CIT

NEWSLETTER

சித்தினை edition

APRIL 2025

CENTRE FOR IMMERSIVE TECHNOLOGIES
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

CONTENTS

MESSAGE FROM HEAD, CIT

We are excited to present the inaugural சித்திரை (Chithirai) edition of the Centre for Immersive Technologies (CIT) Newsletter — a milestone in our mission to explore and lead in the dynamic world of immersive tech, including VR, AR, MR, haptics, and more.

Established in 2022 under the guidance of Dr. T.V. Gopal (Former Dean, CET), CIT was founded to harness the transformative potential of immersive technologies across education, research, and industry. Located on the ground floor of the Hi-Tech Block, the Centre serves as a hub for interdisciplinary innovation where ideas take shape through immersive experiences.

This newsletter aims to keep you informed and inspired. Each edition will feature student breakthroughs, expert insights, and opportunities to engage with emerging tech. Here's a glimpse of what to expect:

- **Spotlight on CIT Infrastructure**: Information about equipment in CIT
- **Dreams in Development**: Student-led projects in immersive tech.
- **Gadget Glimpse**: Highlights of new XR hardware and software.
- **3D Times**: Updates on advancements in 3D content.
- **Mesh Matters**: Case studies on 3D asset development at CIT.
- **XR Lab Logs**: Non-student XR initiatives.
- **xReality Check**: Key news and global XR events.
- **Scholarly Streams**: Abstracts from recent research in immersive tech.
- **Immersion Index**: In-house work featured in conferences or journals.
- **Reality Check-Ins**: Visits from collaborators exploring joint ventures.
- **Immersion Exchange**: Expert talks with industry professionals.

Future editions will bring even more, offering students valuable experience as both readers and contributors. We thank our university leadership, faculty, and students for their continued support. As we launch this new communication channel, we invite you to join us — as a reader, writer, or collaborator — in shaping a future powered by immersive technologies.

Let's explore this exciting journey together.

PROF. R. SENTHILNATHAN
CENTRE FOR IMMERSIVE TECHNOLOGIES

GALEA BCI HEADSET – WHERE NEUROSCIENCE MEETS IMMERSIVE TECHNOLOGY

BY G. KARTHIKEYAN
RESEARCH SCHOLAR
DEPT. OF MECHATRONICS ENGG.

The Galea headset is the world's first device to seamlessly integrate neurophysiological sensors into an extended reality (XR) headset. Developed by OpenBCI, in collaboration with Varjo, Galea is designed for researchers, developers, and technologists looking to gain real-time insight into cognitive and emotional states while engaging with immersive content.

Galea enables brain-computer interface (BCI) capabilities in mixed reality, unlocking new frontiers in adaptive XR, neuroergonomics, mental health research, cognitive training, and user experience optimization.

APPLICATIONS IN RESEARCH & DEVELOPMENT:

- **Adaptive XR Environments** – Real-time brain and body signals used to dynamically adjust content, difficulty, or feedback.
- **Neuroergonomics** – Analyze mental workload and stress during task performance in virtual simulations.
- **UX and HCI Research** – Quantify user engagement and emotional response to digital interfaces and immersive scenarios.
- **Mental Health & Neurofeedback** – Use bio-signals for stress detection, meditation, or therapeutic applications.

Figure 1: Galea-Varjo XR-3

KEY SPECIFICATIONS:

Feature	Description
Platform Integration	Built on Varjo XR-3, a high-fidelity mixed reality headset
EEG (Electroencephalography)	7 active, wet/dry EEG electrodes (10-20 system placement)
EMG (Electromyography)	4 channels for capturing facial muscle activity
EDA (Electrodermal Activity)	1 channel (measures skin conductance for emotional arousal)
PPG (Photoplethysmography)	Heart rate monitoring via optical sensors on the forehead
Eye Tracking	Sub-1° accuracy, 200Hz sampling rate
IMU (Inertial Measurement Unit)	6-DOF motion tracking (accelerometer + gyroscope)
Spatial Audio	Integrated headphones with spatial 3D sound
SDK Support	Python, Unity, and C++ APIs with real-time data access
Use Cases	Cognitive load assessment, biofeedback, adaptive XR, UX studies, mental health

This product was purchased in the year 2024 under Corporate Endowment Funded Facilitated by the then Dean CET Dr. T.V.Gopal for a value of Rs. 45,07,600/-

Reference Links:

OpenBCI: https://openbci.com/

Galea Features: https://galea.co/#features

OpenBCI's new VR headset: https://www.freethink.com/ar-vr/galea-beta

BOOM CONFLICT IN VR: PREVENTING CRANE COLLISIONS IN CONSTRUCTION SITES

BY G. JAYAKANTH

II YEAR STUDENT OF B.TECH

MECHATRONICS ENGINEERING
(IMMERSIVE TECHNOLOGIES)

In modern construction projects, crane placement is crucial for safety and operational efficiency. Incorrect positioning can lead to boom conflicts, where crane arms collide, posing risks of accidents and costly project delays. This article is about a project carried out in the December 2023, that introduces a VR-based simulation that enables engineers to determine optimal crane placements before implementation in the real world.

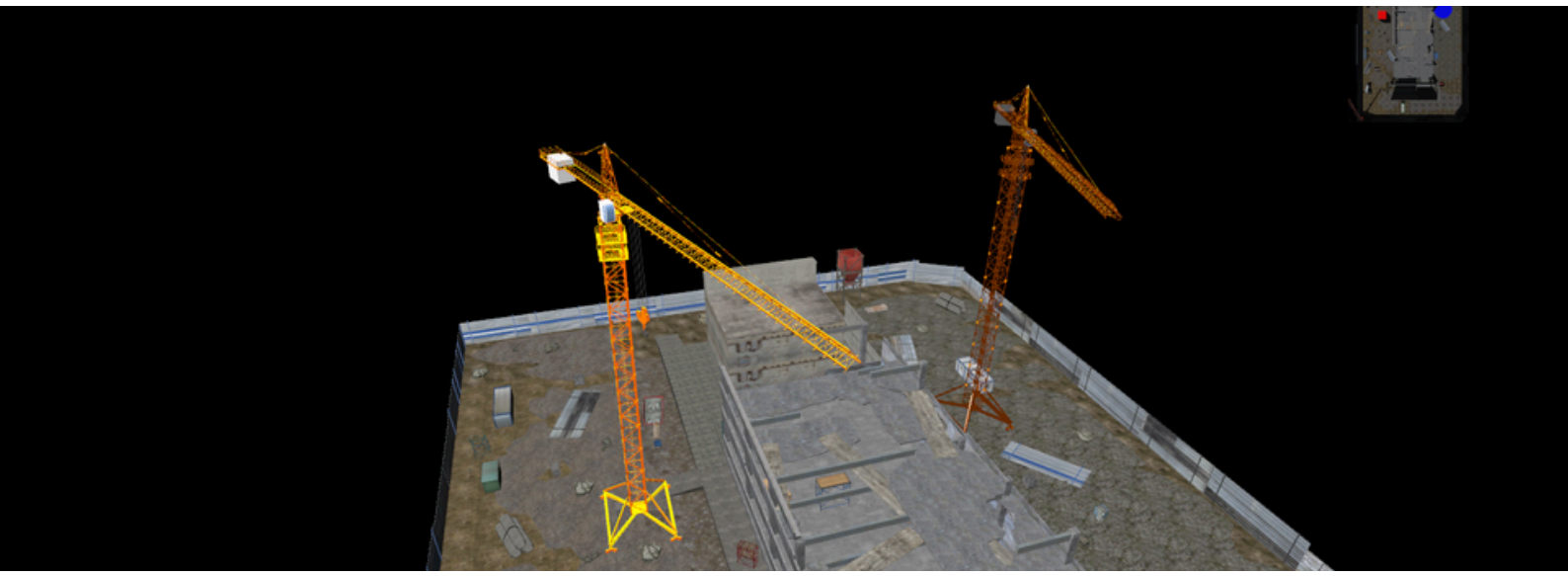

Figure 1: VR Construction Site

The need for this project arises from the complexities of construction site planning. When two cranes are required in a confined space, traditional methods of placement may not account for real-time movement conflicts. By utilizing virtual reality, this simulation replicates real-world construction sites with accurate crane configurations and parameters, allowing engineers to visualize and plan placement effectively.

