

2019 21st Symposium on Virtual and Augmented Reality (SVR 2019)

**Rio de Janeiro, Brazil
28 – 31 October 2019**



**IEEE Catalog Number: CFP1929P-POD
ISBN: 978-1-7281-5435-0**

**Copyright © 2019 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP1929P-POD
ISBN (Print-On-Demand):	978-1-7281-5435-0
ISBN (Online):	978-1-7281-5434-3

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2019 21st Symposium on Virtual and Augmented Reality (SVR) **SVR 2019**

Table of Contents

Message from the General Chairs .x.....	x
Message from the Program Chairs .xi.....	xi
Message from the Graduate Workshop Chairs .xii.....	xii
Message from the Undergraduate Workshop Chairs .xiii.....	xiii
Message from the Pre-Symposium Chairs .xiv.....	xiv
Message from the Demos and Posters Chair .xv.....	xv
Message from the Tutorial Chairs .xvi.....	xvi
Organizing Committee .xvii.....	xvii
Program Committee .xviii.....	xviii
Steering Committee .xix.....	xix
Reviewers .xx.....	xx
Sponsors .xxi.....	xxi

Session 1 - Virtual Reality

Providing Sense of Embodiment with Mobile Virtual Reality Devices: A Case Study using the "Lamp-Head's Laboratory" Animation .1.....	1
<i>Saulo V. Cruz (Federal University of Ceará), Gabriela de Castro Quintino (Federal University of Ceará), Andrei B. B. Torres (Federal University of Ceará), and Windson Viana (Federal University of Ceará)</i>	
BalletVR: a Virtual Reality System for Ballet Arm Positions Training .10.....	10
<i>Ricardo R. Barioni (Universidade Federal de Pernambuco), Willams Costa (Universidade Federal de Pernambuco), Alessandra Aleluia (Universidade Federal de Pernambuco), and Veronica Teichrieb (Universidade Federal de Pernambuco)</i>	
Virtual Reality for Agribusiness in the Development of a Maintenance Simulator for Agricultural Machinery for Senar Goiás .17.....	17
<i>Vitor Figueredo (DOT Digital Group), Alessandro Vieira dos Reis (DOT Digital Group), Fabiano Garcia (Simulógica), and Fernando Couto Araújo (Senar Goiás)</i>	
Immersive Virtual Environment for Math Aid in the Early Years .20.....	20
<i>Gabriel Santana Fleury (Universidade Federal de Goiás), Marcos Wagner de Souza Ribeiro (Universidade Federal de Goiás), and Carlos Gabriel Silva Stedile (Universidade Federal de Goias)</i>	
Virtual Reality in Army Artillery Observer Training .25.....	25
<i>Romullo Girardi (Military Institute of Engineering) and Jauvane C. de Oliveira (National Laboratory for Scientific Computing)</i>	

Session 2 - Interaction & Tools

A Virtual Makeup Augmented Reality System .34.....	Aline de Fátima Soares Borges (University of São Paulo) and Carlos H. Morimoto (University of São Paulo)
A Proposal of Interaction with 3D Object using Hologram by Reflection on Low-Cost Devices .43.....	Eduardo Filgueiras Damasceno (Universidade Tecnológica Federal do Paraná), Douglas Lopes Farias (Universidade Tecnológica Federal do Paraná), Renan Cleverson Laureano Flor da Rosa (Universidade Tecnológica Federal do Paraná), and Rafael de Souza Fernandes (Universidade Tecnológica Federal do Paraná)
Eva: A Virtual pet in Augmented Reality .47.....	Afonso Costa (SIDIA - Instituto de Ciência e Tecnologia), Rachel Lima (SIDIA - Instituto de Ciência e Tecnologia), and Sergio Tamayo (SIDIA - Instituto de Ciência e Tecnologia)
3DJPi: An Open-Source Web-Based 3D Simulator for Pololu's 3Pi Platform .52.....	Lucas Oliveira Maggi (Universidade Federal de Pernambuco), João Marcelo Xavier Natário Teixeira (Universidade Federal de Pernambuco), José Roberto Fonseca e Silva Júnior (Universidade Federal de Pernambuco), João Paulo Cerquinho Cajueiro (Universidade Federal de Pernambuco), Pedro Vitor Soares Gomes de Lima (Universidade Federal de Pernambuco), Maria Helena Rocha de Alencar Bezerra (Universidade Federal de Pernambuco), and Guilherme Nunes Melo (Universidade Federal de Pernambuco)

