Design of an Intelligent Agent for the reproduction of official documents using an Intelligent Artificial Clerk (G.A.I)

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ABSTRACT: *In this article we will propose the "Intelligent Artificial Clerk" which is an Intelligent Agent designed to assist users, editors, facilitators of interactive meetings and rapporteurs in general, and in particular the clerks of the High Court of Kananga in order to save them from heavy tasks related to the reproduction of official documents, in particular minutes during hearings and public hearings. Apart from this task, this intelligent agent will also allow the court to be seized remotely and will transmit interviews and trials in audio format via Mp3 files.*

KEYWORDS: design, agent, intelligent, reproduction, document, official, clerk, artificial.

INTRODUCTION

In many courts, drafting minutes is a tedious and time-consuming task for clerks, who must take detailed notes during hearings and then transcribe them accurately and exhaustively. However, the advent of Artificial Intelligence technologies offers new possibilities to automate this task and make the process of drafting minutes more efficient. An Intelligent Artificial Clerk (IAC) can be developed to assist clerks in taking notes during hearings, using speech recognition and natural language processing techniques to automatically transcribe the words of the various stakeholders. The objective of this modeling and implementation project is to create an intelligent agent called: "intelligent artificial clerk.

This artificial clerk will be able to understand and transcribe, in our next research, the different local languages used during hearings, in addition to French. It can also be equipped with advanced features such as emotion detection and automatic generation of hearing summaries.The implementation of an intelligent artificial clerk has many advantages. First of all, it will speed up the process of drafting minutes, by reducing the time needed to transcribe audio recordings of hearings. In addition, it will help improve the accuracy and reliability of minutes, by avoiding human transcription errors. This ambitious project also aims to improve the efficiency and accuracy of the process of reproducing official documents, thus contributing to a more efficient and equitable administration.

SIMILAR WORK

1. "Realization of a conscious intelligent tutor agent" (Mohamed Gaha: 2008) at the University of Quebec in Montreal for a Master's degree in Computer Science, he estimated that to improve the performance of intelligent transportation systems that represent a combination of information and advanced communication technologies, many material and immaterial investments have been made. However, Intelligent Transportation Systems, ITS for short, remain complex and their implementation expensive.

2. "Development of an architecture of a conscious agent for an intelligent tutorial system" at the University of Quebec. (Patrick Hohmeyer: 2006)
   According to this author, for at least thirty years, computers have been used in the field of education. The first systems were refined by the integration of artificial intelligence techniques, thus giving rise to intelligent transportation systems, ITS for short. ITS are autonomous and intelligent agents that must consider a significant amount of information in order to better follow the reasoning of a learner and help him in his learning process.

3. "Contribution to the ergonomics of design of human-machine graphical interfaces in industrial processes: Application to the SYNOP expert system." in Engineering Sciences. (Christophe Kolski: 2018)
   This thesis concerns the development and validation of the SYNOP expert system for the ergonomic evaluation and improvement of graphical views used in industrial process control rooms. SYNOP uses a first-order inference engine and the notions of frame and semantic network for knowledge representation.

RESEARCH METHODOLOGY

To carry out our study, we used the following methods:

- ➤ **Comparative method**: Compare different contexts or situations and finally analyze the differences and similarities;
- ➤ **Descriptive method**: This method consists of mapping the data on a specific aspect. It is often quantitative and is based on previous studies;
- ➤ **Field research**: which allowed us to observe the data directly in the field in order to understand the real practices and challenges encountered in a heterogeneous environment.
- ➤ **The unified process**: software development methods. It is characterized by an iterative and incremental approach

INFORMATION SYSTEM MODELING

In the design of an information system, data modeling is the analysis and design of the information contained in the system.

Data modeling is an abstract representation, in the sense that the values of the individual data observed are ignored in favor of the structure, relationships, names and formats of the relevant data, even if a list of valid values is often recorded. (Pascal Roques: 2007).

Thanks to the model, it is possible to simply represent a problem, a concept and simulate it. Modeling has three components, namely (i) analysis, i.e. the study of the problem, (ii) design, i.e. the development of a solution to the problem, (iii) the model thus constitutes a possible representation of the system according to a given point of view. (Jean-François Pillou: 2006).

Modeling an information system involves choosing the software development model but also the software engineering workshop.