The construction site and cranes are modeled in a 3D engine to ensure precise replication of real-world conditions, incorporating physics-based constraints that simulate realistic crane movement and interactions. Users interact with the simulation through Oculus joystick controls, which allow them to move and position the cranes within the virtual space. The joystick input is mapped to crane operations, providing precise and intuitive control. A real-time collision detection system continuously monitors the distance between crane arms, triggering immediate visual warnings and auditory alerts when a conflict is detected.

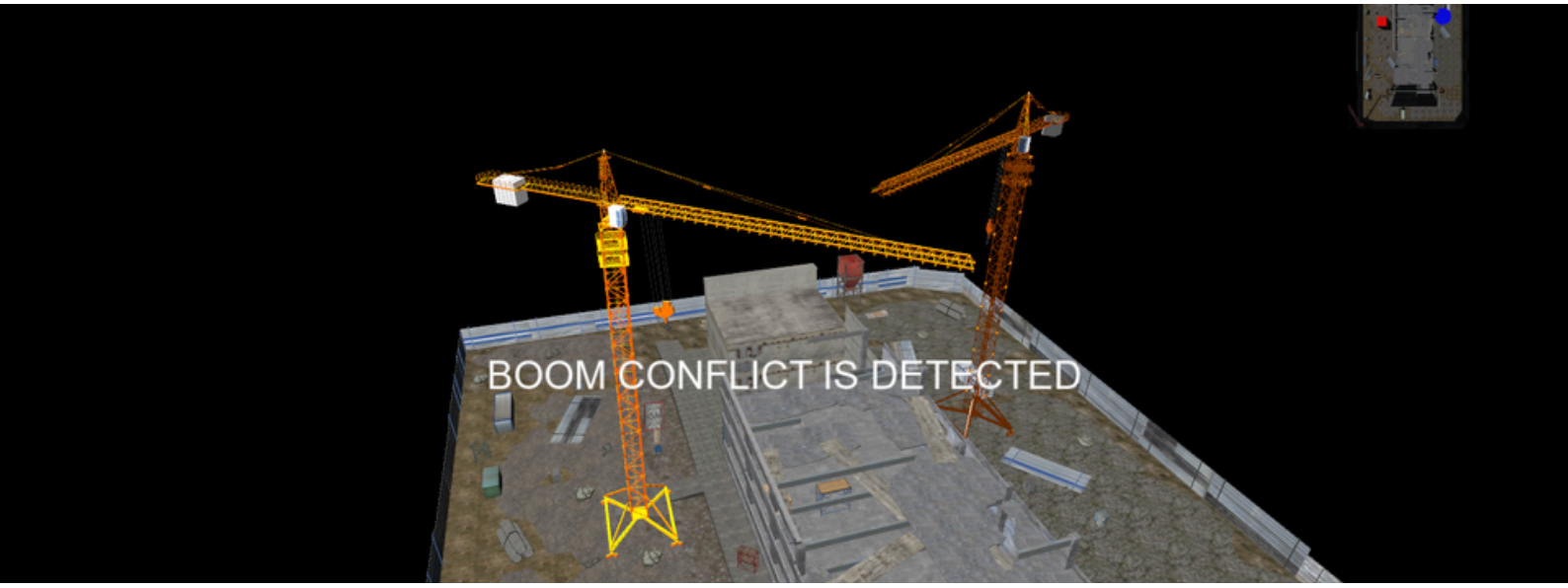

Figure 2: Boom Conflict Detected

The benefits of this project are substantial. By preventing real-world crane collisions, it enhances safety on construction sites and reduces trial-and-error in crane placement. Engineers can experiment with different crane positions in VR, minimizing costly on-site adjustments and delays. Furthermore, it serves as a risk-free training platform, allowing engineers and crane operators to understand optimal placement strategies in a safe, controlled environment. The system is also highly scalable and can be expanded to accommodate multiple cranes and diverse construction site layouts, making it a versatile tool for construction planning.

Project Ideation: Dr. S. Gopinath, Assistant Professor, Dept. of Civil Engineering
Project Development: Mr. Jayakanth, Student of B.Tech Immersive Technologies
Domain Expert: Dr. S. Gopinath, Assistant Professor, Dept. of Civil Engineering
Project Video Link: https://youtu.be/ys49hQs6oKM

BY P.MADHAN

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(IMMERSIVE TECHNOLOGIES)

NEW XR HARDWARE

ROKID GLASS

The Rokid Max 2 is Rokid's latest innovation in augmented reality smart glasses, blending immersive display technology with a sleek, ergonomic design. Built for both productivity and entertainment, Max 2 delivers a cinematic experience on the go. It features an ultra-wide 50° field of view, up to a 360-inch virtual display at a 10-meter distance, and a smooth 120Hz refresh rate—ideal for streaming, gaming, and multitasking. The dual Micro-OLED screens offer crisp visuals with up to 600 nits of brightness, ensuring clarity even in bright settings. Comfort is a major upgrade with the Max 2. Its lightweight frame, adjustable diopters for myopia, and improved nose support make it comfortable for all-day wear. It pairs seamlessly with smartphones, PCs, gaming consoles, and the Rokid Station —an Android-based companion device that adds voice control and app access. Whether used for remote work, virtual training, or immersive entertainment, Rokid Max 2 delivers powerful performance in a compact, wearable form.

Figure 1: Rokid Glass Max 2

ROTO VR

Roto VR is an advanced virtual reality platform that enhances immersion through its innovative motion chair. Designed to synchronize with VR experiences, the Roto VR Chair offers 360-degree movement, allowing users to physically rotate in response to virtual environments. This motion simulator is ideal for gaming, simulation training, and cinematic VR experiences, providing greater realism by eliminating the need for users to turn their heads manually. Equipped with features like automatic rotation tracking, haptic feedback, and foot pedal controls, the Roto VR Chair integrates seamlessly with leading VR headsets such as Oculus, HTC Vive, and PlayStation VR. It helps reduce motion sickness by aligning real-world and virtual movements, making it a top choice for VR enthusiasts, developers, and professional training applications.

Figure 2: Roto VR

NEW XR SOFTWARE

UNITY REFLECT 2.0

Unity Reflect 2.0 is a powerful tool designed specifically for the Architecture, Engineering, and Construction (AEC) industry. It enhances collaboration by enabling real-time visualization of Building Information Modeling (BIM) data in augmented reality (AR) and virtual reality (VR). With Unity Reflect 2.0, global teams can work together seamlessly, making

design decisions faster and more efficiently. The software supports integration with popular BIM platforms like Revit, Navisworks, and SketchUp, allowing users to sync and view project data in an interactive 3D environment. Its advanced rendering capabilities, cloud-based sharing, and multi-user collaboration make it a game-changer for professionals looking to streamline their workflows and improve project outcomes.

Figure 3: Unity Reflect 2.0

SPATIAL COLLABORATION SUITE

Spatial's Collaboration Suite is a cutting-edge platform designed to revolutionize remote teamwork by allowing users to meet and collaborate in immersive 3D virtual spaces. It provides an interactive environment where teams can brainstorm ideas using virtual whiteboards, share 3D models, and engage in dynamic discussions. The suite supports multiple devices, including VR headsets, AR-enabled smartphones, tablets, and traditional desktop setups, ensuring seamless connectivity across different platforms. With features like real-time avatar interactions, spatial audio, and cloud-based file sharing, Spatial's Collaboration Suite enhances productivity, making remote meetings feel as natural and engaging as in-person sessions.

Figure 4: Spatial Collaboration Suite

Reference:

https://www.tomsguide.com/computing/vr-ar/i-tested-a-vr-chair-that-moves-as-you-turn-your-head-roto-vr-explorer-is-the-wildest-gadget-ive-used-in-2024

https://www.xrtoday.com/augmented-reality/rokid-max-2-review-sharp-new-ar-specs-from-rokid/

BY RANJITH

3D MODELLING ENGINEER, CIT

SRMIST-KATTANKULATHUR

This article is about the 3D content development in the animated adventure movie **Flow** released last year (2024).

