
Development of a Usable and Accessible Conversational Interface for a Mexican University System

Adriana L. Iñiguez-Carrillo

Universidad de Guadalajara
Guadalajara, Mexico
adriana.carrillo@cusur.udg.mx

Laura S. Gaytán-Lugo

Universidad de Colima
Colima, Mexico
laura@uclm.mx

Miguel A García-Ruiz

Algoma University
Algoma, Canada
miguel.garcia@algonau.ca

Rocio Maciel-Arellano

Universidad de Guadalajara
Guadalajara, Mexico
rmaciel@cucea.udg.mx

Abstract

Currently, conversational interfaces are becoming more common due to the convenience of interacting with a device using natural language. This kind of interfaces brings accessibility for users with low technical skills and the integration of users with disabilities (visual or motor). However, it is necessary to identify user experiences challenges from users with visual and motor disabilities in conversational interfaces and which HCI testing methods apply to evaluate them. The aim of the research presented in this paper is to implement a conversational interface in a Mexican university system where the user experiences might be easier, intuitive and efficient. At this time, there is not a system of these characteristics. The proposed interface will bring accessibility and usability advantages to an existing university computer system, which is not currently accessible.

Author Keywords

Conversational interfaces; accessibility; usability; user interface design; user testing

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): User interfaces

Introduction

The most common way for humans to communicate is through conversation[1]. Due to the advances in the accuracy of Automatic Speech Recognition (ASR), Natural Language Processing (NLP), the ubiquity of microphones and power of machine learning algorithms, the use of conversational interfaces are becoming commonplace. These interfaces enable people to interact with devices using conversational spoken language[2]. Hence, in this type of interface, both computers and humans speak natural language, increasing user attention, facilitating the execution of tasks of users with non-technical training and taking advantages that hands and eye free interfaces provide in many situations.

The development of conversational interfaces has focused mainly on native applications like messaging[3][4], social assistance for elderly [5][6], customer services [7][8], e-commerce[9][10], home appliances [11][12], and entertainment[13][14]. However, it is just the tip of the iceberg. More and more developers and users explore the benefits of having a conversational interface, interacting through a fluid conversation and sometimes combining other kinds of interactions such as touch or visual.

In conversational interactions, we assume that technology will be more accessible and usable for everyone. It facilitates the use of devices and services when users are doing activities with their hands (driving, cooking, operating specialty machinery) or when the user has difficulties to manipulate objects or coordinate movements when interacting with a device, especially with blind users and users with motor disabilities. Conversational interfaces could provide better user

experiences offering faster, easier and more pleasant interactions with a system[15].

Mexican University System

The University of Guadalajara is located in the Metropolitan Area of Guadalajara City and in eight regions of the state of Jalisco, Mexico. This university is composed of about 120,000 undergraduate and graduate students. Currently, there are approximately 667 students with some type of disability, which together makes 0.5% of the student population. Architectural projects have been developed to provide accessible facilities that contribute in favor of inclusion and educational equity for people with disabilities[16].



The screenshot shows the 'Sistema Integral de Información y Administración Universitaria' (SIIAU) 'Módulo Escolar' interface. On the left, a navigation menu for 'ALUMNOS' includes 'REGISTRO', 'Agenda', 'Horario', 'Lista', 'Proyección', 'Registro', and 'Registro Vera'. The main content area displays a message: 'AYUDA Si ya tienes cursos registrados, estos aparecen en el listado que se te muestra a continuación.' followed by instructions on how to remove a course. Below this is a table with columns 'BORRAR', 'NRC', 'CVE', 'MATERIA', 'SEC', 'GR', and 'COMENTARIO', and a message 'No tienes cursos registrados'. The 'Forma de registro' section contains another 'AYUDA' message and a table for entering course numbers (NRC) with five columns and two rows. At the bottom are 'Guardar' and 'Limpiar' buttons.

Figure 1: SIIAU system.

The University of Guadalajara's students and professors use a computer system called SIIAU (Integral System of Information and University Administration). In this system, the students can see their academic records, course schedules, and tuition fees, among other types of information[17]. Each student must use the system for registering for courses at the beginning of each semester

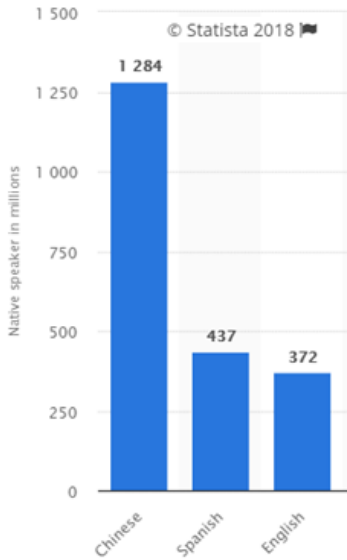


Figure 2: The most spoken languages.

