

# Developing a Smart Nursery Application for Monitoring and Babies Care

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## ABSTRACT

This paper presented a Smart Nursery application for busy parents so that they can ensure the safety and proper care for their babies. This system can show the baby's motion, position and sound through live web-cam camera which is provided by the proposed smart application so that the parents or another responsible person can monitor the baby while away from him or her. This proposed smart application can provide a convenient and easy way for busy parents to take care of their babies. The proposed system was analyzed, design and developed using the Unified Modeling Language (UML), ASP.NET and HTML.

**Keywords :** Baby; Nursery; smart application; and Unified Modeling Language.

## I. INTRODUCTION

In the last few years, female involvement in the job market in the industrialized countries has significantly increased in society. Then, baby care has become challenging task for a lot of families in the everyday life. always mothers are concerned about the wellness of their babies [1, 2].

Currently; the parents have to work and take care of their infants/babies, so more stress and workload are there on parents particularly on mothers. If the smart application is developed to gives continuous updates regarding babies during normal routine or during illness, then it will help significantly the parents to be more productive as they work in a stress-less atmosphere. Furthermore; the smart application will be helpful for the urgent situations that can be rapidly noticed and managed within less time [1-3].

## II. RELATED WORKS

Hadanty is a website which aims to help parents to find a suitable nursery for their children, figure 1 shows the homepage for Hadanty website. The website provides parents with the following information:

- Information about each nursery, its type, languages available and contact addresses.
- Features available in each nursery and nursery pictures.
- The ability to evaluate nurseries by the website and raise the evaluation on the site.
- Offers and discounts available at nurseries.
- A guide explaining the child's websites and the most important places for children in Egypt.
- Display the advantages and disadvantages of the nursery by parents on the page of the nursery website on Facebook.



Figure 1: the homepage for Hadanty website.

Jaleesah is a service application and it is a platform that serves mothers and incubators, the aim of the platform is to take care of the child in an environment that is compatible with the growth standards of the child, the application give the ability to choose a babysitter for the child that is close to the parents work and they can learn about the level of the babysitter through the assessments of the other people [4]. Figure 2 shows the homepage for Jaleesah platform.



Figure 2: the homepage for Jaleesah platform.

The technological revolution influenced everything [5-82], even the methods of intelligent baby behavior monitoring and healthcare. Nowadays, Artificial Intelligence (AI) algorithms were used widely for solving several difficult problems such as image segmentations [8, 26, 27, 42, 83-87], medical image analysis [28, 32, 88-90], nurse rostering problem [91], Healthcare Monitoring [45, 56], Learning Management System [46], patterns recognition and

information retrieval [36, 38], and river flow forecasting [37, 92, 93]. Many researchers have used the AI techniques in monitoring such as smart nursery application [94, 95].

### III. METHODOLOGY

The UML is a method used to provide a standardized notation for defining Models that are Object-Oriented. Though, for applying the UML notation successfully, it has to be employed with an Object-Oriented Analysis and Design (OOAD) method [96-100]. OOAD denotes a set of methodologies that aims to produce business component-based software. The methodology s a summary of system development's life cycle in an object-oriented project, it identifies the tasks and deliverables [101].

Utilizing a combination of UML process and notation, the system development life cycle can be summarized, the reusability of modules can be improved, and the system can be simply maintained.

Traditionally, requirements analysis included finding relevant data and functions that the software system will support. The entity-relationship (ER) diagrams describe the data that will be handled by the system [102, 103]. The development of object-oriented software uses new design methods, they are supported by computer-aided software engineering tools such as Rational Rose [104].

The UML is a language utilized to visuallize, specify model [103], and for documenting the of an underdevelopment object-Oriented system artifacts. It represents a unification for a number of ideas from various methods. In the system design, UML is used to enhance its maintainability and reusability. Object-oriented analysis methods offer use case, class sequence, , statechart and other modeling notations [102]. UML was employed efficiently in various

projects for modeling different architectures and requirements [103].

• **Use Case Diagram**

The use case diagram is a visualization of a use-case [18, 99, 103, 105], i.e., the smart nursery system interact with three actors namely; Guardian, Supervisor and Technical support. In the proposed system the use case diagram mainly consists of register, login, manage announcement, query on kids files, activate the surveillance camera, deactivate the surveillance camera, profile management, make a conversation, and delete the account. Figure 3 shows the use case diagram for the proposed system.