Session 3 - Surveys & Systematic Reviews

Towards Immersive Learning in Object-Oriented Paradigm: A Preliminary Study .59.....	Filipe Fernandes (IF Sudeste MG) and Cláudia Werner (COPPE/UFRJ)
Panorama of Researches Related to the Application of Virtual Reality in the Health Area in SVR .69.....	Taiane Silva Barbosa (Universidade Salvador) and Artur Henrique Kronbauer (Universidade Salvador)
Telecommunications Field Operations Supported by Augmented Reality – a Systematic Review .77.....	Giuliano Ferreira Dela Coleta (Universidade Federal de Uberlândia), Alexandre Cardoso (Universidade Federal de Uberlândia), Edgard Afonso Lamounier Júnior (Universidade Federal de Uberlândia), and Gerson Flávio Mendes de Lima (Universidade Federal de Uberlândia)
User Interface Evaluation Methods for Elderly: A Systematic Review .84.....	Manoela Rogofski Brum Postal (University of Passo Fundo) and Rafael Rieder (University of Passo Fundo)

Session 4 - Augmented Reality

AR Training for Paragliding Pilots: An Investigation of User Experience and Requirements .92.....	Carolin Köhler (Ilmenau University of Technology), Florian Weidner (Ilmenau University of Technology), and Wolfgang Broll (Ilmenau University of Technology)
Use of Augmented Reality for Computational Thinking Stimulation through Virtual .102.....	Adson Marques da Silva Esteves (Universidade do Vale do Itajaí), André Luiz Maciel Santana (Universidade Anhembi Morumbi São Paulo), and Rodrigo Lyra (Universidade do Vale do Itajaí)

ARKLib: An Augmented Reality Library for Applications using Kinect .107.....	
<i>Danilo Melo Amaral (Universidade Federal de São João del-Rei),</i>	
<i>Leonardo Chaves Dutra da Rocha (Universidade Federal de São João</i>	
<i>del-Rei), Matheus Carvalho Viana (Universidade Federal de São João</i>	
<i>del-Rei), Marcelo de Paiva Guimarães (Universidade Federal de São</i>	
<i>Paulo), and Diego Roberto Colombo Dias (Universidade Federal de São</i>	
<i>João del-Rei)</i>	
Handling Occlusions in Augmented Reality for Mobile Devices .112.....	
<i>Silvio R. R. Sanches (Universidade Tecnológica Federal do Paraná),</i>	
<i>Vitor V. G. Silva (Universidade Tecnológica Federal do Paraná),</i>	
<i>Antonio C. Sementille (Universidade Estadual Paulista), Cléber G.</i>	
<i>Corrêa (Universidade Tecnológica Federal do Paraná), and Claiton</i>	
<i>Oliveira (Universidade Tecnológica Federal do Paraná)</i>	

Session 5 - Computer Graphics Techniques for VR/AR/MR

Real-Time Facial Motion Capture Using RGB-D Images Under Complex Motion and Occlusions .120.....	
<i>João Otávio de Lucena (Universidade Federal de Pernambuco), João Paulo</i>	
<i>Lima (Universidade Federal Rural de Pernambuco), Diego Thomas (Kyushu</i>	
<i>University), and Veronica Teichrieb (Universidade Federal de</i>	
<i>Pernambuco)</i>	
Rigid Registration of Point Clouds Based on Indirect Lie Group Approach .130.....	
<i>Liliane Rodrigues de Almeida (Laboratório Nacional de Computação</i>	
<i>Científica), Gilson Antonio Giraldi (Laboratório Nacional de</i>	
<i>Computação Científica), and Marcelo Bernardes Vieira (Universidade</i>	
<i>Federal de Juiz de Fora)</i>	
A Distributed Approach for Automatic Speed Adjustment During Navigation in 3D Multiscale Virtual Environments .140.....	
<i>Henrique Taunay (Tecgraf Institute/PUC-Rio), Daniel Medeiros (Victoria</i>	
<i>University of Wellington), and Alberto Raposo (Tecgraf</i>	
<i>Institute/PUC-Rio)</i>	
Procedural Content Generation using Artificial Intelligence for Unique Virtual Reality Game Experiences .147.....	
<i>João Pedro Assunção Campos (University of Passo Fundo) and Rafael</i>	
<i>Rieder (University of Passo Fundo)</i>	
Chess Position Identification using Pieces Classification Based on Synthetic Images Generation and Deep Neural Network Fine-Tuning .152.....	
<i>Afonso de Sá Delgado Neto (Universidade Federal de Pernambuco) and</i>	
<i>Rafael Mendes Campello (Universidade Federal de Pernambuco)</i>	

Session 6 - Health

Analysis of Low-Cost Virtual and Augmented Reality Technology in Case of Motor Rehabilitation .161....	
<i>Rafael Fernandes de Souza (Universidade Tecnológica Federal do</i>	
<i>Paraná), Douglas Lopes Farias (Universidade Tecnológica Federal do</i>	
<i>Paraná), Renan Cleverson Laureano Flor da Rosa (Universidade</i>	
<i>Tecnológica Federal do Paraná), and Eduardo Filgueiras Damasceno</i>	
<i>(Universidade Tecnológica Federal do Paraná)</i>	
SimObturation: Virtual Reality Application for Simulation of Dental Obturation Procedure Training with Phantom Omni Device Integration .165.....	
<i>Tamirys Virgulino Ribeiro (Military Institute of Engineering) and</i>	
<i>Jauvane C. de Oliveira (National Laboratory for Scientific Computing)</i>	

