Náhuat Language Kinect Application for Museum

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***Abstract*—This paper presents a proposal to contribute to promote the dissemination and awaken the interest in the Náhuat Language. We have designed a Náhuat Language Interactive Kinect Application not only to promote the dissemination and awaken the interest of the Náhuat language, but also to promote the dissemination of Pipil Archaeological Sites and Archaeological Artefact. Through this Kinect Application, visitors interact with a main menu using Kinect Sensor, so that users could choose between options a) Náhuat Dialogs in 2D Animation Format, b) Pipil Archaeological Sites and c) Archaeological Artefact. This Náhuat Language Kinect Application will be used in Anthropology Museums in the capital city of El Salvador.**

Keywords—Kinect Sensor, Interaction Technologies, Náhuat Language, Augmented Reality.

I. INTRODUCTION

This paper finds its relevance within the effort that has been made to safeguard the Náhuat Linguistic Heritage in El Salvador, by a small group of Linguistic Researchers such as Doctor Alan Roy King, notable researcher of the Náhuat language, who wrote the book “Timumachtikan!: Curso de lengua náhuat para principiantes adultos” [1]. Another researcher Doctor Werner Hernández has published the dictionary "Nawat Mujmusta" [2], and we can also mention the contribution of Doctor Jorge Lemus who has written the Textbook "Amatxti" and has published a series of Náhuat papers, among these can be mentioned the paper “Un modelo de revitalización lingüística: el caso del náhuat-pipil de El Salvador” [3]. This paper states that there are at least 200 Pipil elders who still speak the Nahuat language. Among other reasons the reduced number of Náhuat speakers can be explained with the following reasons a) the non-existence of official bilingual intercultural education programs, b) the lack of transmission of the language to new generations, c) low sociolinguistic status of Náhuat, d) denial of vernacular culture for the new generations and among other reasons.

According to the research carried out by UNESCO in 2003 [4] “Vitalidad y peligro de desaparición de las lenguas” which was written by a group of experts, the degrees of threat or danger that a language can face are as follow: not in danger (grade 5), vulnerable (4), clearly endangered or threatened (3), seriously endangered or threatened (2), critically ill (1) and extinct (0).

These degrees of threat that a language can face were addressed in the third edition of UNESCO's Atlas of the World's Endangered Languages published in 2010 [5], where it is mentioned that in the case of El Salvador, the Náhuat language is in grade 1, that is, in a critical situation, it is also mentioned that there is a very small number of speakers and most of them elderly.

Among other initiatives to safeguard the Náhuat Linguistic Heritage in El Salvador, it should be mentioned that by Legislative Decree No. 528 in accordance with the date of celebration of the International Mother Language Day proclaimed by the United Nations in 1999, every February 21 since 2017 The National Day of the Náhuat Language is celebrated [6].

Taking the above into account, the relevance of this proposal is based on contributing to promote the dissemination and awaken the interest in the Náhuat Linguistic Heritage using interaction technologies and also motivating people in general and new generations of children and adolescents to learn this endangered language, and also to know more about Archaeological Sites and Archaeological Artefact built by Náhuat speaker of the Pipil Culture in El Salvador.

This paper is organized as follows: First, a state of the art is presented. Then the proposal to contribute to promote the dissemination and interest in the Náhuat language using an Interactive Kinect Application is presented in order to be implemented in Anthropology Museums in the capital city of El Salvador. Then we will address the methodology to be used to determine the incidence of use of the Interaction Technologies and Kinect Sensor in the process of dissemination of the Náhuat language, Pipil Archaeological Sites and Archaeological Artefact in Anthropology Museums. Finally we give some conclusions.

II. NÁHUAT STATE OF THE ART AND KINECT FOR MUSEUM

There are not many known initiatives aimed specifically at the dissemination of endangered languages applied in museum environments where interaction technologies are used, such as virtual reality, augmented reality or Kinect Sensor mainly.