In this model, the steps selected are the expression of needs, implementation and coding.

In addition, the Visual paradigm for UML software engineering workshop was used as a modeling tool, particularly for the representation of UML diagrams.

Modeling an information system also relies on the method or language to follow. Thus, the UML (Unified Modeling Language) language was chosen for this study.

Model Diagram
This model is an extension of the waterfall model also known as the four-level model, is a concept used in various development processes, such as software development.The V model provides supporting quality management methods and describes how these distinct stages can interact with each other, in addition to the project development phases. It gets its name from the shape of its body, which resembles the letter V.
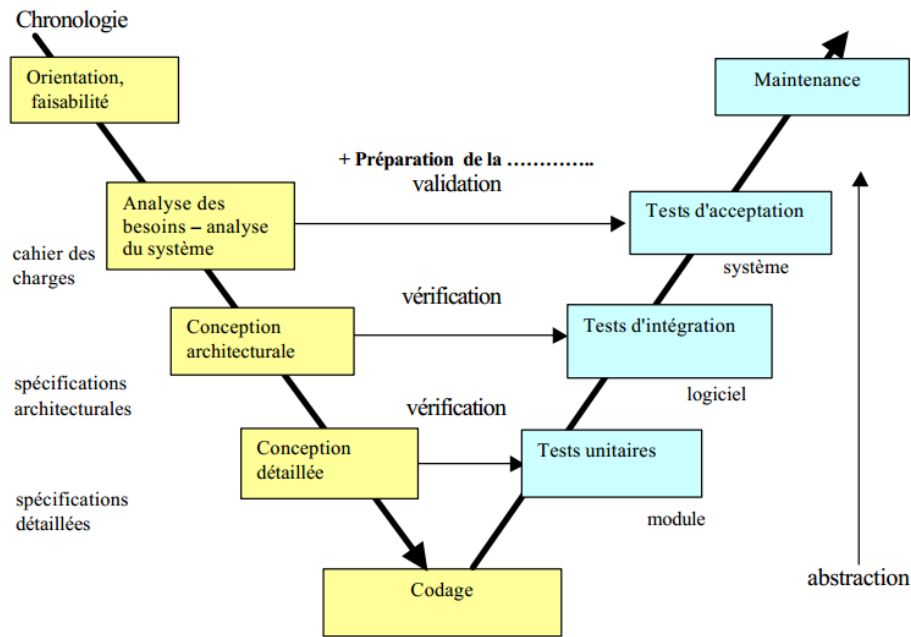
Figure No. 1. V-Model Diagram

Phases of V-Model:

a) Verification Phase:

- Requirements Analysis: The initial step of the verification phase is to understand the customer expectations from our products by communicating extensively with the customers.
- System Design: After identifying the customer requirements and expectations from our products, the detailed design system has to be developed for product development.
- Architectural Design: The system design is separated into different modules based on their functionalities. The data transfer between the internal modules and other systems is acknowledged.
- Module Design: The designs are then separated into smaller and more detailed modules.

b) Validation Phases:

- Unit Testing Unit testing eliminates bugs at the code or unit level.
- Integration Testing: Integration testing validates the internal communication between the modules of the system.
- System Testing: System testing examines the functional and non-functional requirements of the developed application.

- User Acceptance Testing (UAT): UAT validates the usability of the developed system in the real world.

Note: V-model phase should be used in the following circumstances.

1. When the requirements and objectives are explicit and unambiguous.
2. When the technical conditions such as technical resources and technical experts are available at hand.
3. When the failures of the developed system are acceptable.
4. So, to develop our Intelligent Agent which is the ''Intelligent Artificial Clerk'' we have used the V-model.

METHODOLOGICAL APPROACH WITH THE UML LANGUAGE
The Unified Modeling Language (UML) is a graphical modeling language based on pictograms designed as a standardized visualization method in the fields of software development and object-oriented design. (Laurent Audibert: 2009)

UML allows the structure and behavior of a system to be modeled clearly and precisely, independently of any method or programming language. The creators of UML particularly insist on the fact that UML is a modeling language and not a method.

UML allows potential errors in application structures, system behavior, and other operational processes to be highlighted. (Jim Conallen, : 2000, 288 p.)