An EMG-Based Virtual Reality Application for Motor Rehabilitation .170.....	<i>Mirella Santos Pessoa de Melo (Universidade Federal de Pernambuco), José Gomes da Silva Neto (Universidade Federal de Pernambuco), João Marcelo Xavier Natario Teixeira (Universidade Federal de Pernambuco), Alana Elza Fontes Da Gama (Universidade Federal de Pernambuco), and Veronica Teichrieb (Universidade Federal de Pernambuco)</i>
Comparison of RGB and HSV Color Spaces for motion Capture and Analysis of Individuals With limb Discrepancy .178.....	<i>Thiago Buarque de Gusmao Lafayette (Universidade Federal de Pernambuco), Laila Farias Colaco (Universidade Federal de Pernambuco), João Marcelo Xavier Natario Teixeira (Universidade Federal de Pernambuco), Cinthia Rodrigues de Vasconcelos (Universidade Federal de Pernambuco), and Alana Elza Fontes Da Gama (Universidade Federal de Pernambuco)</i>

Session 7 - Best Papers #1

A Virtual Reality Based Platform to Balance Disorders Diagnosis and Vestibular Rehabilitation .186.....	<i>Daniel Valente de Macedo (Universidade de Fortaleza), Eduardo Bruno Silva Lustosa (Universidade de Fortaleza), Matheus Batista Nogueira (Universidade de Fortaleza), Magno Eric Barbosa Peixoto (Clínica Otos), Carla Marineli Saraiva do Amaral (Universidade de Fortaleza), and Maria Andréia Formico Rodrigues (Universidade de Fortaleza)</i>
Towards the Systematic Testing of Virtual Reality Programs .196.....	<i>Stevão A. Andrade (Universidade de São Paulo), Fatima L. S. Nunes (Universidade de São Paulo), and Marcio E. Delamaro (Universidade de São Paulo)</i>
A Study Applied to the Validation of the Box and Blocks Manual Dexterity Virtual Test with Non-Disabled Users .206.....	<i>Helda Oliveira Barros (CESAR), Fabio Campos (Universidade Federal de Pernambuco), Walter Correia (Universidade Federal de Pernambuco), and João Marcelo Teixeira (Universidade Federal de Pernambuco)</i>
Songverse: A Music-Loop Authoring Tool Based on Virtual Reality .216.....	<i>Willams Costa (Universidade Federal de Pernambuco), Luca Ananias (Universidade Federal de Pernambuco), Iago Barbosa (Universidade Federal de Pernambuco), Bruno Barbosa (Universidade Federal de Pernambuco), André De' Carli (Universidade Federal de Pernambuco), Ricardo R. Barioni (Universidade Federal de Pernambuco), Lucas Figueiredo (Universidade Federal de Pernambuco), Veronica Teichrieb (Universidade Federal de Pernambuco), and Daniel Filgueira (Universidade Federal de Pernambuco)</i>

Session 8 - Best Papers #2

An Emotional Virtual Character: A Deep Learning Approach with Reinforcement Learning .223.....	<i>Gilzamir Gomes (State University of the Acaraú Valley), Creto A. Vidal (Federal University of Ceara), Joaquim B. Cavalcante Neto (Federal University of Ceara), and Yuri L. B. Nogueira (Federal University of Ceara)</i>
--	--

Exploring Motor and Sensory Devices in a Bicycle Simulator .232.....	
<i>Raphael de Souza e Almeida (Pontifícia Universidade Católica do Rio de Janeiro), Renato Cherullo (Pontifícia Universidade Católica do Rio de Janeiro), Daniel Radetic (Pontifícia Universidade Católica do Rio de Janeiro), Greis Francy M. Silva-Calpa (Pontifícia Universidade Católica do Rio de Janeiro), and Alberto Barbosa Raposo (Pontifícia Universidade Católica do Rio de Janeiro)</i>	
Analysis and Comparison of Robotics 3D Simulators .242.....	
<i>Mirella Santos Pessoa de Melo (Universidade Federal de Pernambuco), José Gomes da Silva Neto (Universidade Federal de Pernambuco), Pedro Jorge Lima da Silva (Universidade Federal de Pernambuco), João Marcelo Xavier Natario Teixeira (Universidade Federal de Pernambuco), and Veronica Teichrieb (Universidade Federal de Pernambuco)</i>	
Mixed Reality, Mamulengos and MamuLEDs .252.....	
<i>Jarbas Jácome (Voxar Labs, MusTIC, CIn-UFPE, CAHL-UFRB), Maria Oliveira (Cia. Artística Mamulengos e Catrevagens), Fernando Alvim (Escola Municipal de Arte João Pernambuco), Veronica Teichrieb (Voxar Labs, CIn-UFPE), and Geber L. Ramalho (MusTIC, CIn-UFPE)</i>	
Author Index 261	