

Article

Integration of 3D Gaussian Splatting and Neural Radiance Fields in Virtual Reality Fire Fighting

Haojie Lian ¹ , Kangle Liu ¹, Ruochen Cao ^{2,*}, Ziheng Fei ³, Xin Wen ² and Leilei Chen ⁴

- ¹ Key Laboratory of In-Situ Property-Improving Mining of Ministry of Education, Taiyuan University of Technology, Taiyuan 030024, China; lianhaojie@tyut.edu.cn (H.L.); liukangle1238@tyut.edu.cn (K.L.)
- ² School of Software, Taiyuan University of Technology, Jinzhong 030600, China; xwen@tyut.edu.cn
- ³ Department of Architectural Engineering, Hanyang University, Seoul 04763, Republic of Korea; fei0006234@hanyang.ac.kr
- ⁴ Henan International Joint Laboratory of Structural Mechanics and Computational Simulation, College of Architectural and Civil Engineering, Huanghuai University, Zhumadian 463000, China; chenleilei@mail.usc.edu.cn
- * Correspondence: caoruochen@tyut.edu.cn

Abstract: Neural radiance fields (NeRFs) and 3D Gaussian splatting have emerged as promising 3D reconstruction techniques recently. However, their application in virtual reality (VR), particularly in firefighting training, remains underexplored. We present an innovative VR firefighting simulation system based on 3D Gaussian Splatting technology. Leveraging these techniques, we successfully reconstruct realistic physical environments. By integrating the Unity3D game engine with head-mounted displays (HMDs), we created and presented immersive virtual fire scenes. Our system incorporates NeRF technology to generate highly realistic models of firefighting equipment. Users can freely navigate and interact with fire within the virtual fire scenarios, enhancing immersion and engagement. Moreover, by utilizing the Photon PUN2 networking framework, our system enables multi-user collaboration on firefighting tasks, improving training effectiveness and fostering teamwork and communication skills. Through experiments and surveys, it is demonstrated that the proposed VR framework enhances user experience and holds promises for improving the effectiveness of firefighting training.

Keywords: neural radiance fields; 3D Gaussian splatting; fire; immersive virtual reality



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1. Introduction

Frequent occurrence of fires poses significant threats to both human lives and property. The causes of fires frequently stem from factors such as a lack of sufficient safety awareness, negligent fire prevention practices, and inadequate familiarity with the proper use of fire extinguishing equipment [1]. Therefore, it is imperative to prioritize enhancing public awareness and implementing comprehensive fire safety training programs. Although fire drills are a prevalent and efficacious approach, they can impose significant demands on resources, necessitating substantial allocations of manpower, materials, and financial assets [2]. Moreover, the creation of realistic fire scenarios for drills can potentially engender safety hazards, while logistical support complexities often impede broader accessibility to such training programs for diverse populations. Consequently, conventional fire drills may inadequately address comprehensive societal needs. To meet these challenges, there is an increasing need for pioneering fire safety education methods that effectively guide individuals to overcome the limitations of traditional drills.

Utilizing virtual reality (VR) technology allows for the recreation of necessary scenarios in a virtual environment, providing users with interactive platforms to engage with characters or objects via interactive devices, facilitating task completion. In industrial production, VR technology is progressively employed for workforce training, process simulation, and quality assurance [3]. However, a significant challenge in these applications