(Figure 1). However, this is an impossible task for students with visual or motor disabilities.

Development of Conversational Interfaces in Spanish

The development of conversational interfaces reported in the literature has mainly focused on conversational platforms developed for English speakers. In addition, few developed conversational interfaces are available in Spanish language (Table 1). This is important because Spanish is the second most spoken language in the world[18] (Figure 2). The development of conversational interfaces in Spanish is currently very relevant.

Assistant	# Languages	English	Spanish
Alexa	3	1	0
Alisa/Alice	1	0	0
Bixby	3	1	0
BlackBerry Assistant	ND	1	1
Braina	1	1	0
Clova	1	0	0
Cortana	13	1	1
Cubic	2	1	0
Emma	1	1	0
Facebook M.	46	1	1
Google Assistant	8	1	1
Hey Athena	1	1	0
Hound	1	1	0
Howdy	1	1	0
Jibo	1	1	0
Lucida (Sirius)	1	1	0
Maluuba	1	1	0

Assistant	# Languages	English	Spanish
Mya	1	1	0
Mycroft	1	1	0
Nina	38	1	1
S Voice	8	1	1
SILVIA	4	1	1
Siri	20	1	1
Ubi	1	1	0
Viv	1	1	0
Vlingo	5	1	1
Voice Mate	ND	1	1

*ND = No data

Table 1: Comparison of languages that current conversational assistant can handle.

Companies such as Amazon have developed APIs (application programming interfaces) where people can develop custom conversational AI assistant, for example api.ai (Dialogflow), Alexa (Amazon), Microsoft (Cortana), Mycroft (Mycroft AI team), Facebook (M), Google (Assistant), Nina (Nuance), SILVIA (Cognitive Code), Siri (Apple) to mention some. However, not all provide Spanish language to support and some are with a cost for service.

Objectives

Our main research and development objective is to implement a usable and accessible conversational interface in Spanish for a Mexican university system.

Specific objectives:

- To define the interface design, the objects, and actions that are part of a Spanish conversational

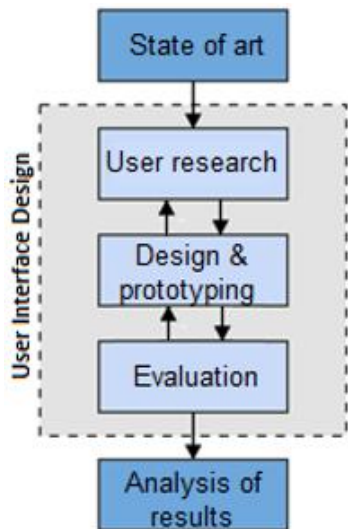


Figure 3. Main phases of the research.

interface for users with visual or motor disability.

- To identify user experiences challenges from users with visual and motor disabilities in conversational interfaces.
- To implement the HCI testing methods suitable for conversational interfaces

Research Questions

Q1 - What are the User Experience challenges for users with visual and motor disabilities in conversational interfaces?

Q2 - What HCI user testing methods can be effectively used to evaluate conversational interfaces?

Methodology

The main phases of this research (figure 3) are:

1. State of art: Write a literature review of primary research studies in relation to development of conversational interfaces for disabled people and in Spanish language, including development platforms, analyzing their features, advantages, and disadvantages.
2. User research: Define context of use, requirements, and characteristics of users with visual or motor disability in conversational interfaces.
3. Design and prototyping: Create a conceptual design, information architecture and workflow modeling.
4. Evaluation: Conduct user usability and user experience testing, following user recommendations and feedback with for

eliminating weak usability results and identify promising areas for improvement.

5. Analysis of results: analysis of qualitative and quantitative results obtained in this research.

Status of Research

Currently, the first author is a doctoral student of Information Technologies at the University of Guadalajara, México. A systematic review of platforms and services for developing conversational interfaces is underway, with the aim of identifying features, advantages, disadvantages, and available programming languages and APIs suitable for developing conversational interfaces. The information obtained in the literature review will define which is the best option for developing a conversational interface for a Mexican university system, which will support its accessibility, due to the actual system is impossible to use by students with visual or motor disabilities. In addition, implementing the conversational interface will also be useful for regular users for hands-free operation.

