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Design and Construction of a Virtual Assistant to Grant the Location of the Dependencies of the Universidad Técnica de Cotopaxi Extensión La Maná

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Abstract: This article details the development and implementation of a virtual assistant designed to quickly locate the different dependencies within the Universidad Técnica de Cotopaxi Extensión La Maná campus. Python, a high-level programming language most commonly used in artificial intelligence, also allows the creation of desktop applications, the web and more. The development and implementation of a virtual assistant to grant locations of the institution's dependencies through the design of the interactive graphical interface, which includes windows and menus, designed to provide accurate information to users about the different locations of the institution, such as those of Block A and B. The agile Scrum methodology, along with the other team roles for management in software development, sprints to iterate implementations, and implementation testing, The survey result indicates a better browsing experience for new students, visitors and administrative staff.

Key Phrases: *Virtual assistant, localisation, python, scrum methodology.*

1. Introduction

In the digital era, educational institutions are destined to implement new technologies, improving the experience of users, students and academic staff. The Technical University of Cotopaxi (UTC), in the country's central region, has been a permanent training space for political leaders. Being an authority, teacher, employee or student at this institution presents opportunities to be trained as a public reference [1].

The Technical University of Cotopaxi, La Maná Extension, located in the canton of La Maná, has two buildings for all careers; each building is called "Block A" and "Block B", designated for administrative staff, classrooms, laboratories, recreation areas, etc. The challenge of improving the location of its dependencies of the institution is of utmost importance, allowing improvement due to its size and the difference in location of each block; it can be confusing to get to any specific area, a technological tool that allows recognising the dependencies of the university, benefiting all users who need this information.

The implementation of a virtual assistant, an innovative solution, provides a tool that shows interface buttons for navigation between sections of the application, displaying images and videos of the university's different departments. The development of software using the Python programming language, the packaging of the application to be used on mobile devices, the agile software development methodology Scrum in project management, and research methodologies with a mixed approach, field, deductive, documentary, and technological. It allows us to learn about suitable tools, collect information from the site, and review manuals on the technologies used to implement software that improves the user experience.

The Technical University of Cotopaxi, Extension La Maná, founded in 2002, has been recognised for its prestige throughout history. It offers several undergraduate careers in business Administration, Accounting and Auditing, Electromechanics, Information Systems, Agribusiness, Agronomy, and Tourism in different modalities distributed in the two blocks.

Due to the extension of the campus, the location of the institution's facilities may be difficult to find. The different floors prevent new students and users visiting the university from having difficulties finding the intended area of the campus. Getting information in a specific place to reach the location would be an ideal and optimal way for the user to achieve their goal.

The Technical University of Cotopaxi, Extension La Maná, has two blocks in different locations but close to each other. Block A includes areas such as a library, language centre, medical department, etc. It is the best-known and most visited place by students, teachers, and others. The careers that use this block are Systems, Accounting, and Administration. These and other careers use the laboratories, as do the students who take English on the top floor.

Block B contains electromechanics laboratories, systems career

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management, electromechanics, recreational areas, etc. This block is most commonly used in electromechanics, agronomy, and agroindustry careers. New visitors should know all this information this information.

Focusing on the information for each area and location in one place improves the experience and saves time in finding it. Software development enables information systems and technologies for innovation and process optimisation. Software plays an essential role in the daily lives of people and organisations, being a key element in everyday devices and advanced systems that allow the operation of different entities. Society's dependence on software is fundamental to organisational success [2].

Provide a better experience in locating the various departments of the institution with software, such as the use of virtual assistant; integration into the University's website facilitates access to information, compatibility and adaptive design allows to be included, facilitating the availability of online information.

2. Literature review

The UBOT virtual assistant, developed by Rubio et al. [3], has been implemented at Universidad Bernardo O'Higgins to integrate into virtual learning environments, allowing students and teachers to access up-to-date administrative and procedural information. Preliminary results indicate that UBOT improves interaction and communication in these environments. A study conducted at a Peruvian university evaluated the implementation of a virtual assistant for undergraduate students. It was assessed using a quantitative approach and a validating questionnaire; it was found that the assistant improved interaction and access to information. This is evidence of its positive impact on the educational environment [4].

Another study conducted by Garibay [4] discusses designing and implementing a virtual assistant that offers attention to Club Premier customers through third-party applications: Facebook, WhatsApp, and the web. Artificial intelligence uses a provider, Aivo, and develops stages for tasks of each participant's role; this implementation allows for managing consumers' responses and demands.