Stylized realism: Flow features a beautifully stylized world that balances realism and painterly aesthetics. It's not photoreal, but it has depth, believable physics, and environmental storytelling.

Minimalist dialogue: The film is almost entirely non-verbal, so all emotion and narrative are expressed through animation, lighting, and camera work

You won't see flashy VFX or crazy simulations, but the technical artistry is top-notch in its restraint and clarity.

TECHNICAL PIPELINE & PRODUCTION

- Gints Zilbalodis created large parts of the film solo using Blender — yes, Blender!
- Blender was used end-to-end: modeling, rigging, animation, rendering, compositing. This is huge because it shows what open-source tools can accomplish at feature film quality.

RENDERING & LIGHTING

- Rendered using Eevee, not Cycles — which is rare for animated features.
- Eevee gave real-time feedback and faster iterations.
- Smart use of volumetrics, screen space reflections, and soft shadows gives the illusion of ray tracing while keeping render times low.
- Stylized lighting helps convey mood shifts — especially in environmental storytelling as the floodwaters rise and scenes become more desperate.

SIMULATION WORK

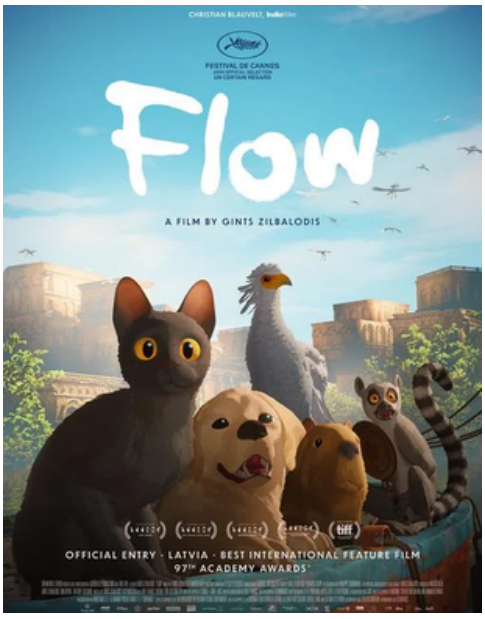
- Water simulation plays a central role:
- Not full-on FLIP simulations or Houdini-style complexity.
- Likely a mix of baked displacement maps, procedural shaders, and mesh-based animation for water.
- Simplified water behavior focuses on art direction and readability more than realism.

CREATURE & CHARACTER ANIMATION

- The film follows a cat and other animals — their body language is used to tell the story.
- Rigging is minimal but expressive.
- Subtle facial expressions, tail flicks, ear movement – attention to secondary motion is key.
- Quadruped locomotion is accurate yet stylized — likely using reference and hand-keyed animation.

COLOR GRADING & POST PRODUCTION

- Stylized color palette — earthy, muted, and pastel tones that evolve with the story.
- Used Blender's compositor for a lot of post-processing (vignette, depth of field, ambient occlusion tweaks).
- Subtle but impactful fog layers, depth cues, and bloom to separate foreground/background.



Flow's success underscores the growing recognition of independent animated films and signifies a shift in the animation industry towards valuing diverse and unconventional storytelling.

Reference:
https://www.youtube.com/watch?v=fxz6p-QATfs
https://www.blender.org/user-stories/making-flow-an-interview-with-director-gints-zilbalodis/
https://www.creativebloq.com/entertainment/movies-tv-shows/how-blender-helped-gints-zilbalodis-make-oscar-nominated-flow

3D RIGGING WORKFLOW FOR AMPUTEE SIMULATIONS

BY RANJITH

3D MODELLING ENGINEER, CIT

SRMIST-KATTANKULATHUR

This article is related to the 3D model development for a VR-based physiotherapy for amputee where a real-time rigged 3D model of a prosthetic human was created specifically for use in a VR environment.

Initially, a free-to-use human model available online was selected as the base. The model was fully rigged for real-time interaction, with performance in VR carefully considered—low-polygon geometry was applied where necessary, clean skin weights were maintained, and bone structures were optimized.

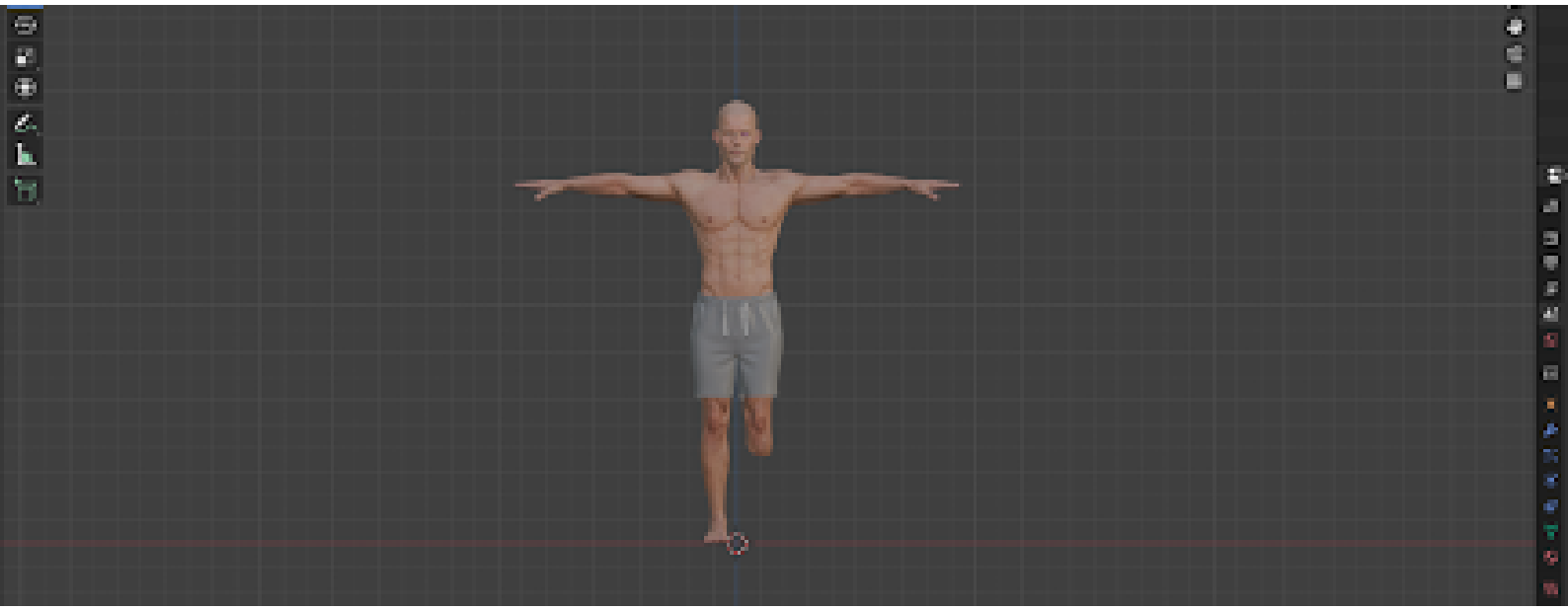


Figure 1: Rigged Humanoid Model with Leg Amputations

To simulate a prosthetic scenario, one of the legs was removed to create a realistic amputation. A custom prosthetic leg was then modeled and seamlessly integrated into the character's body. Both right and left leg variations were rigged to offer flexibility based on scene requirements or user interaction.

Rigging for VR was approached with a focus on both functionality and efficiency to ensure smooth performance in real-time engines such as Unity or Unreal. In immersive environments, anatomical accuracy becomes essential—as the details are experienced more viscerally in VR.

The final model was developed for integration into a VR simulation, where users can either interact with or observe the prosthetic in a highly realistic setting. It was designed to support real-time animation and physics, making it suitable for:

- Medical training and simulations
- Prosthetic fitting demonstrations
- Immersive storytelling and character exploration

The design of the prosthetic was guided not only by aesthetics but also by biomechanics—emphasizing how the limb moves and connects with the body in motion.