Database Modeling

IV.3.1.1. data models: identification of actors

N°	ACTORS	USE CASES
01	Clerk	- Authenticate - Receive the file
02	Plaintiff/Accused	- Authenticate - Complain/Justify
03	Judge	- Authenticate - Deliver justice
04	Bailiff	- Authenticate - Direct the file - Report the accused

Table n°1: identification of actors

IDENTIFICATION OF USE CASES

As part of our work, we have selected four use cases in relation to the stakeholders in this process. These are:

a) Use cases for the clerk;
b) Use cases for the complainant and/or the accused;
c) Use cases for the Judge and
d) Use cases for the Bailiff.
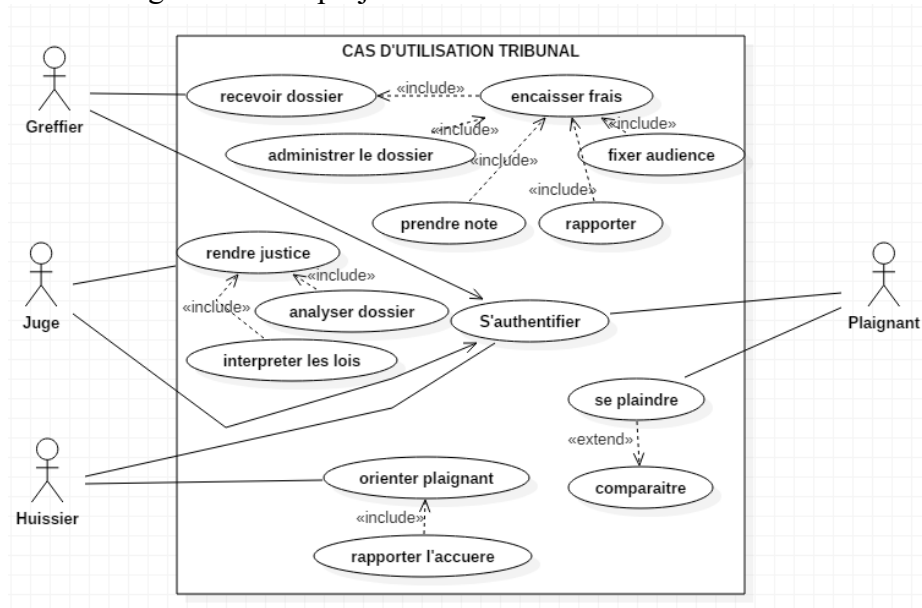
Here is the use case diagram for our project

Figure No. 2: the use case diagram

❖ Textual presentation of the use cases

The artificial intelligent clerk is an intelligent agent that we create to overcome the difficulties listed in the exercise of a clerk at the high court of Kananga.

To do this, the clerk turns on his computer and starts the Artificial Intelligent Clerk then he identifies himself and triggers the process; the Judge identifies himself followed by the parties to the trial (plaintiff and/or accused) and they start speaking.

During the trial, the clerk saves the minutes that will be displayed by the system in text format resulting from the conversion of the previously recorded audio and he also has the possibility of printing these minutes and submitting them for signature to the persons concerned.

❖ Graphical presentation

To be more concrete, our project uses four sequence diagrams which are presented as follows:
- the plaintiff/accused sequence diagram;
- the clerk sequence diagram;
- the Judge sequence diagram;
- the Bailiff sequence diagram.