However, there are many proposals for research projects where the aforementioned technologies are used in museum environments, but for other different purposes, a) Evolutionary History, b) Paleontological Environment, c) improvement of user experience in museums, d) collection demonstration of petroglyphs, e) painting promotion in art museums, among others. The most relevant initiatives are listed as follows, emphasis will be placed on initiatives where Kinect Sensor has been used in museum environments:

Novel application of Kinect sensor to support immersive learning within museum for children [7]. This paper presents a system to support learning within museum for children as a novel application of Kinect based human sensing system.

The system measures the physical movement of the learner using a Kinect sensor, and provides a sense of immersion in the paleontological environment by adapting the surroundings according to these movements.

Exploring Whole-Body Interaction and Design for Museums [8]. Museums increasingly use digital technology to enhance exhibition experiences for families, notably in relation to physically mediated installations for young children through natural user interfaces. This paper addresses a pressing need for research to adopt an analytical focus on the body during such digitally mediated interactions using Kinect in order to understand how bodily interaction contributes to meaning making in the museum context.

Interacting with the past: Creating a time perception journey experience using kinect-based breath detection and deterioration and recovery simulation technologies [9]. This project propose an application that allows a museum audience to interact with the past and to appreciate the value of antique objects through multimedia installations. Discussions in this article are based on our experiences in developing the Mao-Kung Cauldron time perception journey multimedia application.

Based Kinect Application to Promote Mixtec Culture [10]. This study presents the development of an application based on Kinect SDK which manipulates 3D models of Archaeological Artifacts from the Museo Regional de Huajuapan (MureH). This manipulation is performed without controls, with only hand movements needed to interact with the application. The process and details of 3D models design highlighting the use of textures to add a more realistic appearance is presented, along with some details and tests about the development of the Kinect-based Application.

III. Proposal to contribute to promote the dissemination and awaken the interest in the Náhuat language using Interaction Technologies and Kinect

In response to the issue of Náhuat as a minority and endangered language in El Salvador, an augmented reality mobile application and two Nahuat-Spanish dictionary android mobile applications have been developed and a Náhuat augmented reality textbook has been written. Those resources were created to be used in elementary public and private schools, where the Náhuat language is taught in rural areas and in the capital city of El Salvador. This entire proposal was conceived to contribute to the safeguarding, dissemination and teaching of the language in question, using augmented reality technology and 2D animations with mobile devices.

Also, a Náhuat Interactive Kinect Application has been developed, aimed at making this software application available in Anthropology Museums of El Salvador. Museum visitors can interact and make use of the developed application, and this way, we could promote the dissemination of this endangered language, promote Archaeological Sites and Archaeological Artefact, and also visitors can learn basic words and phrases in Náhuat language.

A. Náhuat Augmented Reality Textbook

The Náhuat Augmented Reality Textbook that has been designed and developed, has adequate content in structure and format so that it can be used in conjunction with the augmented reality mobile application developed, Figure 1 provides a sample of the content of this textbook, which will be used in intervention activities in elementary level public and private schools in El Salvador.

B. Augmented Reality Mobile Application and related 2D animations

An augmented reality mobile application has been developed, each image of each chapter of the textbook is associated with Augmented Reality content accessible from theaugmented reality mobile application. Figure 1 shows the main screen of the augmented reality mobile application. The augmented reality multimedia content shown on the mobile phone screen is a 2D animation with audio in Náhuat of the dialogue corresponding to the associated image in the textbook.

C. Náhuat-Spanish Dictionary Mobile Application

A Náhuat-Spanish dictionary mobile application has been developed to support the Náhuat Textbook, each Náhuat word that is translate to Spanish has its respective audio to help the user to learn the proper pronunciation of Náhuat vocabulary presented in the augmented reality textbook. This mobile application also has word search options in Náhuat-Spanish and Spanish-Náhuat, as shown in the screenshot of figure1.

D. Nahuat-Spanish Visual Dictionary Mobile Application

A visual dictionary mobile application has also been developed to support the Náhuat Textbook, which has audio and its respective image for different vocabulary categories in Náhuat, figure 1 shows screenshots of the interface of this mobile application.