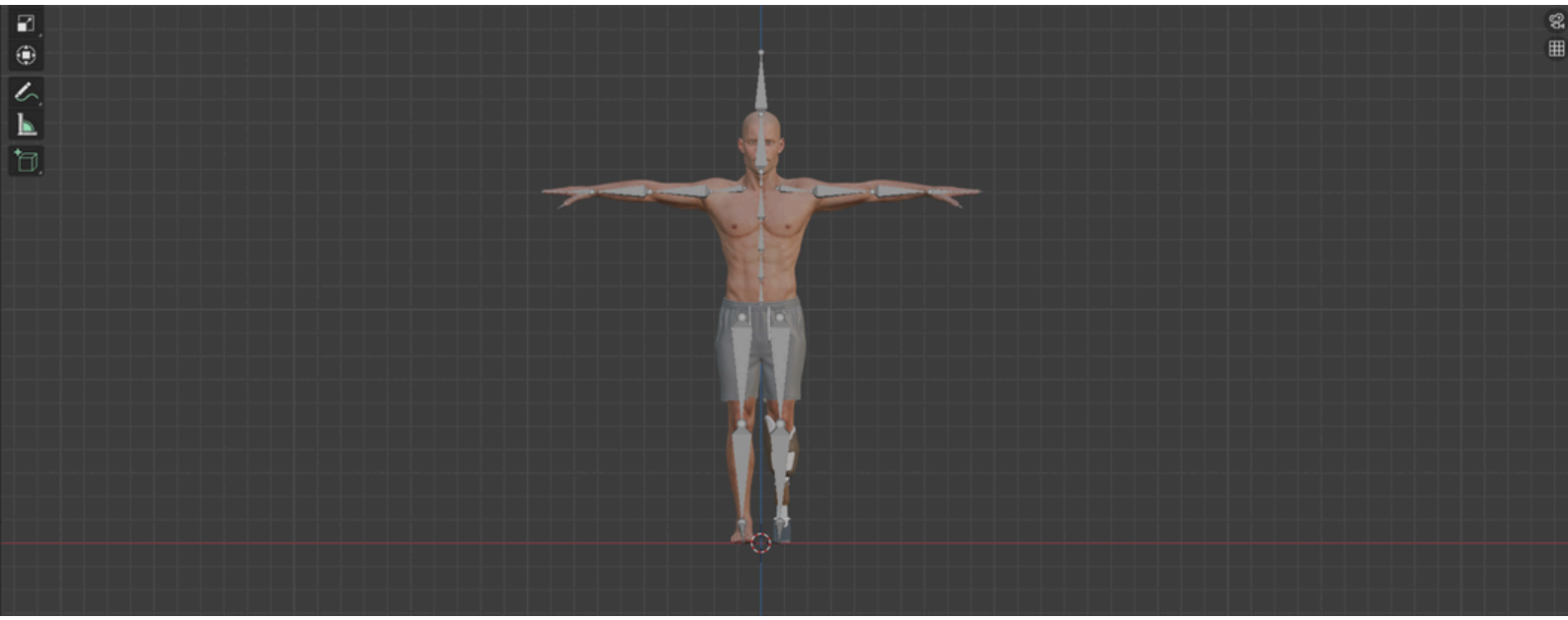


Figure 2: Rigged Humanoid Model with External Accessories

Project Ideation: Mrs. Yasmeen Imtiaz G, Assistant Professor, SRM College of Physiotherapy, Medicine & Health Sciences
3D Model Development: Mr. Ranjith, 3D Modelling Engineer, CIT
Domain Expert: Mrs. Yasmeen Imtiaz G, Assistant Professor, SRM College of Physiotherapy, Medicine & Health Sciences

UNDERSTANDING MECHATRONICS SYSTEMS THROUGH IMMERSIVE EXPERIENCE

BY VIGNESH
SENIOR XR DEVELOPER, CIT
SRMIST-KATTANKULATHUR

Immersive technologies, particularly Virtual Reality (VR), have transformed how we engage with and understand complex systems. By creating interactive, three-dimensional environments, VR allows users to experience and manipulate digital representations of physical objects, leading to enhanced learning and comprehension. In the realm of mechatronics—an integration of mechanical engineering, electronics, and computer science—VR provides a powerful tool for exploring systems like washing machines. This document highlights how VR facilitates understanding through three perspectives: Component View, Functional View, and Exploratory View.

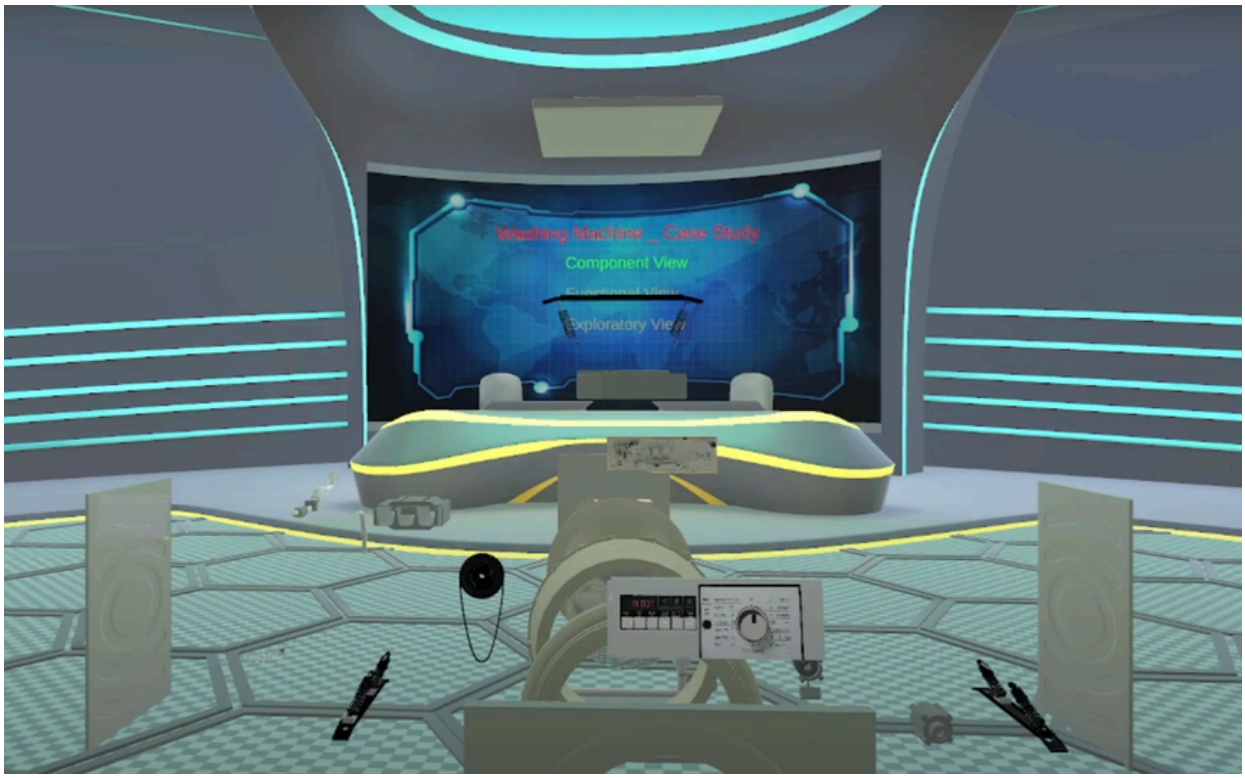


Figure 1. Exploded View of Washing Machine

UNDERSTANDING THE WASHING MACHINE AS A MECHATRONICS SYSTEM WITH VR

A washing machine exemplifies a mechatronics system, integrating mechanical parts, electronic controls, and software to perform the task of cleaning clothes. Using VR, users can gain insights into this complex device in ways that traditional methods cannot achieve.