A virtual assistant is designed to interact autonomously and automatically with users, facilitating communication through natural language processing and machine learning [4].

Implementing a virtual assistant is an innovation that increases and improves the expert experience. Due to its ability to respond as a program, it does not require interaction with people due to. The tools, programming language, and device must be considered when developing a virtual assistant. Programming language is a pre-designed artificial language formed by signs, words and symbols that allows a person (programmer) to write instructions with which it will be possible to communicate with the hardware (computer) to carry out a specific process [...] The instructions followed by the computer for the execution of programs and applications are written in a programming language; then, these are translated into a machine language, which is interpreted and executed by the hardware of the equipment [5Open-source-focusedused application development allows developers to use of programming languages, libra, and software. It also. It will enable you to use code created by other application developers, allowing modular throughndencies.

Python is a high-level and interpreted programming language, which stands out for its simple and accessible syntax, making it an ideal tool for the teaching-learning process of programming. These features encourage its adoption in education and facilitate its use in developing more complex applications, such as those incorporating graphical user interfaces (GUI). Thanks to the wide variety of available libraries, such as Tkinter, PyQt and Kivy, Python allows developers to create applications with intuitive and functional interfaces, thus promoting its versatility in educational and professional projects [6].

The virtual environment is a Python environment that allows code execution. Libraries are isolated from other virtual environments; they do not share a connection because they are only used for a single application. The virtual environment contains executables and configuration files that are very important for its use.
Libraries are files containing code of a specific programming language used for software development. Usually, managers are used to install libraries, among the best known: PNPM and NPM in nodeJS; Python has PIP as a package manager that allows the management of external libraries. Framework, also known as a framework, is a set of predefined and interconnected software structures and components that serve as a basis for the organisation and development of general-purpose systems [7].

Desktop application is software that can be installed on a computer running on a computer. To develop a desktop application, programming languages and frameworks that facilitate this process use tools that bring the framework. One of the best-known software developers is Flutter, an SDK (Software Development Kit) for cross-platform mobile application development; with the same source code, you can create Android, iOS, Desktop (Windows) and Linux apps. These applications are 100% native, not hybrid or pseudo-native, but apps compiled directly for the device processor [8].

The mobile application is software installed on smartphones with iOS or Android operating systems. Developing an application for these operating systems is essential to use different programming languages for native development. For Android, Java is used, which uses an element called Java Virtual Machine (JVM), which is an extension (through a program) of the actual system in which it works, which allows the execution of the code resulting from a Java program already compiled regardless of the platform on which it is being used [9].

On the other hand, iOS development uses Apple's Swift language, a multi-paradigm, strongly typed, open-source programming language created by Apple to program applications for its operating systems. In recent years, Swift has gradually replaced Objective-C, becoming the native language of iOS, macOS, and all software packages of this technology family. It adds safe programming patterns and features to make programming more straightforward and flexible [9].

Web applications are internet-based software that runs in the client's browser. They consist of internet-based software in which

a population of users, via a browser, make remote requests and wait for a response that may involve a mix of print publishing and software development, marketing and IT and external relations, and art and technology. Tools and technologies such as HTML, CSS, and JavaScript are commonly needed to create web applications; nowadays, other languages can be used to develop web applications by compiling code [10].

3. Methodology

In this article's research, different research methodologies were used to learn about the technologies to be used, the approach to determining and understanding the technical capabilities, user expectations, and the validation of the application by the users themselves. The author Zúñiga et al. [11] mentions that descriptive research is dedicated to describing a phenomenon or situation in detail. It is used to represent events, people, or places accurately; a descriptive study could analyse the demographic characteristics of a population.

This type of research has several characteristics, including a detailed description that presents the characteristics, properties, and details of the phenomenon studied. It can answer the questions of who, what, when, where, and how.

It does not provide causes because it provides a clear picture of the object of study. To collect data directly from the phenomenon, use an observational design. This may include direct observation, surveys, questionnaires, interviews, and document analysis [11].

Applied research focuses on applying scientific knowledge to solve specific problems or improve existing situations. Its main objective is to use research results to develop practical solutions and address specific needs in various fields, such as medicine, engineering, and agriculture [11].

make it possible to establish causal relationships and large-scale behavioural patterns [11].

The Scrum methodology is based on empirical process control theory. Three pillars underpin its entire implementation: transparency, inspection, and adaptation. Scrum requires the Sprint Backlog to be transparent but provides limited guidance. It also does not define how to achieve explicit transparency in the workflow from the Product Backlog to the Sprint Backlog or what happens to the work after it becomes a "Finished" increment [12].