Context and motivation

Our main motivation is to further research on conversational interfaces for disabled users, in particular, conversational systems in Spanish language. This project will help to increase the use of new way of interaction in a university context and at the same time to help to implement strategies for bringing accessibility to users with disabilities. Therefore, the participation in this symposium would be a great opportunity to obtain valuable feedback and improve our research. Furthermore, we would like to contribute to cross-cultural multidisciplinary projects and research on human-computer interaction.

If the first author is admitted to this symposium program, the first author will take this opportunity to grow as a person as a more experienced academic. Additionally, I shall commit myself to the best of my abilities to ensure that the program grows and contribute to achieving the proposed goals of the symposium by sharing my knowledge and actively participating in related events.

Expected results

Our scientific contribution in this research will be to elaborate a model for developing a usable system that allows interaction with conversational interfaces, specifically for Spanish-speaking users with visual or motor disabilities. In it, we will need to define which HCI testing methods will be applied to evaluate the proposed interface. This will be a fundamental requirement to contribute to the cohesion of the entire user experience architecture in a conversational interface. This model will be applied in a conversational intelligent system at University of Guadalajara, Mexico. However, it could be applied as a baseline to design inclusive, simple and intuitive conversational interfaces, where the communication processes being more natural for disabled users.

REFERENCES

- [1] S. Greibach, *Towards Mobile and Intelligent Interaction Enviroments*. 2010.
- [2] M. McTear, Z. Callejas, and D. Griol, "The conversational interface: Talking to smart devices," *Conversational Interface Talk. to Smart Devices*, no. Dm, pp. 1-422, 2016.
- [3] S. Truschin, M. Schermann, S. Goswami, and H. Krcmar, "Designing interfaces for multiple-goal environments," *ACM Trans. Comput. Interact.*, vol. 21, no. 1, pp. 1-24, 2014.
- [4] M. F. Schober *et al.*, "Precision and disclosure in text and voice interviews on smartphones," *PLoS One*, vol. 10, no. 6, pp. 1-20, 2015.
- [5] L. . Wulf, M. . Garschall, J. . Himmelsbach, and M. . b Tscheligi, "Hands free-Care free: Elderly people taking advantage of speech-only interaction," *Proc. Nord. 2014 8th Nord. Conf. Human-Computer Interact. Fun, Fast, Found.*, pp. 203-206, 2014.
- [6] I. Alvarez, M. K. López-De-Ipiña, and J. E. Gilbert, "The voice user help, a smart vehicle assistant for the elderly," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 7656 LNCS, pp. 314-321, 2012.
- [7] M. McTear, Z. Callejas, and D. Griol, "The conversational interface: Talking to smart devices," *Conversational Interface Talk. to Smart Devices*, pp. 1-422, 2016.
- [8] L. C. Klopfenstein, S. Delpriori, S. Malatini, and A. Bogliolo, "The Rise of Bots," *Proc. 2017 Conf. Des. Interact. Syst. - DIS '17*, pp. 555-565, 2017.
- [9] E. J. Wong, K. M. Yap, J. Alexander, and A. Karnik, "HABOS: Towards a platform of haptic-audio based online shopping for the visually impaired," *ICOS 2015 - 2015 IEEE Conf. Open Syst.*, pp. 62-67, 2016.

- [10] T. A. Coleti, M. Morandini, and F. De Lourdes, "ErgoSV: An Environment to Support Usability Evaluation Using Face and Speech Recognition," no. 1, pp. 554–564, 2014. worldwide. Retrieved December 26, 2017, from <https://www.statista.com/statistics/266808/the-most-spoken-languages-worldwide/>.
- [11] Y. Mittal, P. Toshniwal, S. Sharma, D. Singhal, R. Gupta, and V. K. Mittal, "A voice-controlled multi-functional Smart Home Automation System," *12th IEEE Int. Conf. Electron. Energy, Environ. Commun. Comput. Control (E3-C3), INDICON 2015*, pp. 1–6, 2016.
- [12] A. R. Fayjie and D. J. Lee, "Voice Enabled Smart Drone Control," pp. 119–121, 2017.
- [13] A. Vékony, "Speech and Computer," vol. 9811, pp. 26–40, 2016.
- [14] L. Stifelman, A. Elman, and A. Sullivan, "Designing natural speech interactions for the living room," *CHI '13 Ext. Abstr. Hum. Factors Comput. Syst. - CHI EA '13*, p. 1215, 2013.
- [15] G. Cordasco *et al.*, "Assessing Voice User Interfaces: The vassist system prototype," *5th IEEE Int. Conf. Cogn. Infocommunications, CogInfoCom 2014 - Proc.*, pp. 91–96, 2014.
- [16] Universidad de Guadalajara 2018, Universidad incluyente. Retrieved January 10, 2018, from <http://universidadincluyente.udg.mx/programa-universidad-incluyente>.
- [17] S. Integral *et al.*, "Manual para alumnos."
- [18] Statista Portal, The most spoken languages



