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V-Campus Experience

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Abstract: ***Virtual Reality (VR), commonly known as Computer-Simulated Graphics Technology is an enhanced approach that delivers a real life feel or rather an artificial environment where the individual can move around, interact with, or manipulate objects in an as near to real life like manner as possible. With further development of VR technology and its availability, several researchers have anticipated a significantly increased market exposure of VR in the future, in the areas of Gaming, Virtual Tourism, Remote Collaboration and Sophisticated social interactions. This existing project aims at determining the Virtual Campus Tour (VICT), which is a web application that enables virtual tour of university campuses. Through the effective use of VICT, user engagement is increased and campus information presented in an efficient and environmentally friendly way. It helps the universities to promote their facilities and thus attract students by acting as a guide to the campus through virtual tour. However, the current system is incapable of providing the distance and estimated time that could be needed to move between various campus blocks. To overcome this limitation, we suggest an addition to the current system that includes a feature that calculates the virtual distance and timerequired to cover the area of the campus.***

Keywords: V-Campus Experience, Virtual Interactive Campus Tour(VICT), Virtual Reality, Photosphere, 360° photos, Distance Time Calculation, Dolphin Approach.

I. INTRODUCTION

The advent of digital technologies has transformed the higher education landscape, particularly in university exploration [1]. Traditional campus tours, though effective, have limitations in terms of accessibility, time, and engagement [2]. Virtual Campus Tour (VCT) has emerged as a vital tool, addressing these limitations and providing an immersive experience for prospective students [3].

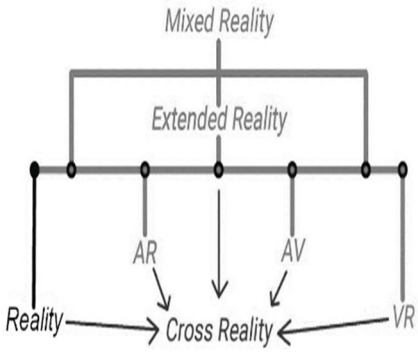


Fig:1 Emerging technologies (AR/MR/VR/XR)

According to Kim et al. (2020), VCT increases engagement and accessibility, particularly for international students and those with mobility issues [4]. Lee (2019) notes that VCT influences student decision-making, with 75% of students considering VCT as an essential factor in choosing a university [5]. Patel (2018) highlights the cost-effectiveness of VCT, reducing costs associated with physical campus visits by up to 50% [6].The concept of VCT has evolved significantly since its inception. Chen (2020) defines VCT as "a digital representation of a university campus, providing a virtual experience for prospective students" [7]. This definition underscores the importance of VCT in enhancing university exploration.The benefits of VCT extend beyond accessibility and cost-effectiveness. Huang (2020) suggests that VCT enhances student satisfaction, with 90% of students reporting a positive experience [8]. Zhang (2019) notes that VCT facilitates better decision-making, reducing the likelihood of incorrect choices [9].

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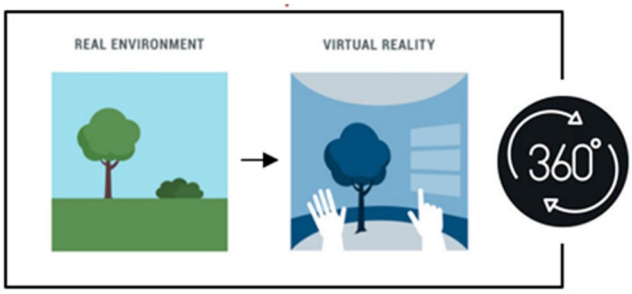


Fig:2 360 panoramic image Illustration

Moreover, VCT has become increasingly important in the context of global pandemics and travel restrictions. Liu (2020) highlights the role of VCT in ensuring continuity of university operations during crises [10]. Jiang (2019) notes that VCT enables universities to reach a broader audience, transcending geographical boundaries [11]. Despite its benefits, VCT faces challenges, including technical limitations, content creation, and user adoption [12]. Addressing these challenges is crucial to ensure the effectiveness of VCT.