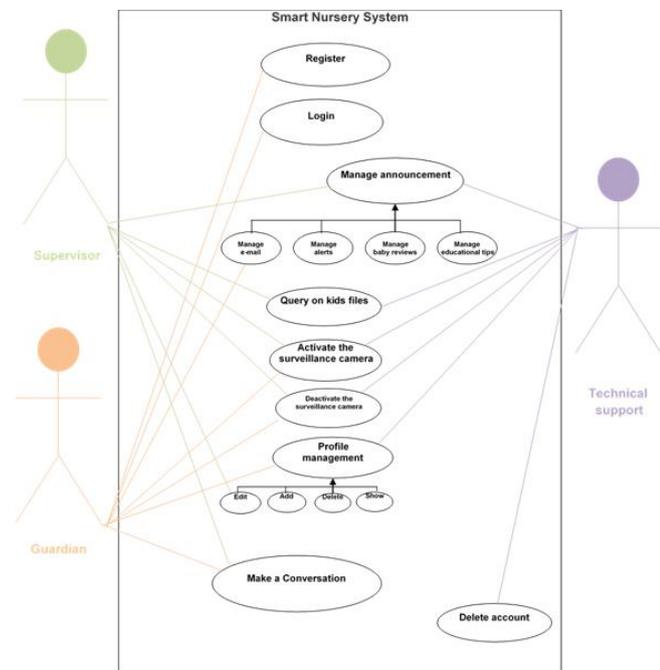


Figure 3: The use case diagram.

• **Context Diagram**

A context diagram is a maximum level in a data flow diagram, it comprises a single process to represent the entire system, that establishes the boundaries and context of the modeled system. It demonstrates the information flows between the external entities(i.e. actors) and the system. Typically a context diagram is

involved in a requirements document. Figure 4 shows the context diagram for the proposed system.

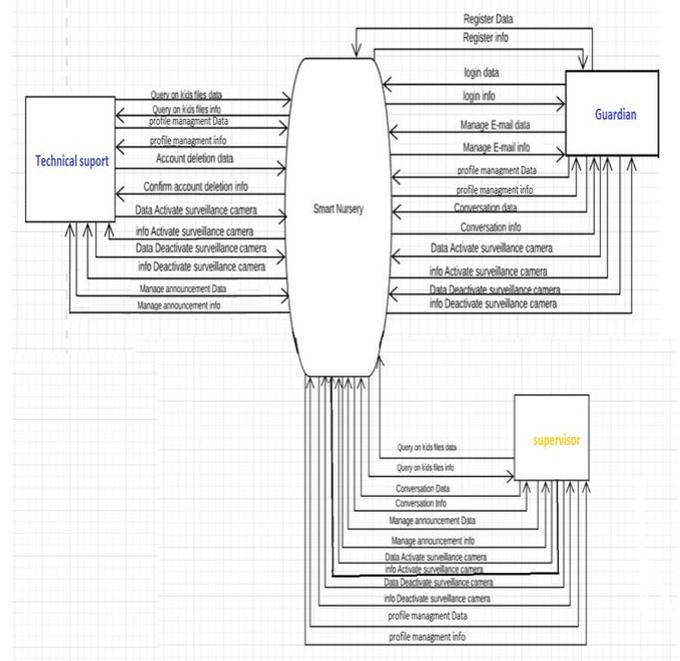


Figure 4: the context diagram.

• **Entity Relationship (ER) diagram**

ER diagram shows the relationships of the entity sets stored in a database [106]. Here; an entity is a data component. In other words, the ER diagram demonstrates the logical structure of the proposed system. Figure 5 represents the Entity-Relationship (ER) diagram.

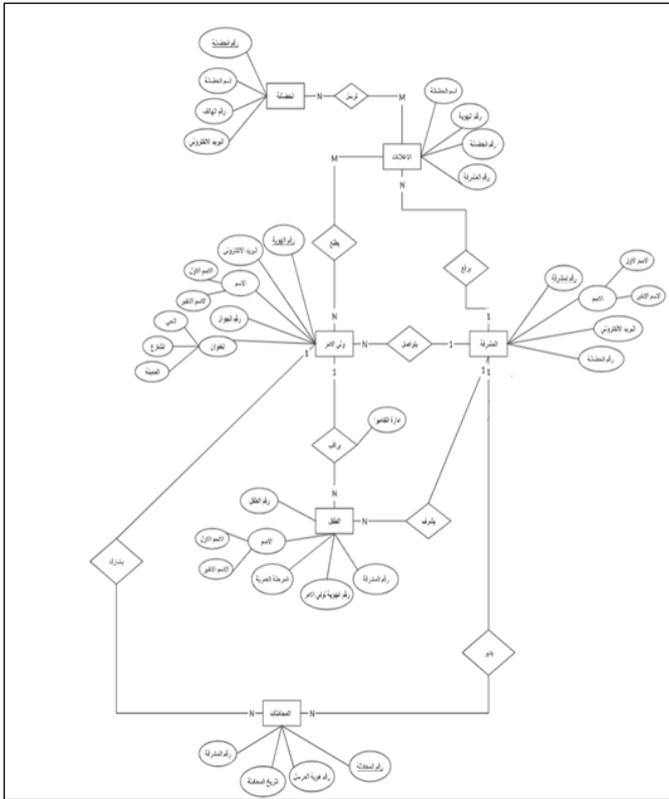


Figure 5: the Entity Relationship (ER) diagram.