Plaintiff sequence diagram
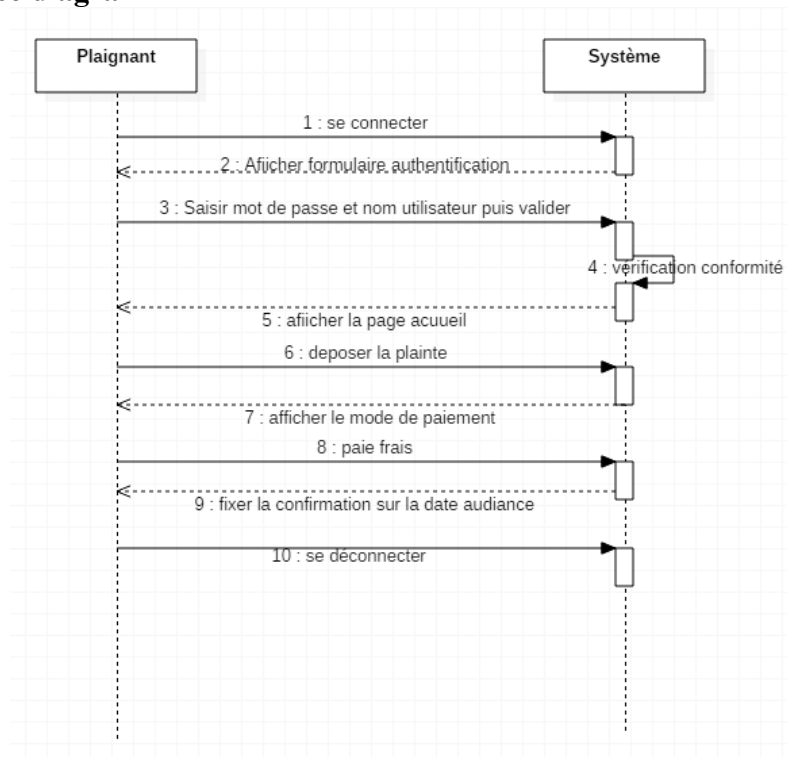
Figure 3: The sequence diagram: Complainant/Accused

Clerk sequence diagram
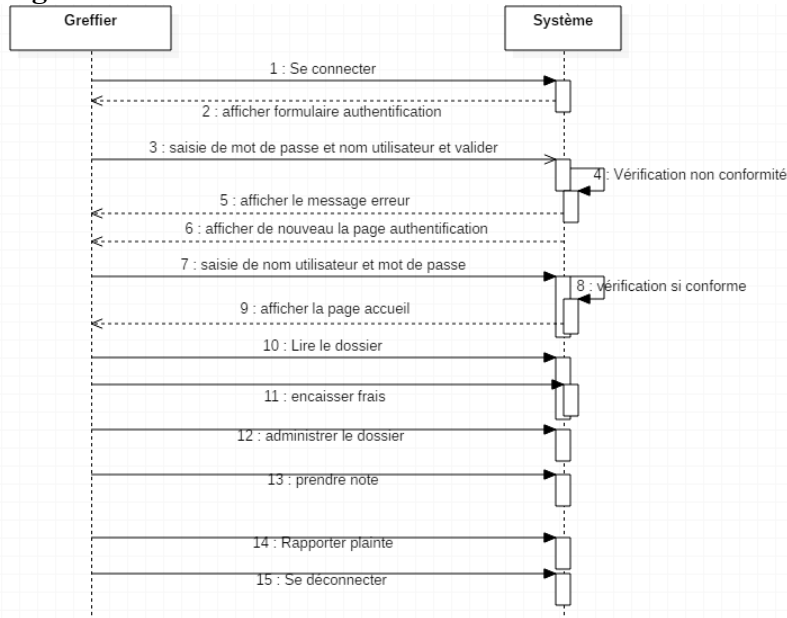
Figure 4: Sequence diagram: Clerk
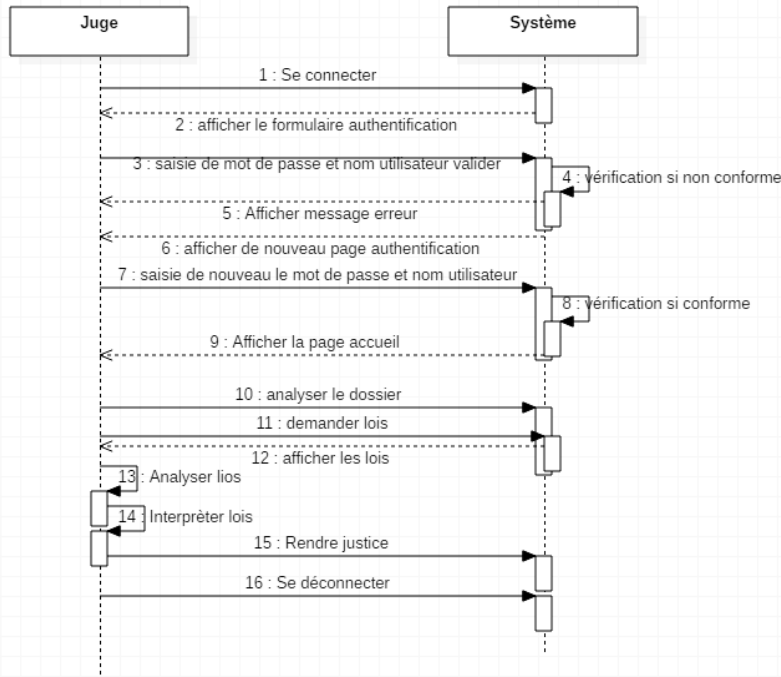
Judge sequence diagram

