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FRAMEWORK FORMULTI-AGENT BASED INTELLIGENT ERGONOMIC USERINTERFACE SYSTEM: REQUIREMENTS PHASE

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***Abstract*:** The foremost way of using information around the globe is through internet. Visual presentations are focused by web and apps designers to utterly aid users to understand, and navigate with the content. The work presents that by perceptive users' behaviour, visual perceptions of Web page intricacy, the necessary cognitive effort for interaction can be understood. This challenge can be met by the extension of the present model-based methods for UI (User Interface) design, with the method required for the design of adaptive capacities in different phases of development for the proposed UI. These expansions can be incorporated in AB-EUIDE (Agent-Based Ergonomic User Interface Development Environment). This method lets the generation of UI able to adapt to diverse situations that can occur during the process of interaction.

The method is shored up by a solution based on MAS (Multi-Agent System) that permits the user to offer adaptive capabilities designed using the proposed method of AB-EUIDE. The work presented in this paper is part of the larger work on AB-EUIDE. In this paper the author had proposed various phases involved in the development cycle of AB-EUIDE and presented the requirement phase.

***Keywords*:** AB-EUIDE, MAS, UI, User Centred Design (UCD), Computer Ergonomics, Modelling

I. INTRODUCTION

There are unknown advantages of applying a systematic method to create any software application. The UI of the software are particularly difficult to design [1]. The design paradigm based on model-driven architectures, try to address the difficulties that arise during the design of a UI, and brings new benefits: automation or semi-automates creation of the UI, reuse of experience, etc..

Within the paradigm of model-based design of UIs, which is designed to complement the classical model-based approaches [2, 3, 4], with the features needed for Builders and description necessary for carrying out the adaptation process. The main requirement of this architecture is the implementation of the steps required to carry out the adaptation process effectively and efficiently. Therefore, the proposed architecture must be able to allow detection of changes in the context of use of the application (user, platform, physical environment, and the user's current task), they react by proposing different adaptation, select the best adaptations to be applied, and finally implementation.

For the design and implementation of the proposed architecture has been chosen to use MAS. Modellingof MAS through roles and ontology are proposed in [21, 23]. One of the main requirements of the architecture is the need to make decisions about which alternative is most appropriate for adaptation. In this regard, an architecture based on the concept of agent will be a great benefit to the system, since it allows human decision making for natural process modelling [5]. MAS also encourage the sharing of responsibilities between different actors, facilitating the current trend of decentralization of the software as proposed in [21,23,31,32]. The proposed architecture will leverage the knowledge of the UI gathered during the design of the interface, allowing integration of design-based UI models in the adaptation process.

The rest of the paper is organized as follows: In section one introduction is presented. In section two a Model-Based method for development of ergonomic UI is presented. In Section three acquisition of requirements phaseand requirements in UI are discussed**.** Section four presents the context of interaction. The author finally presents the conclusions and feature work in section five.

II. AB-EUIDE: A MODEL-BASED METHOD FOR DEVELOPMENT OF ERGONOMIC USER INTERFACES

AB-EUIDE (Agent-Based Ergonomic User Interface Development Environment) is a model-based approach that aims to extend the existing methods based on models with the required artefacts for the design of the elements to include a degree of adaptivity in a UI. The method allows the use of the advantages of model-based approaches, to provide the design adaptation capabilities of a UI, which among other things allows, the automatic generation of the implementation of the components responsible for the process of adaptation, and reuse of the experience gained in

the design of adaptation [6]. AB-EUIDE falls within the user-centred methods [7, 8], and computer ergonomic as discussed in [15,20,24]. Among these methods user is involved in the early stages of development life cycle of the UI, the empirical evaluation of interfaces generated, all within an iterative Lifecycle. However, one must bear in mind that an iterative life cycle where a iterate design over low quality initially; usually produce a final result, no worse than an iterative design where a high quality has been maintained in the design process. That is why, AB-EUIDE combine the proposed practices of UCD with the design focused on user [9], which seeks to ensure the quality, not only by evaluating with the user, but also through the evaluation of the quality metrics generated using software. The author has proposed, the metrics for social computing in [19], methods for assessing the effectiveness of ergonomics UI in [25, 34] and criteria of quality and efficiency of software in [26, 35].