1. Database Testing and Construction

The database testing is vital for errors detection, these errors may affect the consistency, security, performance, and reliability of the system, also it is crucial for validating system against the requirements specified by the user [106, 107]. SQL was used for database implementation. The tables below are examples of the created tables.

Table 1: Child table

Column Name	Data Type	Allow Nulls
Child_Number	int	<input type="checkbox"/>
Child_FName	nvarchar(20)	<input checked="" type="checkbox"/>
Child_LName	nvarchar(20)	<input checked="" type="checkbox"/>
Age_Level	nvarchar(20)	<input checked="" type="checkbox"/>
Guardian_ID	int	<input checked="" type="checkbox"/>
Supervisor_ID	int	<input checked="" type="checkbox"/>

Table 2: Supervisor table

Column Name	Data Type	Allow Nulls
Supervisor_ID	int	<input type="checkbox"/>
Supervisor_FName	nvarchar(20)	<input checked="" type="checkbox"/>
Supervisor_LName	nvarchar(20)	<input checked="" type="checkbox"/>
Gender	nvarchar(10)	<input type="checkbox"/>
Nursery_ID	int	<input checked="" type="checkbox"/>
SPassword	nvarchar(10)	<input checked="" type="checkbox"/>

Table 3: Guardian table

Column Name	Data Type	Allow Nulls
Guardian_ID	int	<input type="checkbox"/>
Guardian_FName	nvarchar(20)	<input checked="" type="checkbox"/>
Guardian_LName	nvarchar(20)	<input checked="" type="checkbox"/>
Email	nvarchar(50)	<input checked="" type="checkbox"/>
Mobile	nvarchar(15)	<input checked="" type="checkbox"/>
City	nvarchar(30)	<input checked="" type="checkbox"/>
Street	nvarchar(30)	<input checked="" type="checkbox"/>
District	nvarchar(30)	<input checked="" type="checkbox"/>
GPassword	nvarchar(30)	<input checked="" type="checkbox"/>

2. Interface Design

This section demonstrates the artifacts of the proposed work and the implementation step that comes after the system analysis and design. The system analysis and results of configuration are presented. The ASP.NET and HTML were used based on their features which make them suitable for this work. The following figures are examples of designed and implemented interfaces.



Figure 6: the main interface for the proposed application.



Figure 7: Log in interface



Figure 8: Supervisor interface

#### IV. RESULTS AND DISCUSSION

This step highlights the proposed system's usability. the system is evaluated while user satisfaction is guaranteed during this stage. The proposed system was tested by running it on Internet Explorer and Mozilla Firefox using the localhost server. Also for evaluating thee system, 20 students from the College of Applied Studies and Community Service at Imam Abdulrahman Bin Faisal University (IAU) were requested to use the prototype. The students were first briefed on the user's interface and the prototype's usage. After that, the students tested the system and answered the survey questionnaire consisting of 10 items formulated to gauge the level of user satisfaction. The proposed system's usability was also determined. The result, as well as the level of

usability of the system according to the feedback provided by 20 students, can be stated in figure 10. As can be seen in figure 10, a high percentage of the users agrees that the proposed system is useful, practical and fulfill the project's main objective.

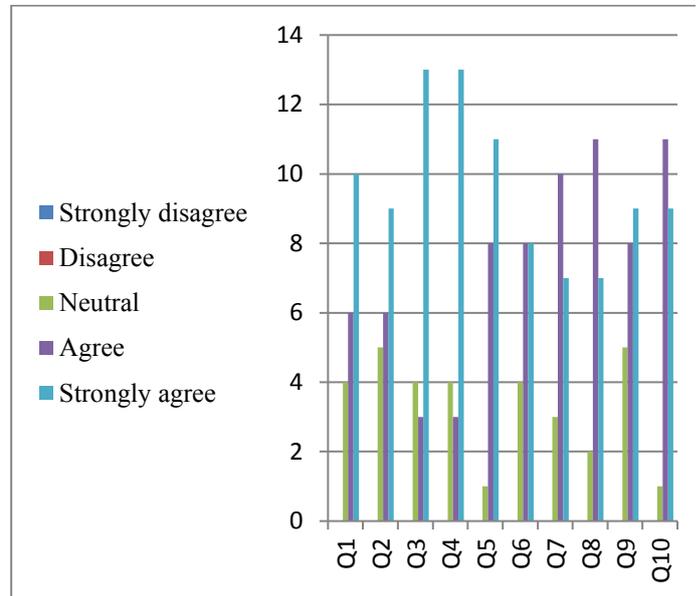


Figure 10: collected data results from the 20 students.

#### V. CONCLUSION

This paper presented a Smart Nursery application for busy parents so that they can ensure the safety and proper care for their babies. This system can show the baby's motion, position and sound through live web-cam camera which is provided by the proposed smart application so that the parents or another responsible person can monitor the baby while away from him or her. This proposed smart application can provide a convenient and easy way for busy parents to take care of their babies. The proposed system was analyze, design and developed using the Unified Modeling Language (UML), ASP.NET and HTML.

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