Figure No. 5: the sequence diagram: Judge
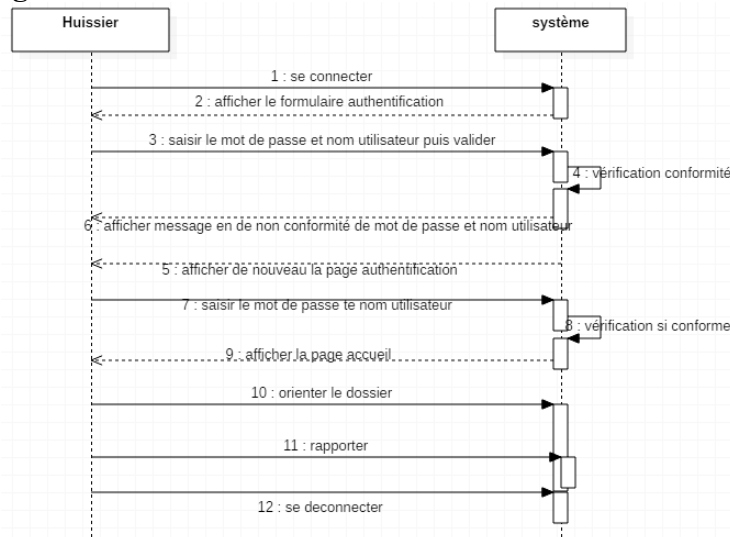
Bailiff sequence diagram

Figure 6: the sequence diagram: Bailiff

Class diagram

The class diagram is a diagram used in software engineering to present the classes and interfaces of systems as well as their relationships. This diagram is part of the static part of UML, not being interested in temporal and dynamic aspects.

A class describes the responsibilities, behavior and type of a set of objects. The elements of this set are the instances of the class.

Classes can be linked thanks to the inheritance mechanism which allows to highlight kinship relationships. Other relationships are possible between classes, represented by a specific arc in the class diagram.

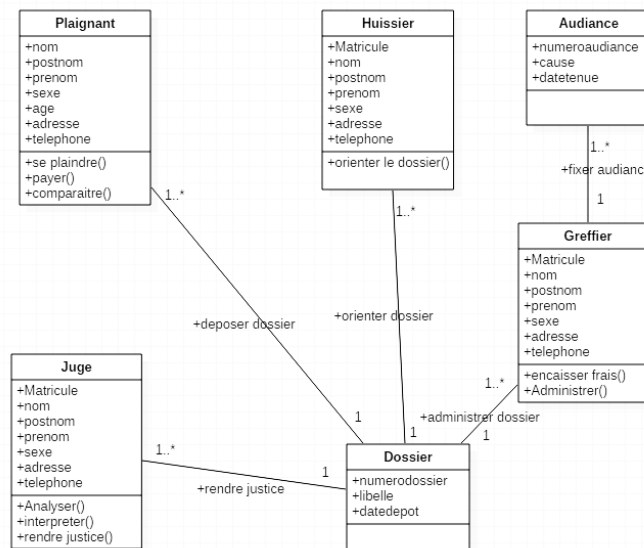Thus, as far as our research is concerned, here is how our class diagram looks.

Figure n°7 : the class diagram

Deployment Diagram

The Unified Modeling Language (UML) is the standard language that many software engineers and companies use to get an overview of complex systems. A deployment diagram is one of the types of diagrams created with this language.