Reality And Radiance

Lei Huang



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Reality and Radiance Emilia Fogelklou-Norlind, 1985 Her Master's Tools? Caroline Vander Stichele, Todd C. Penner, 2005 This collection of essays originating in the SBL International Meetings in Berlin 2002 and Cambridge 2003 explores the current reception of historical criticism in feminist biblical studies pushing the boundaries of past study and opening new vistas for future research By framing the discussion in the context of the current reevaluation of both historical criticism and feminist exegesis the contributors highlight the ongoing need to engage methodological issues In addition a strong postcolonial emphasis throughout the volume challenges the hegemony of Western biblical interpretation promoting a format of dialogue and engagement The collection brings together diverse cultural and geographical perspectives on biblical criticism with over ten countries represented Consisting of Western and non Western perspectives female and male scholars junior and senior voices in the field and a range of feminist scholars situated alongside postcolonial and gender critics this collection reveals not only the multiplicity of perspectives but also the various transitions in scholarship that have taken place over the past thirty years Volume contributors include Roland Boer Athalya Brenner Ann Graham Brock Kristin De Troyer Esther Fuchs Archie Chi Chung Lee Joseph Marchal John Marshall Hjamil Mart nez V zquez Madipoane Masenya ngwana Mphahlele Judith McKinlay Priscilla Geisterfer Nyvlt Jorunn kland Todd Penner Vernon Robbins Susanne Scholz Hanna Stenstr m and Caroline Vander Stichele Paperback edition is available from the Society of Biblical Literature www.sbl-site.org

Modeling from Reality Katsushi Ikeuchi, Yoichi Sato, 2012-12-06 This book summarizes the results of our modeling from reality MFR project which took place over the last decade or so The goal of this project is to develop techniques for modeling real objects and or environments into geometric and photometric models through computer vision techniques By developing such techniques time consuming modeling process currently undertaken by human programmers can be semi automatically performed and as a result we can drastically shorten the developing time of such virtual reality systems reduce their developing cost and widen their application areas Originally we began to develop geometric modeling techniques that acquire shape information of objects environments for object recognition Soon this effort evolved into an independent modeling project virtual reality modeling with the inclusion of photometric modeling aspects that acquire appearance information such as color texture and smoothness Over the course of this development it became apparent that environmental modeling techniques were necessary when applying our techniques to mixed realities that seamlessly combine generated virtual models with other real virtual images The material in his book covers these aspects of development

Spatial Augmented Reality Oliver Bimber, Ramesh Raskar, 2005-08-08 Like virtual reality augmented reality is becoming an emerging platform in new application areas for museums edutainment home entertainment research industry and the art communities using novel approaches which have taken augmented reality beyond traditional eye worn or hand held displays In this book the authors discuss spatial augmented reality approaches that exploit optical elements video projectors

holograms radio frequency tags and tracking technology as well as interactive rendering algorithms and calibration techniques in order to embed synthetic supplements into the real environment or into a live video of the real environment
Special Features Comprehensive overview Detailed mathematical equations Code fragments Implementation instructions
Examples of Spatial AR displays **The Theosophical Quarterly** ,1907 [The Nyingma School of Tibetan Buddhism](#)
Dudjom,2012-07-23 Written by a great modern Nyingma master Dudjom Rinpoche s The Nyingma School of Tibetan Buddhism covers in detail and depth both the fundamental teachings and the history of Tibetan Buddhism s oldest school This the first English translation of His Holiness masterwork constitutes the most complete work of its type in the West An absolute treasure for students of the tradition it is also an indispensable reference for anyone with an interest in Buddhism The book includes chronologies and glossaries that elucidate Buddhist doctrine and it provides fascinating insights into the Buddhist history of Tibet Two treatises form the present volume namely the Fundamentals of the Nyingma School and the History of the Nyingma School Among the most widely read of all His Holiness Dudjom Rinpoche s works these treatises were composed during the years immediately following his arrival in India as a refugee His intention in writing them was to preserve the precise structure of the Nyingma philosophical view within its own historical and cultural context This is the first time this text has been available in a trade edition Beautifully presented this single volume edition represents a truly wonderful gift and features illustrations in black and white and in color plus maps bibliographic information and useful annotations *Bhagavad gita, 'The songs of the master', tr. with an intr. and comm. by C. Johnston* Charles Johnston,1908