Scrum was selected for its agile approach and flexibility, facilitating iterative and continuous deliveries of value in application development. The ease of adapting to changes in the initial requirements, the feedback on the application and the changes made through recommendations. Scrum facilitates the divide in development in Sprint; managing each stage efficiently, each sprint delivers functionalities of the application, communicates with the team, promotes participation, and exchanges ideas about the project.

The requirements are fundamental to knowing the project's scope; each stage allows planning for the optimisation of resources and tasks of the team, enables the distribution of the functions, and maintains an optimal delivery in each sprint. The Python programming language, chosen for its versatility in implementations with its open-source libraries, ensures the creation of desktop applications with very few lines of code; the creation of windows and menus is implemented using Tkinter.

Tabla 1. Etapas del desarrollo e implementación del asistente virtual.

The qualitative research approach is dedicated to exploring and understanding social or human phenomena from the participants' perspectives. Unlike the quantitative approach, which relies on numerical and statistical measurements, this method focuses on the detailed interpretation of data, usually collected through interviews, observations, and document analysis [11].
The quantitative approach is distinguished by its measurement and numerical data analysis emphasis. This method is characterised by the systematic collection of information that can be quantified, followed by rigorous analysis using statistical techniques. Unlike the qualitative approach, which seeks an in-depth understanding of social phenomena from the participant's perspective, the quantitative approach focuses on obtaining quantitative results that

The activities, resources, and tools used in the development of the project, as shown in Table 1, and the research in manuals for implementing the application functionalities were necessary, as well as understanding the use of the library tools. Visual Studio Code is an IDE that allows writing code in any language; it is one of the most used nowadays by developers worldwide, thanks to the community and support. Visual Studio Code is a lightweight but powerful source code editor that runs on the desktop and is available for Windows, macOS and Linux. This includes native support for JavaScript, TypeScript and Node.js, as well as support for other languages (such as C++, C#, Java, Python, PHP, and Go) and runtimes (such as .NET and Unity) [13].

Jira Software is part of a range of products designed to help teams of all types manage work. Jira was initially intended to be an issue and error manager. However, it has become a powerful work management tool for all kinds of use cases, from requirements management and test cases to agile software development [14]. It helps to manage application development, allows the assignment of roles and tasks to the team delivery times, and visualises workflow and task status.

BeeWare allows you to create applications for multiple platforms, with the advantage of writing a single code for Android, iOS, Linux, macOS, and Windows. Flask is a microframework with a simple structure; its learning curve is low, and it does not use complex structures to handle objects. It has advantages over other frameworks, such as Django, due to its optimisation in simple tasks [15].

Flask provides tools for quickly creating web applications without repeating code. It also allows for the design of a nice interface with usability features that integrate the algorithms, so the end user does not have to be familiar with or know Python but consumes the final application. On the other hand, Flask's advantages in handling MVC were evidenced by its ability to allow more agile development and code reuse [15].

4. Results and discussion

In the development process of the virtual assistant using Python as a programming language and the use of libraries for the implementation of the application and the packaging - compilation of this, the installation on the Android device strategically located for use in the university for the use of users entering the institution.

Fig. 1. Virtual assistant interface - home.

Figure 1 shows the application's graphical user interface, which consists of different buttons: dependencies, map, blocks 1 and 2, extra, as, and credits of the development team. These buttons allow users to select an option from the menu.

Fig. 2. Dependencies section options.

The section buttons display information and indications of the dependencies; a video of the classrooms, each numbered, can be found for the students in Figure 2.

Fig. 3. Video of block b - section blocks.

This section shows videos of the blocks, visualising in a panoramic and zoomed-out image of each of the blocks and the extensive area it occupies, showing all areas of the block, figure 3.

Fig. 4. Videos of recreation sites, laboratories and more - blocks section.

Each career's recreation areas and laboratories provide a place for users to entertain themselves, perform practices, and even park their vehicles (Figure 4).

Fig. 5. Credits to the team in charge of developing and implementing the virtual assistant.

Figure 5 shows the team responsible for developing and implementing the virtual assistant at the Technical University of Cotopaxi, La Maná Extension.

To determine the virtual assistant's use experience and satisfaction in the university's facilities location guide, it is necessary to determine whether the implementation was successful in the base, allowing feedback on user satisfaction. This is achieved by conducting surveys to gather essential information about experience.

