bandwidth, preferences/characteristics of the user, etc.) has become a major problem for the Internet. Different alternatives have been developed to allow universal access to any type of content. Adaptive Hypermedia Systems (AHS) have emerged as a solution for this. In previous works we proposed the SHAAD\footnote{SHAAD is the Spanish acronym for “Adaptable, Adaptive and Dynamic Hypermedia System.”} model, which includes the concepts of adaptability, adaptivity and dynamism to adapt web contents. Based on this model we implemented MAS-SHAAD, a multi-agent system implementation of SHAAD. In this work we present the design and development of a \textit{dynamic content generator} that can be added to any JAVA AHS implementation, such as MAS-SHAAD. The structure of the generator is defined by an ontology; therefore, a standard behavior can be obtained for any object included in the web pages generated and stored in the content repository.

Keywords: Adaptive hypermedia systems, multiagent systems, user modeling, device independency, heterogeneity, decision engine.

1 Introduction

The growing heterogeneity of the Internet in terms of user devices, network access links, preferences and user characteristics, and the increasing amount of multimedia content in web pages are important problems these days. One way of solving the problem of presenting contents to different types of devices is replicating the websites for each type. However, web servers usually do not consider this heterogeneity, which creates problems such as slow content delivery or even making it impossible to visualize some pages. Adaptation has been widely researched in the field of hypermedia systems [1-4] and several kinds of applications have been proposed.

In this work we design and implement a \textit{dynamic content generator} based on the SHAAD model [5]. Its objective is to select the atomic elements that make up a web page in real time from a repository.

The design includes two parts: a \textit{content repository}, which stores the atomic elements; and the \textit{content assembler} uses CSS (Cascading Style Sheets) to assemble the
contents according to the adaptation variables that characterize the user preferences and technology. The dynamic content generator is integrated into the multiagent system MAS-SHAAD [6] for web content adaptation. This implementation is based on the proposed SHAAD model.

MAS-SHAAD is a multi-agent application of the SHAAD model using the JADE platform [7]. To implement the system, MAS-SHAAD uses CC/PP (Composite Capabilities / Preference Profiles) [8] to store the characteristics of the access device in the user model.

2 The Content Adaptation Process

The mechanisms used by the generator to adapt the contents from the adaptation variables are shown in Figure 1. Each of the modules performs the following functions:

1. **User preferences and device characteristics.** These are what we call the adaptation variables and are represented by a list of properties with assigned values that describes the preferences and characteristics.

2. The **constructor generator** and **constructor object.** The decision engine, which we represent by the constructor generator, creates a constructor object. This object contains a list with the object types that form the web page and that are requested from the content repository.

3. **Content Selection.** The constructor object is delivered to the assembler (the builder agent), which retrieves the object types from the repository according to the list of object types specified by the constructor object.

4. **Web building from the contents.** Once the appropriate contents are selected and obtained the assembler converts them to XHTML.

![Figure 1. Mechanisms of the dynamic content generator for adapting content](image-url)