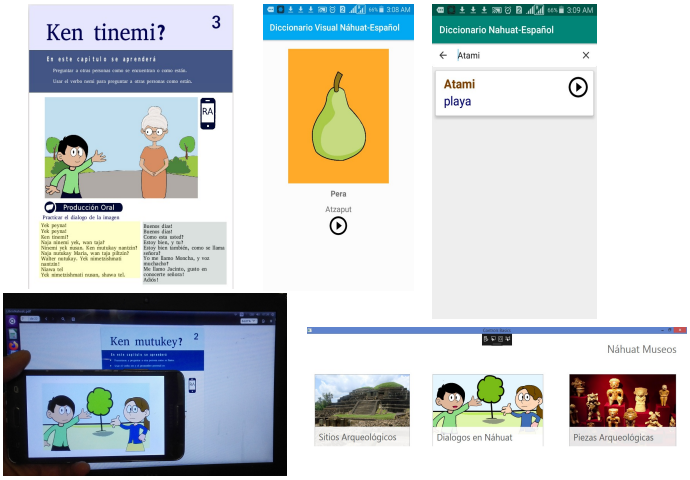

Figure 1. Proposal to contribute to promote the dissemination and awaken the interest in the Náhuat language using Interaction Technologies.

Figures 1 shows all the proposed software for the entire proposal, including android mobile and kinect software application, and the augmented reality textbook to contribute to promote the dissemination and awaken the interest in the Náhuat language using Interaction Technologies.

This article emphasize only the Náhuat Interactive Kinect Application for Museum, and this specific proposal was conceived to contribute to promote the dissemination and awaken the interest in the language in question, using Interaction Technology, Kinect Sensor and 2D animations in Náhuat.

The results obtained from the aforementioned Kinect proposal will be used to verify the benefits and contribution that Emerging Technologies, Interaction Technologies and Kinect Sensor usage could provide in the dissemination of Náhuat Linguistic Heritage process in anthropology museums in El Salvador.

E. Náhuat Interactive Kinect Application for Museum

The Náhuat Interactive Kinect Application developed, has in its main menu the options a) Archaeological Sites, b) Archaeological Artefact and c) Náhuat Dialogues in 2D Cartoon Format. Without using any mouse, touchpad, touchscreen or any peripheral that muss be touched, the user can select any of this options just interacting with the Kinect Sensor and using interaction technologies. Figures 2 and 3 show the aforementioned menu. Figure 2 show the Kinect Sensor and the main menu of the Kinect Application developed. In this window capture, it is even showed the typical Hand Cursor that muss be used by the user when the Kinect Sensor has recognized any hand of the user. With this Hand Cursor the user can interact with this kind of Interaction Technology Applications and select any available option or link.

After been selected, each of the aforementioned links in the main menu window has a submenu where the user can select the interactive object that wants to execute with his option.

Figure 2. Main Windows of Náhuat Interactive Kinect Application

Figure 3. Main Windows of Náhuat Kinect Application

In the case of the Archaeological Sites link, the user can select using the Kinect Sensor the following options: a) Tazumal, b) Cihuatán, b) San Andrés c) Joya de Cerén and d) Casa Blanca, as showed in figure 3. Each of this options opens a window with information of the Archaeological Site selected as shown in figure 5.

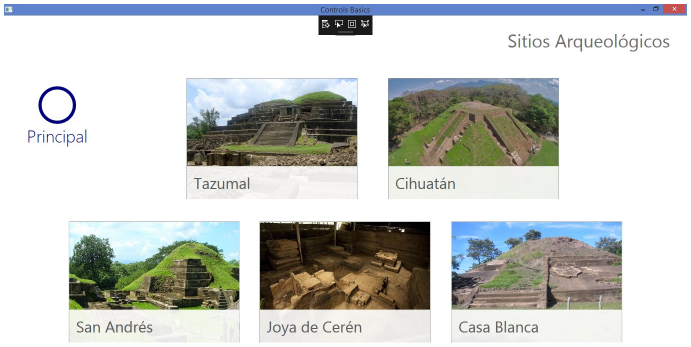

Figure 4. Archaeological Sites of Náhuat Interactive Kinect Applications

This information is oriented so that the user could learn the most relevant details of each archaeological site, historical places where the endangered Náhuat language was spoken.