Figure 1 shows the proposed phases in the development cycle of AB-EUIDE. The process begins with the requirements phase, guided by the use cases identification, where both functional and non-functional requirements are captured for future implementation. The acquisition of requirements will guide the analysis of the future system, which translates the requirements captured in models that allow the translation of requirements in a uniform and consistent representation, and particularly describing the domain model of the application, the user profiles system, and finally the engagement of usability and computer ergonomic. The design stage creates an abstract description of the future detailed UI, by modelling the interaction tasks, the objects involved in these tasks, abstract UI, concrete representation, and the relationships between these elements. The following describe the acquisition of requirement phase of the proposed development in detail. For a simple instance where a user must register in a system is used. For this users need to provide username and password, and urge the system to validate.

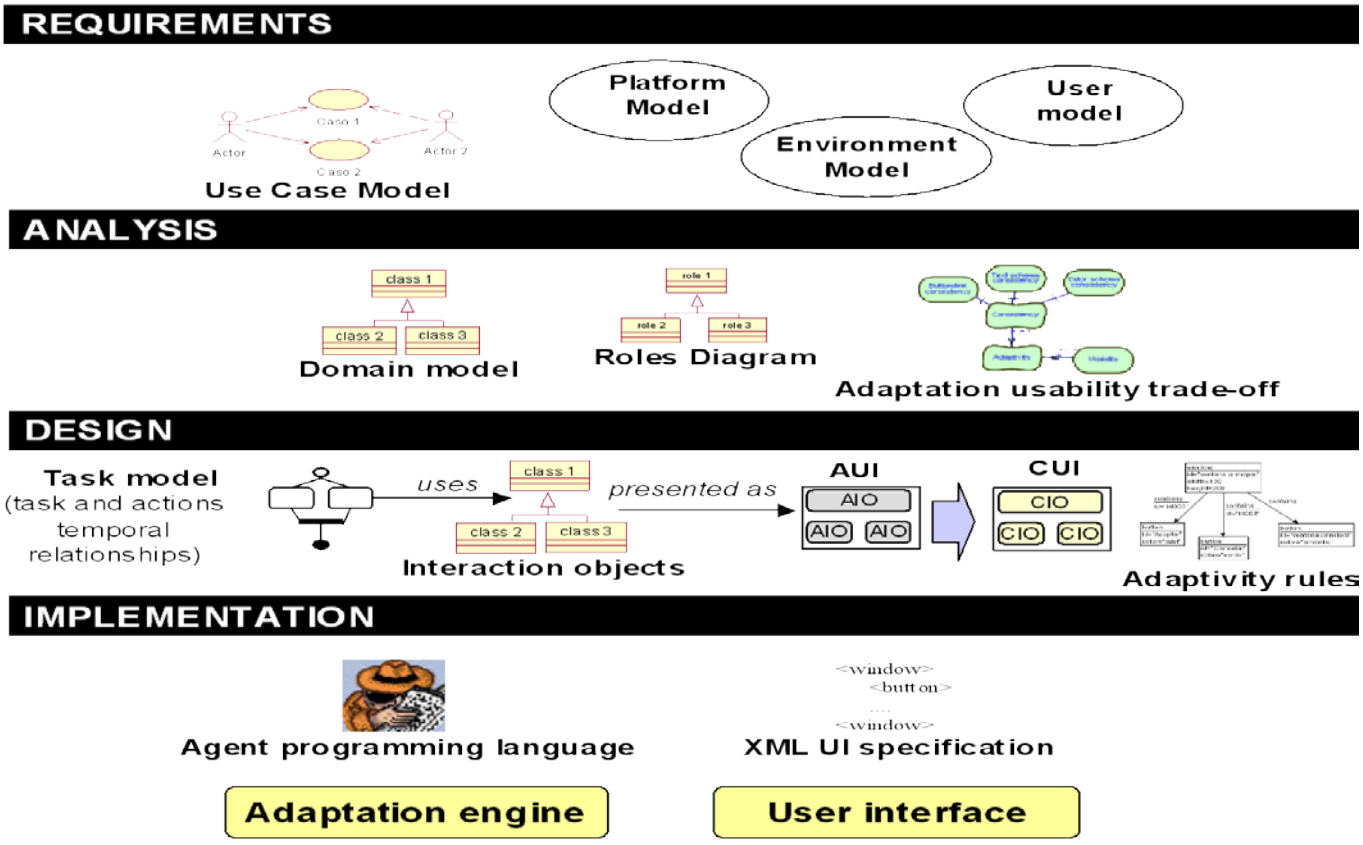

Figure 1. Phases in the development cycle proposed in AB-EUIDE

III.ACQUISITION OF REQUIREMENTS PHASE

The acquisition of requirement phase is essential for the proper design. A poor requirements lead to incorrect system design. Moreover, a comprehensive acquisition requirement leads to exponential proportion and will impact on the cost of the application. Some requirements erroneous detected in the later stages of development induces an increase in the costs and delivery times.

The importance of acquisition of requirement stage phase has led to the emergence of Requirements Engineering as a branch of Software Engineering. It's defined by Zave [10] as "Requirements engineering is the branch of software engineering concerned with the real-

world goals for functions of and constraints on software systems. It is also concerned with the relationship of these factors to precise specifications of software behavior, and to their evolution over time and across software families".The author in his previous work has discussed about, the software composition modelling and aspect oriented programming in [14, 22, 29], affective computing in [17,18] and dynamic ID based remote user authentication scheme in [30].