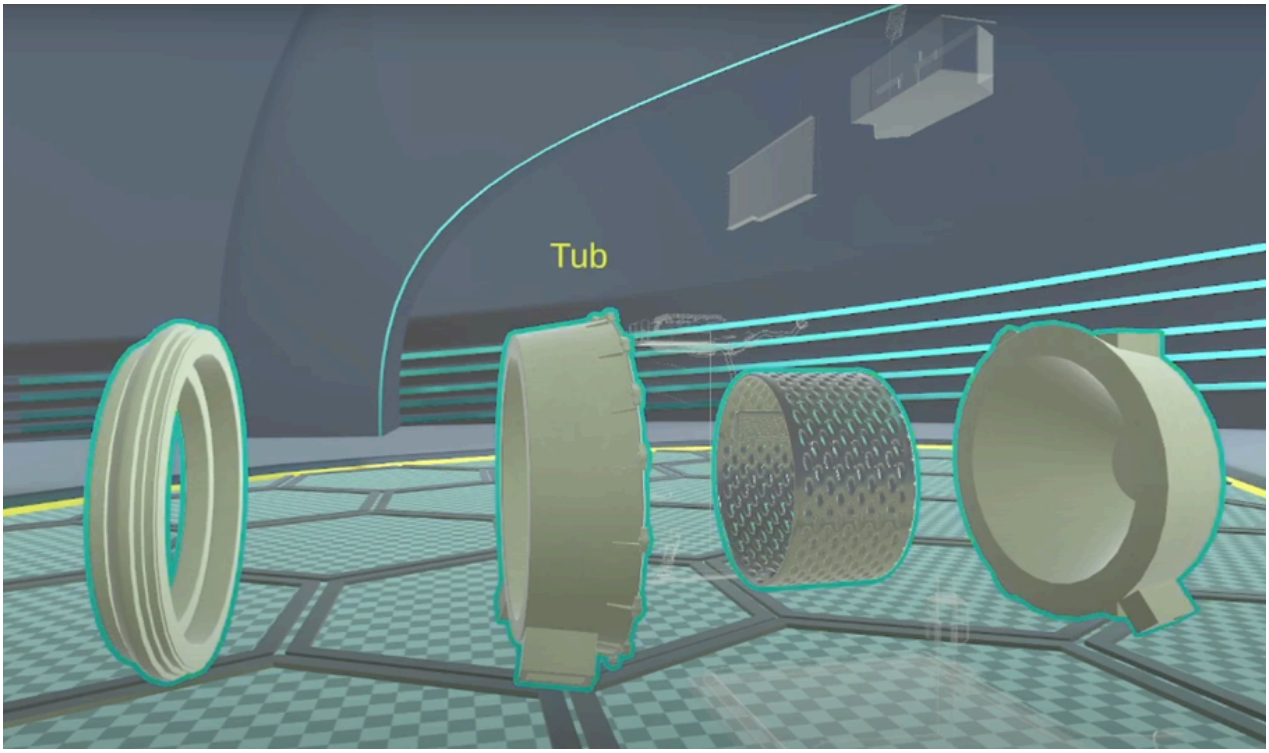


Figure 2. Exploring Individual Components of Washing Machine with Functionalities

COMPONENT VIEW

The Component View emphasizes the individual parts of the washing machine and their interactions. VR enhances understanding in the following ways:

Guided Learning Experiences: Users can engage in structured tutorials and challenges within the VR environment, reinforcing key concepts and encouraging active participation in their learning journey.

Visualizing Interactions: In VR, users can see how components fit together and interact. For example, they can observe how the motor drives the drum and how sensors detect load weight, leading to a more intuitive understanding of the machine's design.

FUNCTIONAL VIEW

The Functional View illustrates how the components work together in a washing cycle. VR aids understanding through:

Dynamic Simulations: Users can initiate a virtual wash cycle, witnessing the step-by-step operations—filling, washing, rinsing, and spinning. This sequence helps users understand how timing and coordination among components are essential for effective washing.This hands-on experience helps them understand how sensors and controls work together to maintain operational integrity..

User Experience: By practicing on the control panel, users can learn how to navigate different settings and see immediate results. This familiarity enhances their confidence in using actual machines.

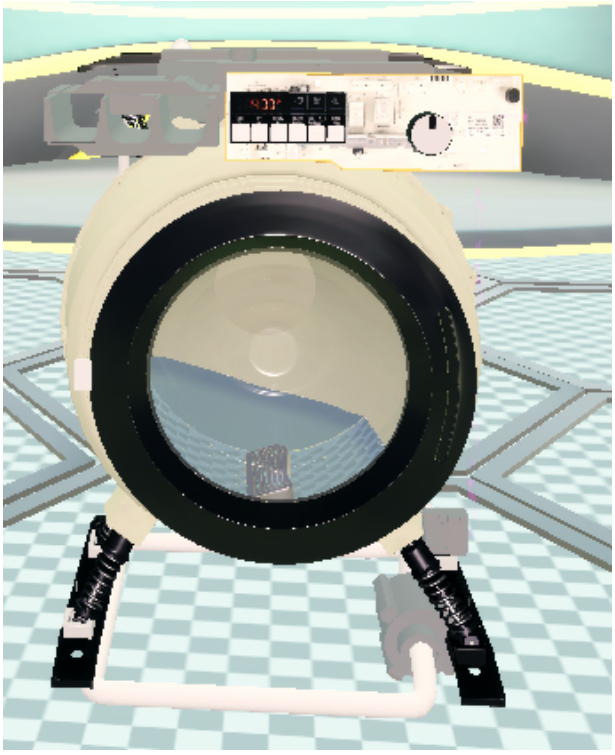


Figure 3: Working Animation Showcasing the Washing Machine Functionality

EXPLORATORY VIEW

The Exploratory View allows users to investigate the washing machine's design and operation in depth. VR contributes to understanding by offering:

Interactive Exploration: Users can virtually examine components such as the drum assembly, motor, control panel, sensors, and water systems. By manipulating these elements in a 3D space, users can grasp their physical layout and function.

Component Behavior: Users can experiment with different settings (e.g., motor speed) and immediately see the effects on the washing process. This direct interaction reinforces learning by providing real-time feedback.

Integrating VR into the study of mechatronics systems like washing machines offers a transformative educational experience. By facilitating interactive exploration, dynamic simulations, and innovative design experimentation, VR enhances understanding of complex systems. The Component, Functional, and Exploratory views provided by immersive technologies enable learners to visualize, engage with, and comprehend the intricate workings of mechatronics, preparing them for real-world applications in engineering and beyond.

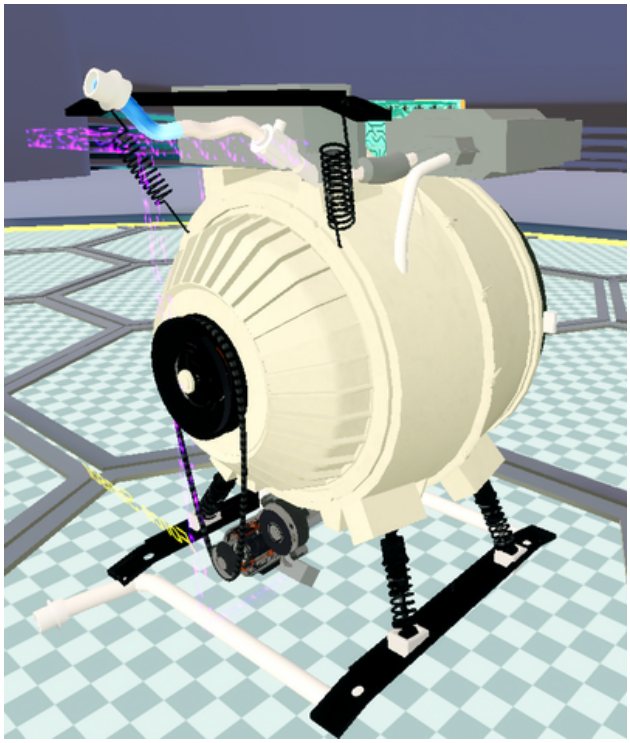


Fig 4 Working Animation Showcasing the Washing Machine Functionality

This VR module, developed by CIT, is used as supplementary technical orientation content for first-year students of all specializations of BTech Mechatronics Engineering.

Fig 5 Students Experiencing Washing Machine Case Study as Mechatronics System Module in VR Studio

Project Ideation: Dr. R. Senthilnathan, Professor, Dept. of Mechatronics Engineering
XR Development: Mr. G. Vignesh, Senior XR Developer, CIT
3D Asset Creation: Mr. Kamlesh, Former 3D Modelling Engineer, CIT
Domain Expert and Narrative: Dr. K. Sivanathan, Assistant Professor, Dept. of Mechatronics Engineering
Project Video Link: https://youtu.be/bsEfZlfN3o0

BY S.P.VISHWAS

I YEAR STUDENT OF B.TECH
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(IMMERSIVE TECHNOLOGIES)

Stay updated with the latest news in Extended Reality (XR), where innovation in virtual, augmented, and mixed reality is shaping the future of digital experiences.