UNIVERSIDAD DE GUADALAJARA

CENTRO UNIVERSITARIO DE CIENCIAS ECONÓMICO ADMINISTRATIVAS
DIVISION DE GESTIÓN EMPRESARIAL / DEPARTAMENTO DE SISTEMAS DE INFORMACIÓN
CENTRO DE INNOVACIÓN EN CIUDADES INTELIGENTES

To whom it may concern,

It is my pleasure to write a letter in support of Adriana Lorena Iñiguez Carrillo's proposal to join the "HCI Across Borders: Paving New Pathways" workshop in CHI2018. She is an outstanding and accomplished third-semester student in the Information Technologies Ph.D. program at the University of Guadalajara, which belongs to the National Register of High-Quality Postgraduate Programs (PNPC) of the National Council on Science and Technology (CONACYT). The research project that Adriana is working on is related to Human-Computer Interaction Models, specializing in conversational interfaces. At this point, she is working on a systemic literature review, an overview of primary research studies using explicit and reproducible methods by other researchers in relation to human-computer interaction in conversational interfaces. We believe this program would be a great fit for Adriana, since the guidance of world-renowned experts would help her advance her project, further her learning and improve her research. We are also very keen on expanding our institutional network connections, so we can collaborate in future research projects.

Without further ado, I thank you in advance for your consideration.

Sincerely,

ATENTAMENTE

"PIENSA Y TRABAJA"

30 de Enero de 2018 Zapopan, Jalisco

Dra. Rocio Maciel Arellano
Adviser

Dra. Laura Sanely Gaytán Lugo
Adviser



Adriana L. Iñiguez-Carrillo

adriana.carrillo@cusur.udg.mx

RECENTS ACTIVITIES

"Workshop in Information Technologies (WIT20)" in INTEL GDC. June 2017.

Postgraduate consortium in the "Summer School on Pervasive Computing Interaction for binational challenges" sponsored by the ACM-SIGCHI, September 2017.

"8th Latin American Conference on Human-Computer Interaction", in Antigua, Guatemala. November 2017

"Workshop in Information Technologies (WIT21)" in IBM Campus Guadalajara. December 2017.

Participation in the "Mobile Application Development Program with high social and environmental impact Jalisco 2017", organized by the State Council of Science and Technology of Jalisco (COECyTJAL) as part of the winning proposal team "Speech View".

I am studying a Ph.D. in Information Technologies at University of Guadalajara, under the supervision of Prof. Rocio Maciel-Arellano and Laura S. Gaytán-Lugo. My thesis is about "Towards a Human-Computer Interaction Model for Voice User Interfaces in a Conversational Intelligent System". My research interest is in Human-Computer Interaction, User Interface Evaluation, and Voice and Natural User Interfaces (VUI & NUI).

EDUCATION

M.S. in Computer Science with emphasis in software engineering. Universidad de Colima, July 2006. Thesis: Usability test of a virtual environment focused in learning a foreign language.

B.S. in Computer Engineering with emphasis on Networks. Instituto Tecnológico de Ciudad Guzmán. September 2002.

EXPERIENCE

I have gained a professional experience as university program coordinator, in the performance of quality and relevance analysis of the curricula. As well as general organizer of conferences and workshops.

I am a professor in the department of computational sciences and technological innovation at Universidad de Guadalajara.

I have been an evaluating member of the Institutional Committees for Higher Evaluation (CIIES) in Mexico, where I have been part of the External Academic Pairs Commission (CPAE) in the area of Engineering and Technology.

Participated in the usability analysis of the research project "Application of the virtual reality for the practice of the auditory understanding of the English language".

Participation in the software project "Interactive platform for the learning of calculus (PIAC)". Contributed with content design for the system and conduction of experimentation and evaluation of the web site. This project applies information technologies for the support of learning math.