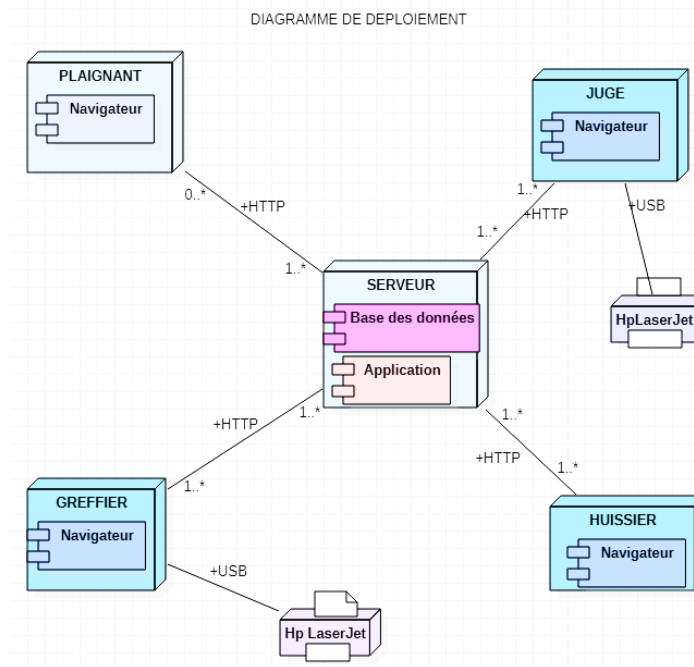So the deployment diagram of our system looks like this:

Figure No. 8: the deployment diagram

VAPPLICATION OF THE ARTIFICIAL CLERK

To set up the Intelligent Artificial Clerk (G.I.A) we used computer design methods in order to make a brief analysis of the existing system and realize the importance of providing the Kananga High Court with this technological support.

Indeed, in this point we will talk about the cloud, demonstrate the programming languages used, the database management system, the interfaces of our software with explanations on its operation and the source codes of the algorithms used which constitute the bulk of our application hosted on the cloud. (Nicolas Duminil: 2019 p280)

Intelligent Artificial Clerk Algorithm and its Explanation

Algorithm in Pascal for an Intelligent Artificial Clerk.

```
Program GreffierArtificielIntelligent;
uses crt;
type
   Document = record
      title: string;
      content: string;
```

```pascal
  end;
var
  doc: Document;
// Fonction pour initialiser un document
procedure InitializeDocument(var d: Document; t: string; c: string);
begin
  d.title := t;
  d.content := c;
end;
// Fonction pour valider le contenu du document
function ValidateContent(c: string): boolean;
begin
  // Cette fonction devrait inclure la validation réelle du contenu
  // Pour simplifier, supposons que tout le contenu est valide ici
  ValidateContent := true;
end;
// Procédure pour formater le document
procedure FormatDocument(var d: Document);
begin
  // Ajouter une ligne de séparation pour formater le titre
  d.content := '--- ' + d.title + ' ---' + #10 + d.content;
end;
// Procédure pour générer un document final
procedure GenerateDocument(d: Document);
begin
  if ValidateContent(d.content) then
  begin
    FormatDocument(d);
    // Affichage du document généré
    writeln('Document généré :');
    writeln(d.content);
  end
  else
    writeln('Le contenu du document est invalide.');
end;
begin
  clrscr;
  // Initialisation des données du document
  InitializeDocument(doc, 'Exemple de Document', 'Ceci est le contenu du document officiel.');
  // Génération du document
  GenerateDocument(doc);
  readln;
end.
```

Explanation of the algorithm

1. Declaration of types and variables: `Document`: A record to store the document information, including the title and content.

2. Procedure `InitializeDocument`: Initializes a document with a given title and content.
3. Function `ValidateContent`: Checks the validity of the document content. In this simplified example, it always returns `true`. You can add specific checks according to the requirements.
4. Procedure `FormatDocument`: Formats the document content, for example, by adding a separator line at the beginning for the title.
5. Procedure `GenerateDocument`: Validates and formats the document before displaying it.
6. Main program:
   - Initializes the document with sample data.
   - Generates the document by calling the procedure `GenerateDocument`.