A. Acquisition of Requirements inUI

The acquisition of the necessary requirements for the design of a UI requires specific techniques able to capture non-functional requirements of ergonomic system that introduce the human factors element in the UI design. Therefore, it has been proposed a variety of techniques ranging from textual methods to rapid prototyping methods as discussed in [8].

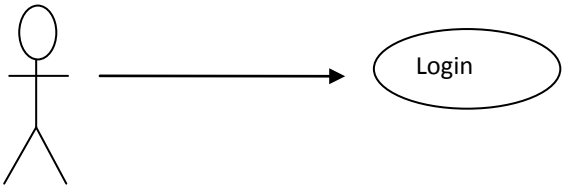

Figure 2a. Use case for entry into a system.

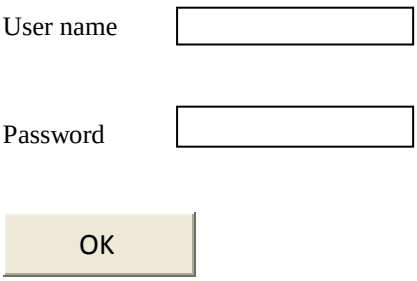

Figure 2b. Image associated to the use case Login.

In AB-EUIDE, the user goals while using the application are described by using the use cases [11]. Use cases show clear and intuitive user goals, in a language that can be understood both by the user and the developer. Keep in mind that the use case diagrams are not by themselves sufficient to capture all the details, it only captures what the system should do, but do not capture any type of information on the flow of control between different use cases. It will therefore be necessary to supplement the use case diagram with sequence diagram.

Similarly, it will be necessary to accompany each case study with detailed description in natural language. The NLP, NLIand language schizophrenia are discussed in [16,27]. It will be useful to document each use case by a graphic image which identifies the user with the aim to perform, which can be captured from a user application. Often the association of interaction patterns such as those proposed in [12, 13] will facilitate to identified the use cases. Fig. 2 shows an example of a specification for the use case (Fig. 2a). The use case has been documented through a graphic image (Fig. 2b) illustrating the task, and facilitates the discussion of the objectives of the system with the user. Similarly, the use cases can be documented and validated through prototyping techniques. In [8, 12] description of the techniques most widely used rapid prototyping in the design of UI are presented.