Figure 5. Archaeological Sites of Nahuat Interactive Kinect Application

It should be mentioned that each window of the Kinect Application developed has links to return to the previous or parent window or even the main windows, links that correspond to its navigation system. From the main window the user can select the link Dialog in Náhuat, in this option the user can select different dialogues in Náhuat in 2D cartoon format as shown in figure 5. Through these short dialogues in Náhuat, it is intended that the user learns basic greetings, phrases of daily use and basic words using interaction technologies during a typical visit to a Museum.

This way we try to contribute to promote the dissemination and awaken the interest in the Náhuat Language, because most people in El Salvador never have heard a conversation in Náhuat language. It is even unknown that some words most people use in everyday life in El Salvador come from Náhuat. For example, a word in everyday language is Chacalin replacing shrimp, this word comes from the Náhuat word Chakalin. Chocolate comes from the Náhuat word Shukulat, and Chuco a type of thick texture drink that is very common in El Salvador, its name comes from the Náhuat word shukuk, and many other words.

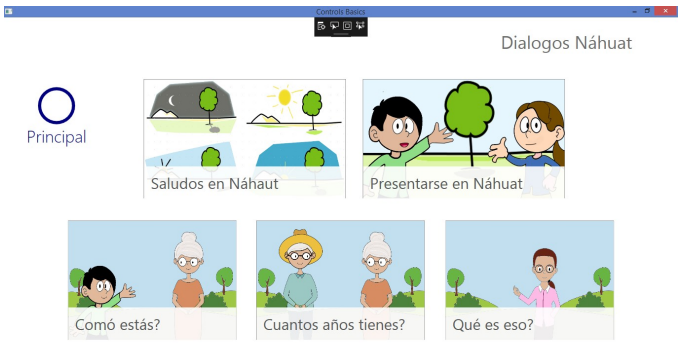

Figure 6. Náhuat Dialogs in 2D Kartoon Animation Format of Kinect Application

From the main window the user can select the link Archaeological Artefact, in this option the user has access to different links that show information about relevant Archaeological Artefacts discovered in different Archaeological Sites in El Salvador, as shown in figure 7 and 8. Hence, people who visit anthropology museums can learn about these Archaeological Artefacts using non-traditional means such as Interaction Technologies and Kinect Sensor.

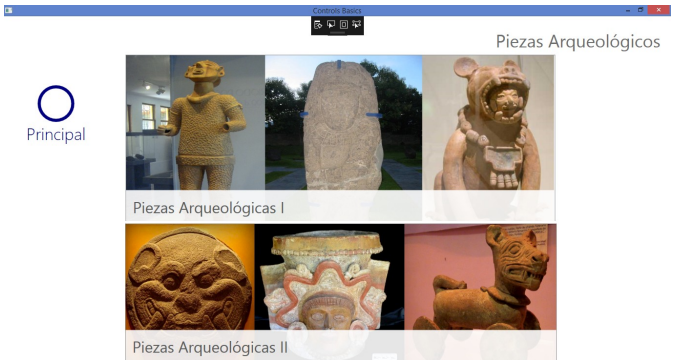

Figure 7. Archaeological Artefact Main Window of Interactive Kinect Application

Figure 8. Archaeological Artifact Window of Interactive Kinect Application

F. Methodology and Intervention in Anthropology Museum

This paper addresses a hybrid research approach, incorporating quantitative and qualitative research methodologies. This methodological proposal is supported by Jaime Rubio [11] and James McMillan [12], corresponding to the combination of research methods. Observation methods and self-administered questionnaires will be used. Observation will be used to evaluate people's reaction when interacting with the developed Kinect Application. This technique will be used to obtain data about the user's impact when accessing information on Archaeological Sites, Archaeological Artifacts and the Náhuat language exhibited using Interaction Technologies and Kinect Sensor. The interest shown by the user, degree of attention and tour sequences in the different links of the software application will also be evaluated. The observation data collection process consisted of randomly choosing the visitors who access the Museum Room to cover a greater variety in the sample, trying to make the maximum possible annotations in the data collection sheets designed for this purpose. The survey or questionnaire self-administered by visitors is a methodology for collecting information that completes the possible gaps or limits in the size of the sample of visitors that are obtained through the observation method.