GOOGLE'S ANDROID XR & SAMSUNG'S PROJECT MOOHAN

Google has announced Android XR, a mixed reality operating system set to power the next generation of AR/VR devices. Samsung's Project Moohan, expected in 2025, will be the first consumer headset running Android XR. This device will feature immersive content capabilities, optional light seals, and Gemini AI integration for seamless interactions.

META'S PROJECT ORION

Meta's Project Orion, an AR eyewear prototype, aims to introduce in-lens holographic displays controlled via a sensor wristband, pushing the boundaries of augmented reality applications.

KEY XR EVENTS IN APRIL 2025:

Laval Virtual 2025:

- Dates: April 9-11, 2025
- Location: Laval, France
- Highlights: As highlighted previously, Laval Virtual is a cornerstone event in the European XR landscape. This multi-day experience features a comprehensive exhibition showcasing cutting-edge technologies, insightful conference sessions led by industry experts, opportunities for business matchmaking, and engaging networking events. It's a fantastic platform to get a pulse on the European XR market and connect with a diverse range of professionals.

AI & Metaverse Innovate Summit 2025:

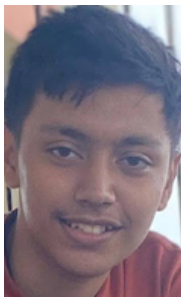
- Dates: April 17-18, 2025
- Location: Online
- Highlights: This virtual summit delves into the exciting intersection of Artificial Intelligence and the Metaverse. Over two days, attendees can expect to hear from thought leaders, participate in interactive sessions, and gain insights into how AI is shaping the future of immersive digital experiences. Topics will likely include AI-powered content creation, intelligent avatars, enhanced user interactions, and the evolving landscape of AI within virtual worlds.

VENTILATED IMMERSIVE SUIT FOR INTERACTIVE & OPERATIVE NUCLEAR OPERATIONS (VISION) APPLIED TO ITER TEST BLANKET MODULES

BY K.P.HARJIT

II YEAR STUDENT OF B.TECH

. MECHATRONICS ENGINEERING
(IMMERSIVE TECHNOLOGIES)



This article is about **THE VISION project,** a groundbreaking innovation in **Extended Reality (XR) training**, designed to enhance safety for workers in nuclear environments. Developed in collaboration with **MATISEC**, this initiative combines a high-tech protective suit with immersive XR simulations, allowing trainees to experience realistic work conditions without exposure to actual hazards.

At the heart of this system is the MATISEC MRV5 prototype, a next-generation air-fed suit (AFS) designed for use in XR-based simulations. This suit is embedded with advanced sensors, including internal and external motion trackers, inertial units, and optical depth cameras, ensuring precise real-time monitoring of body movements. Inside the suit, specialized gloves track hand motions, allowing users to interact naturally with the virtual environment. To enhance the immersion further, Kinect cameras are placed strategically, capturing the full range of movement and creating a 360-degree view of the surroundings.

Figure 1 Virtual Clash Detection with Depth Camera.

Figure 2. Qualification Process with Nuclear Experts.

The virtual environment is a detailed simulation of a nuclear facility, featuring pipelines, welding stations, and complex machinery. Through XR, trainees can practice technical tasks such as assembling and disassembling components, handling flanges, and performing welding operations with accuracy. The XDE physics engine ensures that every interaction feels realistic, making the training experience as close to the real world as possible.

Beyond technical training, this system is also designed for emergency response preparation, allowing workers to experience different safety scenarios in a controlled setting. By simulating high-risk situations, trainees can learn how to react effectively without real danger.

Despite its advantages, the technology comes with a few challenges. The enclosed nature of the suit can sometimes reduce airflow, making it less comfortable for extended use, and visibility of the feet is somewhat limited, which may affect movement accuracy. However, these are areas that can be refined as the system evolves.

By integrating XR technology with protective gear, the VISION project is setting a new standard for nuclear safety training. This innovation not only minimizes risks but also enhances learning by allowing users to gain hands-on experience in a completely virtual yet highly realistic setting. With continued improvements, this approach could revolutionize safety training for hazardous industries, making workplaces safer and more efficient than ever before.

References:

https://doi.org/10.1016/j.fusengdes.2025.114889

AUGMENTED REALITY FOR DIMENSIONAL METROLOGY: BRIDGING PRECISION & VISUALIZATION

BY G. KARTHIKEYAN
RESEARCH SCHOLAR
DEPT. OF MECHATRONICS ENGG.

A novel AR-based application for dimensional metrology is pushing the boundaries of industrial quality inspection by enabling real-time, interactive 3D evaluation of manufactured parts. This system combines stereo and structured light-based 3D reconstruction techniques with immersive AR visualization for effective discrepancy analysis.

THE CORE INNOVATION: AR-DRIVEN EVALUATION

Using Vuforia's Model Target technology, the AR application can

- Automatically detect physical parts using their 3D geometry.
- Overlay the CAD model onto the real-world object.
- Visually compare scanned reconstructions from stereo and structured light-based systems.
- Compute and display key geometric distance metrics like Chamfer Distance and Hausdorff Distance directly on the screen.

This markerless AR system works robustly even with low-feature, textureless models, offering seamless interaction for industrial operators.

AR APP DEVELOPMENT WORKFLOW

MODEL TARGET GENERATION (MTG):

- CAD models are imported into Vuforia's MTG.
- 360° advanced views are trained to detect and track the object in any orientation.
- A custom dataset is exported for Unity integration.

UNITY INTEGRATION:

- The scanned models and CAD model are aligned using translation/rotation tools.
- UI elements are added, including buttons to toggle visibility and trigger distance calculations.

DISTANCE METRIC SCRIPTING:
A CUSTOM C# SCRIPT PERFORMS:

- Real-time Chamfer and Hausdorff Distance calculations between the CAD and reconstructed models.
- UI updates to show these metrics upon user input.

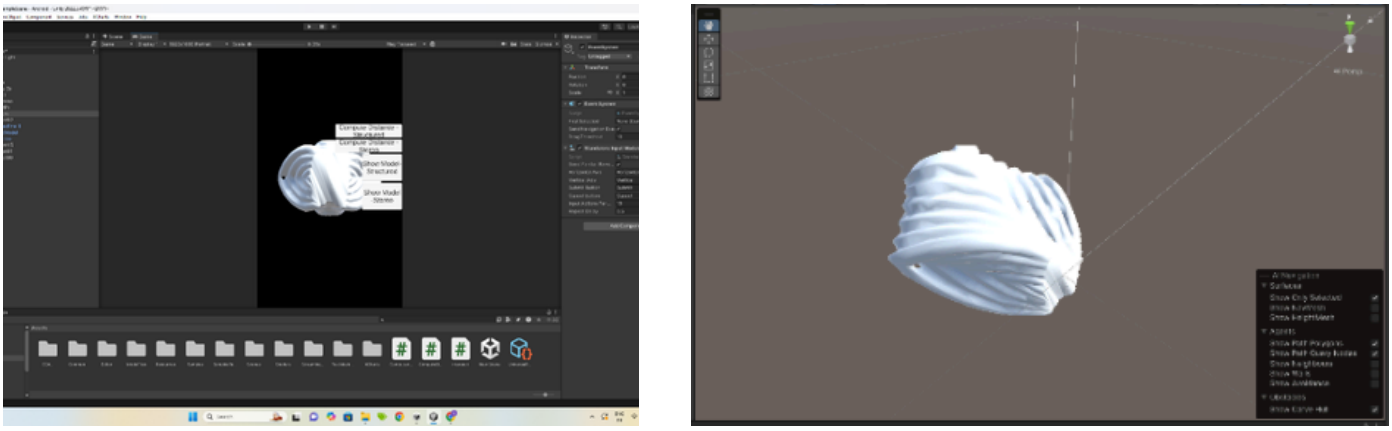


Fig 1 Left: Game Object of CAD Model Loaded and Aligned in the Scene Window. Right: Game Window Showing Aligned Model with UI Buttons

ALGORITHM 1 ALGORITHM TO DEFINE THE FUNCTIONALITIES OF THE AR APP WRITTEN IN C#

INPUT:

- model1, model2, model3: Three sets of 3D models represented as mesh objects(CAD model, Stereo scanned model, Structured light scanned model).
- currentVase: Integer representing the index of the current vase model.
- UI Buttons: For triggering distance computation between different models.