Programming Language Used

Website design programming languages are the languages used to create and manage the content, appearance and operation of a website. (Camille Paloque-Begrès: 2009)
The main web programming languages are:
➢ HTML and CSS: languages for structuring and visually presenting web pages
➢ JavaScript: client-side coding language that allows you to add interactivity and dynamics to web pages
➢ JQUERY is a free, open-source and multiplatform JavaScript library. Compatible with all web browsers (Internet Explorer, Safari, Chrome, Firefox, etc.), it was designed and developed in 2006 to facilitate scripting. It is the best-known and most widely used JavaScript framework. It allows you to act on HTML, CSS, JavaScript and AJAX codes and is mainly executed on the client side.
➢ PHP and MySQL: server-side programming and database management languages that allow information to be stored and manipulated

Website Creation

The interface for creating our web application remains "GoDaddy", which is a technology giant and offers just about everything, from selling domains and hosting to offering website creation software and marketing services. GoDaddy is the largest web services platform in the world, with millions of customers.
We offer you some steps to follow to create a website using GoDaddy's services easily and quickly. You will need to follow these 7 steps:
• Step 1: Create an account to get started
• Step 2: Choose the category of your website
• Step 3: Choose a name for your website
• Step 4: Start editing and customizing your site.

• Step 5: Optimize your website for SEO.
• Step 6: Preview and publish your website
• Step 7: Upgrade to connect a custom domain.

Database Creation

To allow the storage of audio files before their conversion, we thought it was good to create a database using MySQL combined with WordPress as a database management system, this database that supports these specific files.

Interfaces

General Menu
The general menu of the Intelligent Artificial Registrar (IAG) has a background composed of three images including:
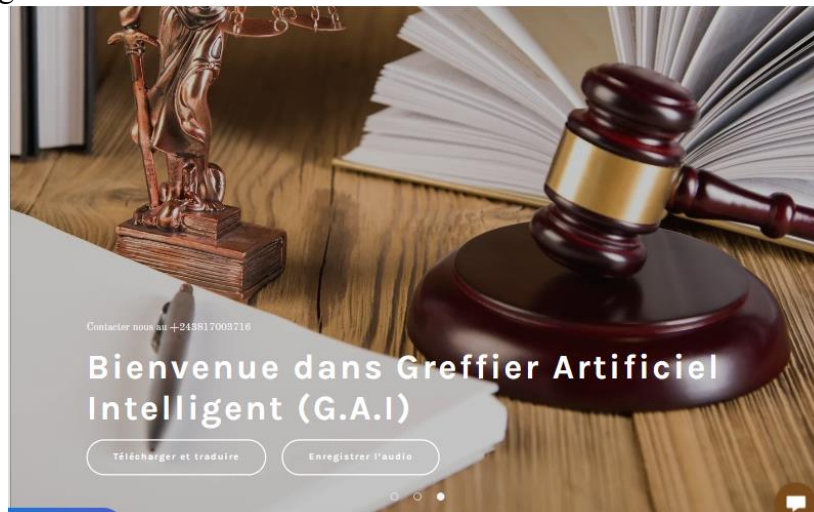
Figure 10: the general menu of our Intelligent Artificial Registrar

Audio Recording
Before the recording starts, the form looks like this:
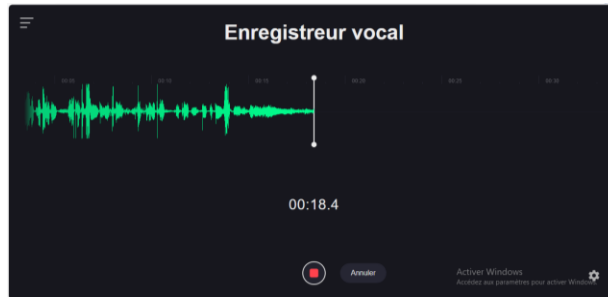
Figure 11: Audio recording forms
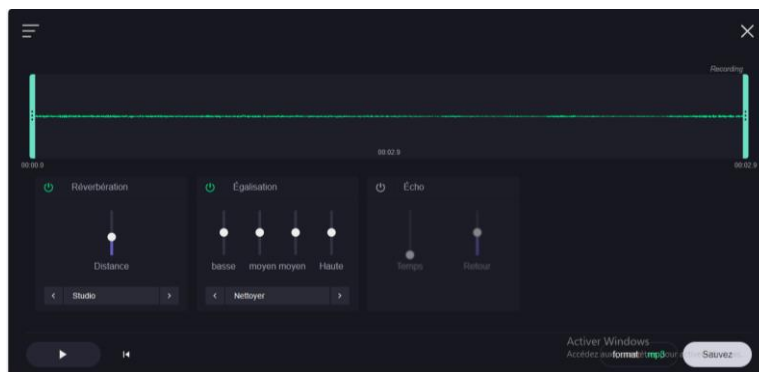
Downloading audio in Mp3 format