AWARE Gary Warren,2011-07-10 Before purchase visit this website GaryLouisWarren com for a better understanding of the book **AWARE** This may help determine if this book is for you **Genres of Philosophy** Robyn Ferrell,2017-03-02
Philosophy is textual it is written and it is read yet today much of philosophy regards itself as a kind of science sometimes reducing itself to a species of intellectual bureaucracy It is important to see these qualities as having their own aesthetic Even realism is a genre The aesthetic of the empirical and the bureaucratic the aesthetic of the rhapsodic and of the clinical in each of these the genres of philosophy are as creative as they ever were They are productive of worlds not only worlds of thought but real worlds enabled by the technological and other changes that thought has envisaged This book explores genres through the history of philosophy providing new ways of thinking about philosophical writing Exploring a wide range of both European and analytic philosophers and their works including Plato Aristotle Hume Kant Nietzsche Deleuze Wittgenstein Derrida and Rorty **Genres of Philosophy** explores the reading and writing of philosophers who themselves read and write revealing the textual relation to the history of philosophy While the focus of the book is in aesthetics Ferrell reveals that the interest in philosophy s writing turns out to be a metaphysical question The question becomes one of evaluating the ontological basis for writing its subject and its means of expression within a world of thought which is presently captivated by a particular aesthetic that of the empiricist Presenting fresh readings of classic texts in aesthetics and offering an original

approach to the question of philosophical writing this unique analysis will prove of particular interest to readers in European philosophy the history of philosophy aesthetics and literary studies **Reality** ,1928 **Ultimate Reality and Meaning** ,1999 **Radiosity and Realistic Image Synthesis** Michael F. Cohen,John R. Wallace,1993-08-04 The goal of image synthesis is to create using the computer a visual experience that is identical to what a viewer would experience when viewing a real environment Radiosity and Realistic Image Synthesis offers the first comprehensive look at the radiosity method for image synthesis and the tools required to approach this elusive goal Basic concepts and mathematical fundamentals underlying image synthesis and radiosity algorithms are covered thoroughly A basic knowledge of undergraduate calculus is assumed The algorithms that have been developed to implement the radiosity method ranging from environment subdivision to final display are discussed Successes and difficulties in implementing and using these algorithms are highlighted Extensions to the basic radiosity method to include glossy surfaces fog or smoke and realistic light sources are also described There are 16 pages of full colour images and over 100 illustrations to explain the development and show the results of the radiosity method Results of applications of this new technology from a variety of fields are also included Michael Cohen has worked in the area of realistic image synthesis since 1983 and was instrumental in the development of the radiosity method He is currently an assistant professor of computer science at Princeton University John Wallace is a software engineer at 3D EYE Inc where he is the project leader for the development of Hewlett Packard s ATRCore radiosity and ray tracing library A chapter on the basic concepts of image synthesis is contributed by Patrick Hanrahan He has worked on the topic of image synthesis at Pixar where he was instrumental in the development of the Renderman software He has also led research on the hierarchical methods at Princeton University where he is an associate professor of computer science All three authors have written numerous articles on radiosity that have appeared in the SIGGRAPH proceedings and elsewhere They have also taught the SIGGRAPH course on radiosity for 5 years The first comprehensive book written about radiosity Features applications from the fields of computer graphics architecture industrial design and related computer aided design technologies Offers over 100 illustrations and 16 pages of full color images demonstrating the results of radiosity methods Contains a chapter authored by Pat Hanrahan on the basic concepts of image synthesis and a foreword by Donald Greenberg **The Tibetan Book of the Dead** Graham Coleman,Thupten Jinpa,2008-11-06 The acclaimed English translation of this masterpiece of world literature prepared with the participation of the Dalai Lama One of the greatest works created by any culture and one of the most influential of all Tibetan Buddhist texts in the West The Tibetan Book of the Dead has had a number of distinguished translations but strangely all of these have been partial abridgements Now the entire text has not only been made available in English but in a translation of quite remarkable clarity and beauty A comprehensive guide to living and dying The Tibetan Book of the Dead contains exquisitely written guidance and practices related to transforming our experience in daily life on the processes of dying and the after death state