OUTPUT:

Displayed Chamfer and Hausdorff distances on the UI.

INITIALIZATION

- **Button Listeners** Attach listeners to UI buttons that trigger distance computations.
- **Button for model2** is linked to compute the distance between model1 and model2.
- **Button for model3** is linked to compute the distance between model1 and model3.

SET CURRENT MODEL FOR COMPARISON

- **SetCurrentVase(no)**: Update the index (currentVase) of the vase model that is being analyzed.
- **ActivateScan1() and ActivateScan2()**: Toggle visibility of the selected models (stereo-based reconstructed model or structured light-based scanning model) based on currentVase.
- **Deactivate all models** in the respective arrays before toggling the selected model

COMPUTE AND DISPLAY DISTANCES

- Trigger Computation: On button press, call **ComputeAndDisplayMetrics**
- The function retrieves mesh vertex data from the 3D models: CAD model and **modelToCompare** (either Stereo scanned or structured light scanned model based on the button pressed).
- The vertices are transformed into world coordinates using the **GetVertices** (model) function
- **Randomly sample** 2048 points from each model's vertex list to ensure a manageable point set size.

DISTANCE METRICS

- Calculate **Chamfer Distance**: For each point in points1, find the closest point in points2 and vice versa and return the average of both sums
- Calculate Hausdorff Distance: For each point in points1, find the closest point in points2 and record the largest minimum distance. Similarly, find the largest minimum distance from points2 to points1 and return the maximum of these 2 distances

REAL-TIME VISUALIZATION IN ACTION

Once deployed (tested on a Samsung S20 FE), the app:

- Recognizes a physical object via the AR camera.
- **Overlays the CAD model**, followed by the **scanned 3D reconstruction**.
- Highlights **physical deviations or defects**.

Displays the measured distances, assisting in pass/fail decisions during inspection.

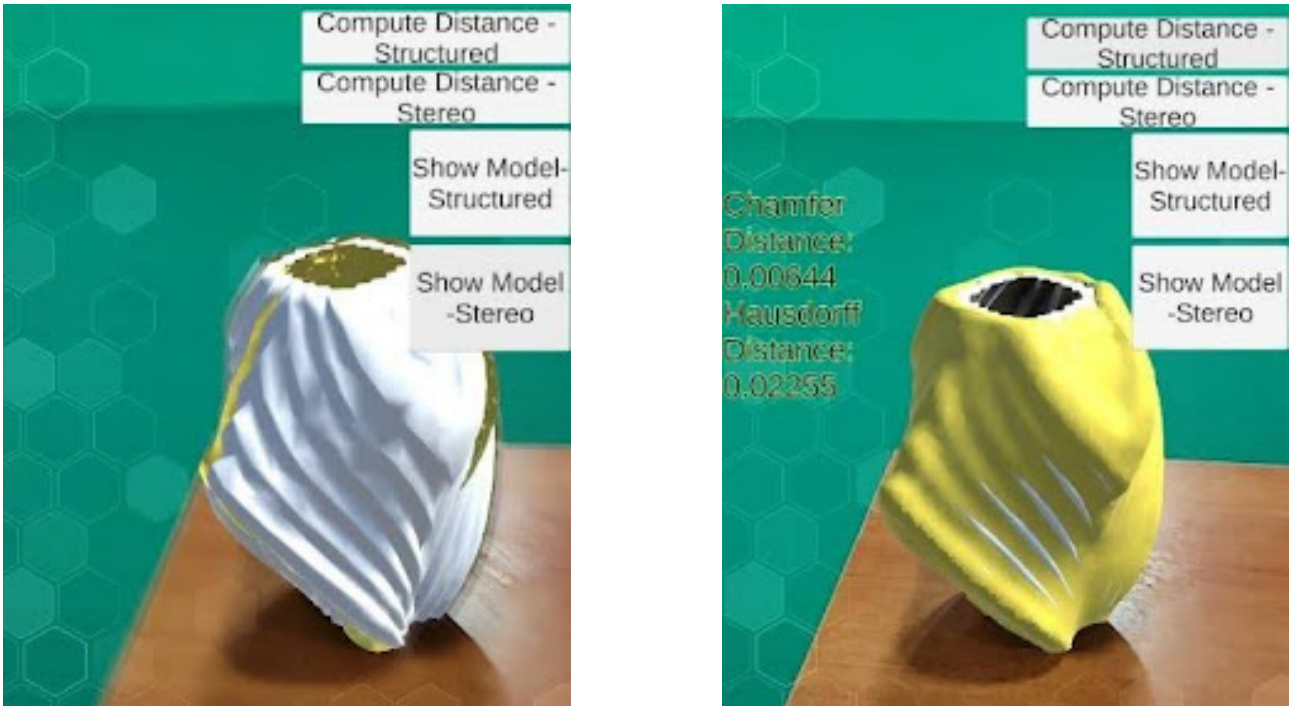


Fig 2: Real-world overlay showing CAD model + stereo/structured light scan with metrics.

Project Ideation and Development : Mr. G. Karthikeyan, PhD Scholar, Dept. of Mechatronics Engineering
Project Video Link: https://youtube.com/shorts/vGvIYXkSpcE

Reference:

Karthikeyan G and Senthilnathan R. "Development and performance evaluation of stereo and structured light reconstruction systems for dimensional metrology application using augmented reality and distance metrics". Measurement Science and Technology, Volume 36, pp 046008; 2025.

BY R. PRAKASH
ENGINEERING ASSOCIATE
CENTRE FOR IMMERSIVE TECHNOLOGIES

Dr.S.Devarajan Sr.vice president from TVS Motor company, visited Centre for Immersive Technologies on 26/02/2025

International Advisory Board Members Prof. J. N. Reddy, Texas A&M University, USA, and Professor Junghyun Cho from Binghamton University, USA visited Centre for Immersive Technologies on 25/02/2025

Dr Senol Piskin from Istinye University, Turkey visited Centre for Immersive Technologies on 14/02/2025

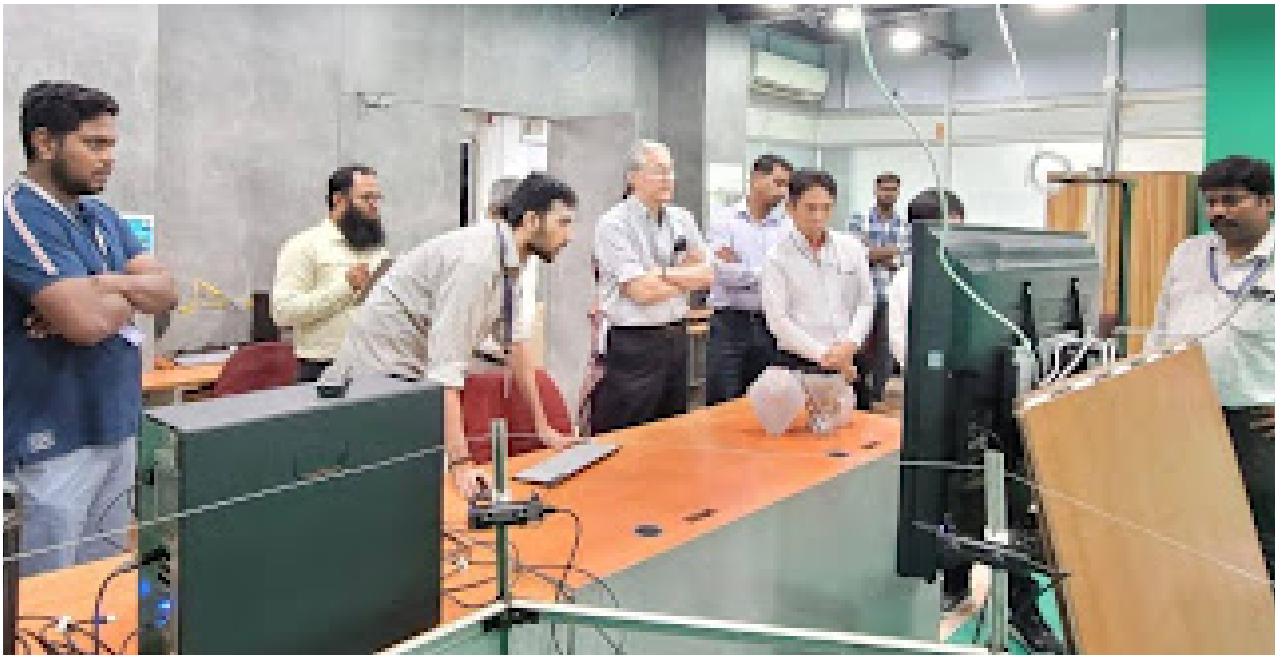
Dr. Rajkumar Roy,Prof. Executive Dean of the School of Science and Technology at City, St George's University of London UK. visited Centre for Immersive Technologies on 10/02/2025,

