Ph.D. Christian **Arzate Cruz**

PH.D. COMPUTER SCIENCE

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Education

Ph.D. in Computer Science

Estado de México, México

TECNOLOGICO DE MONTERREY

2013 - 2018

- Thesis: HRLB^2: A Game AI Architecture For Believable Bots That Unifies the Elements of Flow and Reinforcement Learning
- Thesis Advisor: Jorge Adolfo Ramirez Uresti
- Description: My work is aimed towards maximizing the player's enjoyment through artificial intelligence techniques in real-time. Specifically, my thesis' main objective was to create non-player characters that behave in a human-like manner. Our approach to achieve this goal is based on reinforcement learning techniques.

M.Sc. in Computer Science

Estado de México, México

TECNOLOGICO DE MONTERREY

2010 - 2011

- Graduated with honors
- Thesis: Body Part Detection Using a Low Cost Depth Camera
- Thesis Advisor: Isaac Rudimín Goldberg
- Description: The main objective of my dissertation was to design and implement real- time algorithms to detect body parts using the Kinect depth camera. Our algorithms make use of parallel computing – they were coded in the GPU (CUDA). The principal application of the proposed algorithms was the generation of human-like crowd behaviors.

B.Sc. Mechatronics Engineering

Estado de México, México

TECNOLOGICO DE MONTERREY

2004 - 2009

- Graduated with honors
- Specialization: Automotive engineering
- Description: For my specialization in automotive engineering, I took courses of mechanical vibrations and the finite element method.

Research Experience

Project Researcher

Tokyo, Japan

THE UNIVERSITY OF TOKYO

2019 - present

- Takeo Igarashi Laboratory
- Description: My research currently focuses on creating aligned agent behaviors. One open challenge in this research area is creating effective communication channels between the agent and the user. From the user agent, this channel has to enable it to explain its decision procedure to the user. From the user standpoint, communication has to provide her with the tools to give precise feedback to the agent. I, and my collaborators at the Igarashi Lab, tackle this challenge by designing human-computer interaction methods that minimize the needed human feedback, and reinforcement learning based agents that explain their thinking process.

Professional Experience

Research Assistant

California, USA

HEWLETT PACKARD LABS

2012 - 2013

- Laboratory: Mobile and Immersive Experiences
- Description: I developed artificial vision based technologies aimed to improve the man-machine interaction of Hewlett-Packard systems for the visualization of data on 3D displays in real-time.
- Computer vision: I designed and implemented a real-time camera calibration system for arrays of projectors. This calibration system facilitates the constructions of more precise panoramas.
- Computer graphics: I ported a multimedia engine to OpenGL. This engine was mainly used for creating 3D environments for stereoscopic displays. Additionally, I implemented a 3D engine aimed to visualize and manipulate big data sets of social networks.
- Man–machine interaction: I participated in the design and implementation of a gesture based interface using the Leap Motion depth camera.

Honours & Awards

JST CREST	**AIP Challenge**, a 10,000 dollars support for young researchers.	*2021*
COMECYT	**Studies Financial Support**, living expenses support throughout the duration of Ph.D. studies.	*2017 - 2018*
Tec de Monterrey	**Tuition Scholarship**, full tuition support as a student of Ph.D. program in Computer Science.	*2013 - 2018*
CONACyT	**National Studies Financial Support**, living expenses support throughout the duration of Ph.D. studies.	*2013 - 2016*
Tec de Monterrey	**Honors**, graduated with honors from M.Sc. in Computer Science	*2011*
Tec de Monterrey	**Honors**, graduated with honors from B.Sc. in Mechatronics Engineering	*2009*

Teaching Experience

Part-Time Faculty Member *Estado de México, México*

Universidad Mexicana de Innovación en Negocios *2016*

- Teacher of undergraduate students on *operating systems* and *computational architecture courses.*

Selected Publications

2021	**Interactive Reinforcement Learning for Autonomous Behavior Design**, Christian Arzate Cruz, and Takeo Igarashi. In: Li Y., Hilliges O. (eds) Artificial Intelligence for Human Computer Interaction: A Modern Approach. Human–Computer Interaction Series. Springer, Cham.	*Book Chapter*
2021	**Interactive Explanations: Diagnosis and Repair of Reinforcement Learning Based Agent Behaviors**, Christian Arzate Cruz, and Takeo Igarashi. In the IEEE Conference on Games (CoG).	*Conference*
2020	**MarioMix: Creating Aligned Playstyles for Bots with Interactive Reinforcement Learning**, Christian Arzate Cruz, and Takeo Igarashi. In Extended Abstracts of the Annual Symposium on Computer-Human Interaction in Play (CHI Play).	*Conference*
2020	**A Survey on Interactive Reinforcement Learning: Design Principles and Open Challenges**, Christian Arzate Cruz, and Takeo Igarashi. Designing Interactive Systems Conference (DIS).	*Conference*
2018	**HRLB^2: A Reinforcement Learning Based Framework for Believable Bots**, Christian Arzate Cruz and Jorge Adolfo Ramirez Uresti. Applied Sciences (MDPI).	*Journal*
2017	**Player-centered game AI from a flow perspective: Towards a better understanding of past trends and future directions**, Christian Arzate Cruz and Jorge Adolfo Ramirez Uresti. Entertainment Computing.	*Journal*

Reviewer

PC member	Game HCI track at the IEEE Conference on Games (CoG).	*Conference*
Reviewer	The ACM Symposium on User Interface Software and Technology (UIST), IEEE Conference on Games (CoG).	*Conference*
Reviewer	IEEE Transactions on Games (ToG), Elsevier Entertainment Computing, and Springer 3D Research.	*Journal*

Technical Skills

Programming Skills

- My background includes parallel computing and, data-driven programming techniques. My main programming languages are: **C**, **C++**, **CUDA**, **OpenCL**, **Matlab**, **Java**, and **Python**. Furthermore, since my work focus on computer graphics and game AI, I have experience in the next programming libraries: **OpenGL**, **OpenCV**, and **PyTorch**.

Languages

English, Spanish, and Japanese (basic level).