and on how to help those who are dying As originally intended this is as much a work for the living as it is for those who wish to think beyond a mere conventional lifetime to a vastly greater and grander cycle Extraordinary this work will be a source of inspiration and support to many His Holiness the Dalai Lama Significant Accomplishments in Sciences ,1972 **The Tibetan Book of the Dead** Karma Lingpa,Sambhava Padma,Coleman Graham,2023-12-12 One of the greatest works created by any culture and overwhelmingly the most significant of all Tibetan Buddhist texts in the West The Tibetan Book of the Dead has had a number of distinguished translations but none encompassed the work in its entirety Now in one of the year s most important publishing events the entire text has not only been made available in English but in a translation of quite remarkable clarity and beauty With an introductory commentary by His Holiness The Dalai Lama who calls this translation an extraordinary accomplishment undertaken with great care over many years this complete edition faithfully presents the insights and intentions of the original work It includes one of the most detailed and compelling descriptions of the after death state in world literature exquisitely written practices that can transform our experience of daily life guidance on helping those who are dying and an inspirational perspective on coping with bereavement Translated with the close support of leading contemporary masters including HH Dilgo Khyentse Rinpoche and learned scholars such as Khamtrul Rinpoche and Zenkar Rinpoche *Monthly Weather Review* ,1989 **Once Upon A Time In My Life - Stories Of Real Women** Pasquale De Marco,2025-08-09 Once Upon A Time In My Life Stories Of Real Women is a collection of inspiring stories about real women who have overcome adversity and achieved their dreams These women are from all walks of life and they have all faced their own unique challenges But they have never given up on their dreams and they have all achieved great things In this book you will meet women who have Founded successful businesses Overcame addiction Survived cancer Lost and regained their faith Dealt with grief and loss Found love and happiness Made a difference in the world These stories are a testament to the power of the human spirit They show us that anything is possible if we only believe in ourselves Once Upon A Time In My Life Stories Of Real Women is a book that will inspire you to never give up on your dreams It is a book that will remind you that you are capable of anything you set your mind to If you are looking for a book that will motivate and inspire you then Once Upon A Time In My Life Stories Of Real Women is the book for you If you like this book write a review

Angels in America at the British National Theatre Emily Garside,2022-10-21 Angels in America was one of the most significant pieces of American theatre in the 20th Century Much has been written on Tony Kushner s epic drama However the National Theatre of Great Britain s productions of the show are relatively under discussed Not only was the National Theatre responsible for helping to originate the play in the early 1990s but it helped revitalize interest in 2018 with Marianne Elliott s reimaged version starring Andrew Garfield and Nathan Lane This book considers the role of the National in the play s history and how Elliott s production reframed the play 25 years after the original it chronicles the tumultuous first production and the play s successes in London and New York The book also looks at the key features of the play its

representation of AIDS its status as an iconic gay play and its searing political commentary Concluding with an in depth analysis of Marianne Elliott s reimagining of the play this book is an up to date history of Angels in America and a reflection on its continued importance Christ the Form of Beauty Francesca Aran Murphy,1995-03-04 Reveals the importance of the sacramental imagination as the key to the renewal of Christology and of modern Christian literature

Optical Radiometry ,2005-10-26 This book deals with the practice of Optical Radiation Measurements with introductory material to introduce the topics discussed It will be most useful for students scientists and engineers working in any academic industrial or governmental projects related to optical radiation The book contains chapters that treat in detail the procedures and techniques for the characterization of both sources and detectors to the highest degree of accuracy and reliability It has a chapter devoted specifically to optical measurements of laser sources and fiberoptics for communication and a chapter devoted to uncertainty in measurement and its treatment with real examples of optical measurements The book contains introductory materials that will allow a newcomer to radiometry to develop the expertise to perform exacting and accurate measurement The authors stress the various causes of uncertainty in each phase of a measurement and thus allow for users to arrive at a correct assessment of their uncertainty of measurement in their particular circumstance Authors are from the Standards laboratories of AUSTRALIA CANADA ENGLAND GERMANY and the USA Latest techniques and practice of laboratory measurements to achieve the highest accuracy in the use of sources or detectors Unique illustrations of the apparatus and measurement techniques Practical measurement examples of calibration with full uncertainty analysis Comprehensive treatment of optical standards such as sources detectors and radiometers A complete chapter on laser power measurements and standards for fiber optic measurements A complete chapter on correlations in radiometry and practical examples A chapter devoted to diffraction effects in radiometry

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