IV. Conclusions

In this paper, the aim was to present a proposal for the use of Interaction Technologies and Kinect Sensor to promote the dissemination and awaken interest in learning more about the Náhuat Language, Pipil archaeological sites and artifacts. The Kinect Application mentioned above will be used in the Anthropology Museums of the capital city of El Salvador. It has been hypothesized that the use of Interaction Technologies and Sensor Kinect in Museums could promote the dissemination and awaken interest in learning more about the linguistic heritage of the Nahuatl language, Pipil archaeological sites and archaeological artifacts in visitors of anthropology museums of El Salvador, in the aforementioned context.

This hypothesis has not yet been verified at the moment, due to the current COVID-19 health situation, because Anthropology Museums are not yet open at the time of writing this paper. It is expected as soon as possible to be able to carry out the Museum interventions activities proposed, to verify the hypothesis originally formulated, according to the hybrid methodology with a quantitative and qualitative approach proposed, depending on the development of the current situation of the COVID-19 pandemic.

References

[1] *Alan R. King. 2011. Timumachtikan!: Curso de lengua náhuat para principiantes adultos. Retrieved January 15, 2020 from http://tushik.org/timumachtikan/*

[2] *[Werner Hernandez. 2019. Nawat Mujmusta. (1a Edición). Editorial Municipal. Secretaría de Cultura de San Salvador.*

[3] *Lemus, J. 2012. Un modelo de revitalización lingüística: el caso del náhuat/ pipil de El Salvador. Wani. 62, (oct. 2012), 25-47. DOI:https://doi.org/10.5377/wani.v62i0.857*

[4] *Vitalidad y peligro de desaparición de las lenguas. Retrieved February 25, 2020 from https://unesdoc.unesco.org/ark:/48223/pf0000183699_spa*

[5] *Atlas of the world's languages in danger. Retrieved February 25, 2020 from https://unesdoc.unesco.org/ark:/48223/pf0000187026*

[6] *Celebrarán el Día Nacional de la Lengua Náhuat. Retrieved February 26, 2020 from http://www.cultura.gob.sv/secultura-celebro-el-dia-internacional-de-la-lengua-materna/*

[7] *Ryuichi Yoshida., "Novel application of Kinect sensor to support immersive learning within museum for children," 2015 9th International Conference on Sensing Technology (ICST), 2015, pp. 834-837.*

[8] *Sara Price, Mona Sakr, Carey Jewitt, Exploring Whole-Body Interaction and Design for Museums, Interacting with Computers, Volume 28, Issue 5, August 2016, Pages 569–583. DOI: https://doi.org/10.1093/iwc/iwv032*

[9] *Chun-Ko Hsieh, Wen-Ching Liao, Meng-Chieh Yu, and Yi-Ping Hung. 2014. Interacting with the past: Creating a time perception journey experience using kinect-based breath detection and deterioration and recovery simulation technologies. J. Comput. Cult. Herit. 7, 1, Article 1 (February 2014), 15 pages. DOI: https://doi.org/10.1145/2535937*

[10] *Erik Ramos, Moisés Ramírez, Eduardo Nila. 2013. Based Kinect Application to Promote Mixtec Culture, Procedia Technology, Volume 7, 2013, Pages 344-351, DOI: https://doi.org/10.1016/j.protcy.2013.04.043*

[11] *J. Rubio. 2004. El análisis de la realidad en la Intervención Social. Métodos y Técnicas de Investigación.. Editorial CCS.*

[12] *J. H. McMillan. 2007. Investigación Educativa (5a Edición). Editorial Pearson.*