IV. CONTEXT OF THE INTERACTION

One of the determining factors for the development of a quality UI is its adaptation to the context of use. This implies that within the requirements capture it is necessary to describe the context of use of the application. The context of use is defined by the description of the user who interacts with the application, both software and hardware platform, where the interaction takes place and finally the physical environment in which the interaction is done as proposed in [31, 32].

A. Modelling platform

The description of both software and hardware platform where interaction occurs is the cornerstone of multiplatform applications. The platform can be described using the standard CC/PP. However, the extensibility of the platform model as well as the other components of the description of the context is a key element in the flexibility for specifying adaptive systems. It will require a description of many platforms as needed. Table 1 shows a description of two possible platforms, characterized by the colour (colorDepth), screen resolution (screensize) and ability of the platform to display images (isImageCapable) on screen simultaneously.

Table I Example of AB-EUIDE platform.

Platform	1	Platform	2
colorDepth	256	colorDepth	2
screenSize (x, y)	800x600	screenSize (x,y)	320x200
isImageCapable	True	isImageCapable	False

B. Modelling environment

The modelling of the environment will often be reusable from one to another application, since there are a variety of possible interaction usual environments, except for very specific applications. In the example of Table 2 has considered only two possible interaction environments: at home and on the street. The characteristics that affect interaction are considered, the level of ambient luminosity, and the surrounding noise level.

Table II AB-EUIDE environment.

Home		**Street**	
Lighting	High	Lighting	Medium
Noisy	Low	Noisy	High

C. User Modelling

The description of the user model should be divided into characteristics dependent on the specific application and independent features. Moreover, the user model of AB-EUIDE is also divided into user features and relationships in Table 10.3. The user features described properties of Users that are independent of the remaining components of context. The relationships, describe user features associated with other components of the context description. The example, in Table 3 describes how the user can give attention to the application (cognitiveFocus) in two different environments (Home and Street).

Table 3, describes two user features, on the one hand, if user prefers to describe the data in textual form or not (Preferentes.textualRepresentation), the other is possible degree of blindness (Physical.blindness). This also describes how the properties of the user in relation to the platform and environment models. The user is inexperienced in the use of software platform2, but an average user in software platform1. Similarly, the user can maintain a high focus on the interaction with the system when at home, but can maintain a low attention when on the street (cognitiveFocus.Home/cognitiveFocus.Street). The user model will usually be replicated for each user profile identified in the application. Unable to identify user profiles future in the application, the designer may choose a single profile, and specialization along time, according to the parameters of the captured interaction.

Table III Example of user model AB-EUIDE.

User features	
Preferences.textualRepresentation	True
Physical.blindness	Null
Relationships	
softwarePlatformExperience.Platform1	Average
softwarePlatformExperience.Platform2	Rookie
hardwarePlatformExperience.Platform1	Average
hardwarePlatformExperience.Platform2	Rookie
cognitiveFocus.Home	High
cognitiveFocus.Street	Low

V. CONCLUSION

The work described an architecture that allows the user to provide a set of adaptation capabilities that are designed using the method proposed. The proposed architecture is based on the concept of agent, also describes how to carry out each stage of the process of adaptation in MAS. The work has posed an effort to improve software quality, especially an improvement in the quality of ergonomic UI. To do this, in recent years, author has delved to improve the ergonomics of the system on several frontsin the arena computer science.

A. Future directions of our research will focus on

- The Work will also present the remaining phases (Analysis, Design, and Implementation) of AB-EUIDE.
- The development of AB-EUIDE for affective computing [17, 18], social computing [19], remote user authentication systems [30], Internet banking environment [33], and management information system [36] can be explored.
- The author has identified the methods to register the Intellectual property (IP) in [28], the same will be implemented for UI.
- As shown by the study, the problem of designing an AB-EUIDE for Internet of things is highly relevant and has a lot of unresolved and controversial interpreted tasks and decisions.

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