Figure 12: Audio upload form

Converting audio to text format

To convert this audio to text we start by importing the recorded audio by specifying its path as shown in this image:

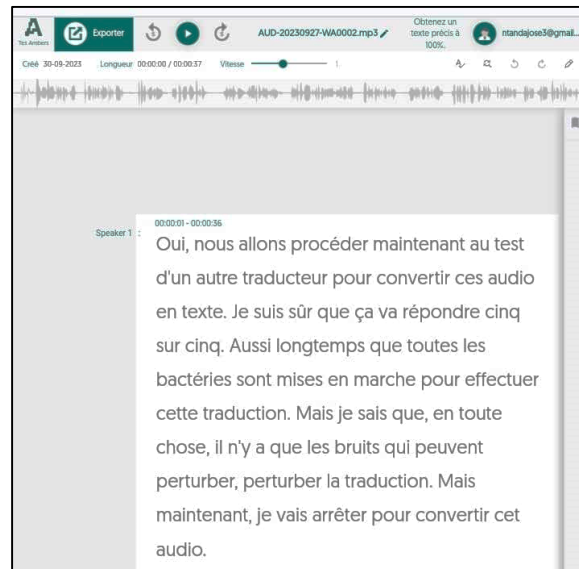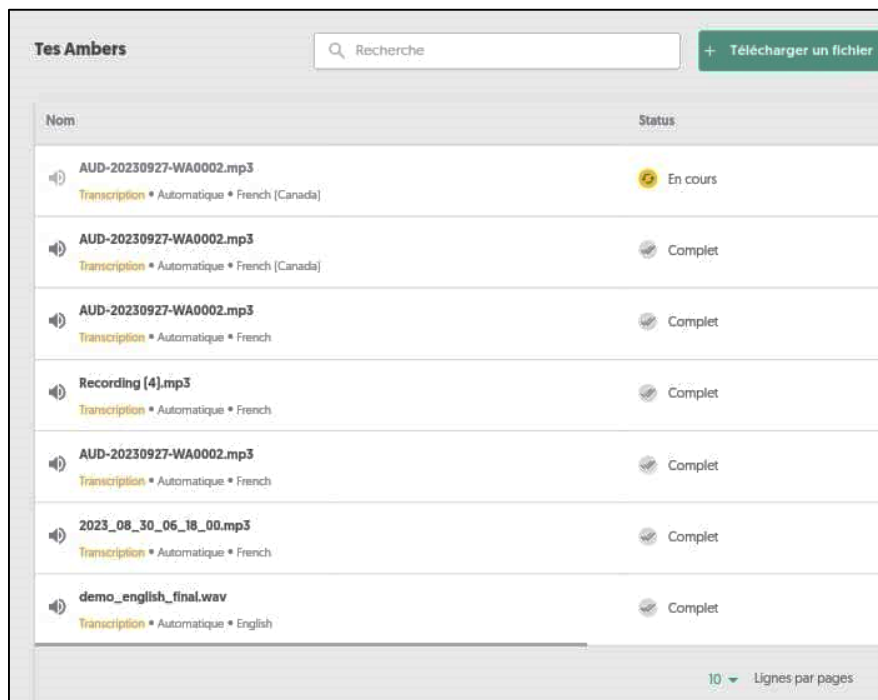Then the conversion is done without this interface:

Figure 12: Audio to Text Conversion Form

MySQL database containing audio recordings

Figure 12: the mysql database

CONCLUSION

The design of an Intelligent Agent for the reproduction of official documents, via an Intelligent Artificial Clerk, marks a significant advance in document management and the automation of administrative processes. By combining advanced artificial intelligence technologies with a deep understanding of legal and administrative requirements, this agent offers an innovative solution to improve efficiency and accuracy in the creation and management of official documents.

The implementation of this Intelligent Artificial Clerk not only accelerates the process of producing minutes, but also ensures strict compliance with legal standards and required formats.

By minimizing human errors and facilitating more consistent document management, this technology paves the way for better resource management and reduced operational costs.

However, it is crucial to continue monitoring and refining this technology in order to meet changing regulatory and administrative needs. Challenges related to data security, privacy protection and integration with existing systems will need to be proactively addressed to ensure the long-term success of this solution.

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