Dr.Tole Siutikno, Professor, Universitas Ahamad Dahlan, Yogyakarta, Indonesia and Dr.Lina Hindayani, Professor, Dept of Public Health, Universitas Ahamad Dahlan, Yogyakarta, Indonesia visited centre for Immersive Technologies on 07/02/2025.

Delegates from SCMS School of Engineering & Technology (SSET), Ernakulam, Kerala visited Centre for Immersive Technologies on 29/01/2025

Dr Prasad Panda, Director of Industry Relations, Vignan's University, visited the Centre for Immersive Technologies on 27/01/2025.

State Institute of Rural Development (SIRD) visited the Centre for Immersive Technologies, with Dr. V. Thirumurugan, Associate Director (Campus Life) on 23/01/2025



A Team from Astemo LTD, Japan visited Centre for Immersive Technologies on 20/01/2025

TRENDS IN XR INDUSTRIES

Mr. Jasim Mohammed, Founder & CEO at Neur Industries Pvt Ltd visited the Centre for Immersive Technologies on 19th March 2025 to interact with students and staff associated with Immersive Technologies. The interaction covered various topics such as:

- Future of XR
- Pros and Cons of XR
- Role of XR in Holograms
- Future of the Metaverse
- Project Management in Industries
- Key Aspects of a Start-up,
- Applications of XR in India
- Challenges in Implementing XR Technologies

The students of B.Tech Mechatronics Engineering with Spln. in Immersive Technologies demonstrated the various projects developed by them. Mr. Jasim was very impressed with the work and assured internship opportunities to students based on the request from the institute's side.

PANEL DISCUSSION

Dr. R. Senthilnathan, Professor and Head, Centre for Immersive Technologies, SRM Institute of Science and Technologies participated in the Panel Discussion on as part of the IEEE SPS Sponsored Forum: Industry-Academia Conclave on "Transforming Experiences – AR/VR Technologies in Education" organized by the Department of Electronics and Communication Engineering, **Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology**, Avadi, Chennai, Tamil Nadu.

The following members were the co-panelists:

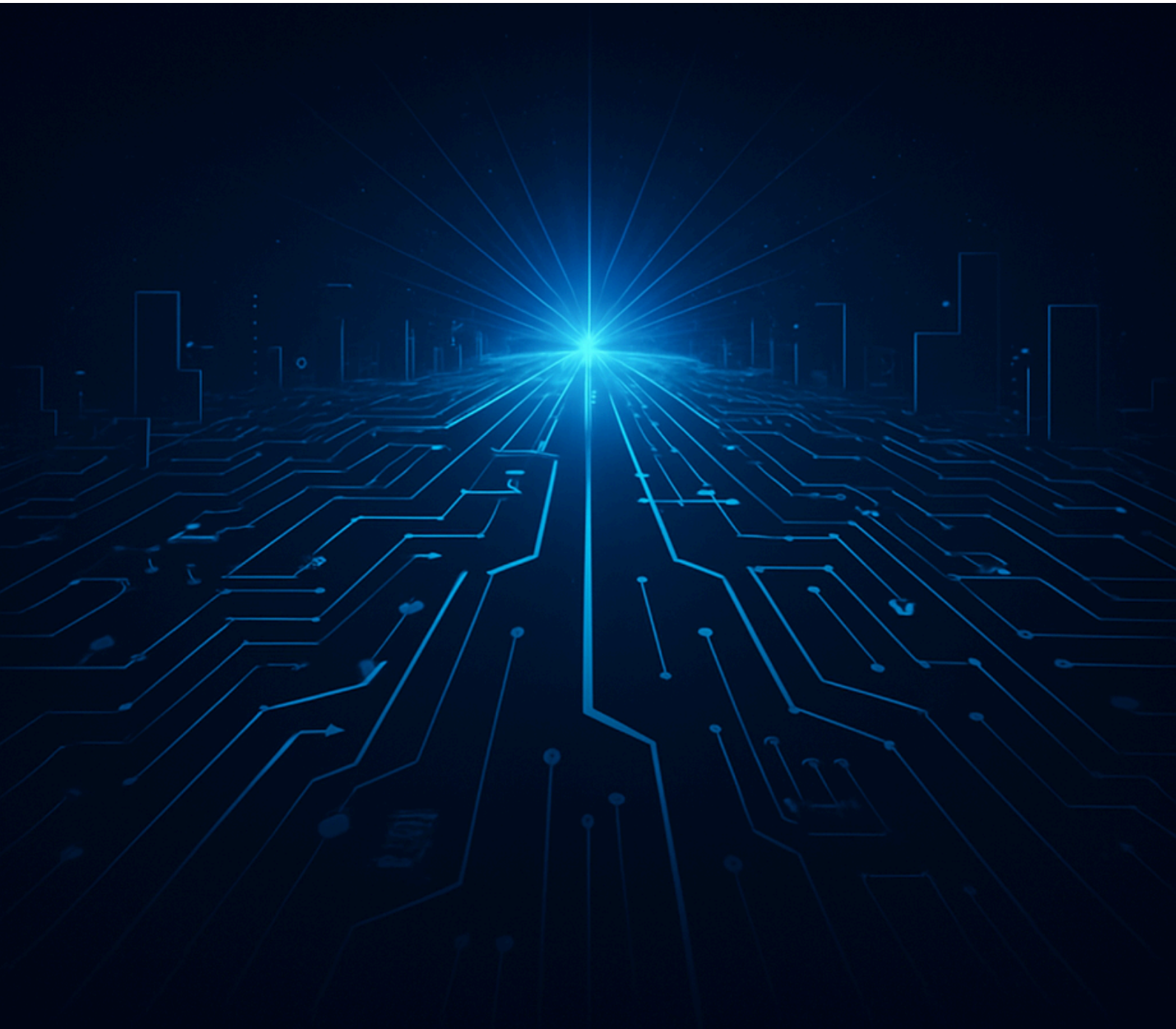
- Dr. S. Pravin Kumar, Associate Professor, Department of Biomedical Engineering, SSN College of Engineering, Chennai.
- Mr. Vishnu T U, CEO & Co-Founder, ALLREAL (Machenn), Coimbatore.
- Faculty members of Dept. of Electronics and Communication Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Avadi.

The discussion were centered around various frontiers of XR technologies and its adoption in education.

GUEST LECTURE

Dr. R. Senthilnathan, Professor and Head, centre for Immersive Technologies, SRM Institute of Science and Technologies delivered technical speech on the title “Understanding Virtual Reality from a System Integrator’s Perspective” on 20th February, 2025 in the Department of Production Technology, **MIT Campus of Anna University**, Chennai. The talk is organized as part of 25th year celebration of M.E Mechatronics program in MIT Campus.

Dr. R. Rajkumar, Core Faculty Member, Centre for Immersive Technologies, SRM Institute of Science and Technologies delivered technical speech on the title “The Influence of Personality on Multiplayer Gaming Preferences” as part of 'XR Summit' hosted by **Indian Institute of Technology, Madras** on 16th – 17th November 2024.



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