A satisfaction survey was conducted on the use of the application; these questions were carefully selected to determine how the user has experienced using the application. Based on the questions asked, graphs have been created for a better interpretation of the data, and these are the following results: the survey was conducted to people who made use of the application; Google Forms was used with a list of carefully selected questions about the experience in the use of the virtual assistant. Using Microsoft Office Excel and the results obtained, pivot tables were used to visualise and create the charts with the information received.

Fig. 6. Results of satisfaction with the use of the application.

The level of satisfaction allows us to know if it has been implemented satisfactorily. The survey data show the results obtained based on user experience: 21% and 66% of the surveyed users are satisfied with the application, which meets the proposed objective. In comparison, 4% perceive it neutrally, 8% are not

happy, and 1% indicate that they are not completely satisfied (Figure 6).

Fig. 7. Results of the application response time.

The response time in the user's interaction with the application should be optimal for displaying what is requested. This allows the user to have a better experience. The results show that 21% are delighted, and 66% are satisfied; the results indicate that 87% of the people show that the application responds quickly to interactions between the different sections (Figure 7).

Fig. 8. Results of the design and graphical interface of the application.

One of the main things the user notices is the interface. An accessible interface improves the application experience. The user should easily recognise the application's options (Figure 8).

Fig. 9. Results on the recommendation for the use of the application.

For users who used the application based on their experience, Figure 9 shows that 1919 users would recommend the application; this is equivalent to 96.53% of the surveyed users. On the other hand, 69 people would not recommend using the application, equivalent to 3.47% of the people. Many users show that the application would be recommended for use in consulting information about the Technical University of Cotopaxi Extension La Maná facilities.

5. Discussion

Through the evaluation of use and the survey conducted with users to determine the level of satisfaction in the implementation of the application, a tool that serves as a virtual assistant to guide users to recognise and orient themselves to the destination of the Technical University of Cotopaxi Extension La Maná. The development of the application has represented a challenge, as well as the search for information for the implementation process. Artificial intelligence is trending as a tool that can be used to manage tasks efficiently; implementing software with artificial intelligence is a big step, depending on the intended result.

This is demonstrated by the author Menacho et al. [16], who researched the use of artificial intelligence for autonomous learning, highlighting that he used the quantitative method through a cross-sectional descriptive design in the research. The population consisted of higher education students, and the sample consisted of 200 participants. The instrument applied was a questionnaire made up of items that evaluated four dimensions: analytical learning, virtual teaching, motivation and satisfaction. The questionnaire was subjected to content validation processes and pilot tests before its application. The conclusions mention that the application, implementation, and use of artificial intelligence (AI) as a tool for autonomous learning in higher education are critical as long as they are used ethically and responsibly.

The educational approach to using artificial intelligence to implement autonomous applications represents a breakthrough as long as necessary. The virtual assistant created does not require artificial intelligence because it uses static data as a source; it does not require computational power beyond displaying the required information on the screen through interaction with the user.

A thesis project by the author Morales [17] mentions the development and implementation of a virtual assistant, indicating that a virtual assistant prototype was developed using the tools and techniques offered by the Dialogflow platform, which allowed the definition of entities, parameters and training sentences according to the context of the project. Taking as a reference the knowledge and experience of companies such as Google, it was possible to research and develop the project that allowed the creation of a virtual agent model, which simulates through an integration channel a real-time conversation with students quickly and accurately, providing them with administrative information about the faculty.

Making use of third-party tools such as those provided by Google, the so-called Dialogflow, makes the development more productive at the time of implementation, considering that you will always have an internet connection, do not exceed the free limit of use so as not to generate a high usage in the request in each request and response. However, the services provided by third parties may suffer abrupt changes, such as an increase in the value of the service or even the discontinuation of the service.

The assistant developed for the university works without cloud services or an internet connection, making it attainable software free of unforeseen events compared with software that uses external services.

All software must consider the support it will receive throughout its life cycle, allowing scalability and availability in the face of changing times. Using third-party services may result in vulnerability and service unavailability.

6. Conclusions

Developing a virtual assistant by using the agile Scrum methodology was optimal for project management, allowing to assign tasks to the work team; meetings to obtain feedback on the implementations performed allowed to make required changes during the development phase of the application. Jira made it possible to maintain and manage the tasks of the development team to achieve the objective; the visualization of Sprints made it possible to know the progress towards completion.

Python allowed to create an application very quickly without writing repetitive code; in addition, it allows to create applications for different platforms by using frameworks that contain different tools that do it for you. The collection of information for the application was essential to feed data to the application, allowing to show this information to users so that they can make use in the location of the dependencies of the Technical University of Cotopaxi Extension La Maná.

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