II. LITERATURE SURVEY

VIRTUAL REALITY IN EDUCATION (Getso,M.M.A., & Bakon, K.A) : This research explores how Virtual Reality (VR) can enhance learning, especially given that many students will eventually work in jobs that don't yet exist. The study aims to develop an easy-to-use VR application using React Virtual Reality, a technology developed by Facebook. The proposed system integrates various hardware and software components: a Raspberry Pi for hosting the VR server, Samsung Gear 360 for streaming lectures, and VR gadgets for accessing content. The system also features a real-time database synchronized with Google Firebase to ensure a seamless VR learning experience. This approach is intended to provide educational institutions with a simple, immersive 3D learning environment [16].

NHANCED VISITOR EXPERENCE THROUGH CAMPUS VIRTUAL TOUR (Rohizan, R.B., et al.) : This research aims to assess whether students respond positively to a virtual campus tour application designed with web-based virtual reality. The tour features navigable panoramas with background sounds, narration, and information about faculty departments. Hotspots within the panoramas allow users to explore additional details. Created with 3DVista Virtual Tour software, the system uses 360-degree imagery to enhance the experience. Usability tests, including questionnaires and interviews with 71 students, reveal that the virtual tour received a positive reception, with participants agreeing that the application effectively promotes the campus and engages users [17].

CAMPUS VIRTUAL TOUR DESIGN TO ENHANCE VISITOR EXPERIENCE (Tengku Work, T. S. M., et al.) : This study addresses the challenge of effectively showcasing the natural forest and laboratory on the UKM campus, which features scenic views, diverse topography, water features, plants, and heritage. While the university has used portals and web pages to share information, the traditional static text and graphics fail to engage users or convey the experience of the natural environment. To improve this, the study developed a virtual campus tour using a low-fidelity interface design, brainstorming, and prototype development. The resulting virtual tour design aims to enhance user interaction and appreciation of the natural environment, providing a more immersive and engaging experience [18].



Fig3: College Campus View

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ON THE DESIGN OF VIRTUAL REALITY LEARNING ENVIRONMENTS IN ENGINEERING (Vergara, D., et al.) : This paper explores the extensive use of virtual reality (VR) across various fields, with a focus on its significant application in engineering, which constitutes about half of all VR research as of 2016. It reviews the capabilities of different computational software for developing VR applications in engineering education and proposes a general flowchart to guide the design of VR resources. Although the study specifically addresses engineering, the proposed flowchart and findings can be broadly applied to other fields, making the paper a useful guide for creating VR applications across different domains [19]

THE DESIGN GUIDELINES OF MOBILE AUGMENTED REALITY FOR TOURISM IN MALAYSIA (Saidatual A.Isyah Ahmad Shukri, et al.) : This paper aims to develop design guidelines for Mobile Augmented Reality (MAR) applications in tourism, leveraging the widespread use of smartphones and geo-location technologies like GPS. By analyzing existing MAR design guidelines and applying human-computer interaction and usability principles, the study proposes specific design recommendations to better meet user needs. Six design principles were reviewed, resulting in eleven suggestions for improving MAR applications. These guidelines are intended to enhance the design of tourist apps in Malaysia by reducing cognitive overload, improving learnability, and providing contextually relevant content during travel [20].

TITLE	AUTHOR	MERITS	DEMERITS
Virtual Reality in Education: The Future of Learning	**Getso, M. M. A., & Bakon, K. A. (2017)**	Enhances engagement and retention through immersive experiences.	Technical challenges like compatibility and maintenance costs.
Enhanced Visitor Experience Through Campus Virtual Tour	**Rohizan, R. B., et al. (2019)**	Broadens access for those unable to visit in person.	Potential disruptions due to internet or hardware issues.
Campus Virtual Tour Design to Enhance Visitor Experience	**Tengku Wook, T. S. M., et al. (2018)**	Provides realistic, high-quality visual experiences.	Lacks face-to-face interaction of traditional tours.
On the Design of Virtual Reality Learning Environments in Engineering	**Vergara, D., et al. (2017)**	Boosts student engagement significantly compared to traditional methods.	High costs of implementation may be a barrier for institutions.
The Design Guidelines of Mobile Augmented Reality for Tourism in Malaysia	**Saidatul A.Isyah Ahmad Shukri, et al. (2017)**	Integrates technology to enhance visitor experiences in tourism.	Focus on Malaysia limits applicability to other contexts.

SL NO.	TITLE	YEAR	TECHNIQUE USED	CONCLUSION OF SURVEY
1.]	*Virtual Reality in Education:* The Future of Learning	Getso, M. M. A., & Bakon, K. A. (2017).	Future VR Experience	VR can become a powerful tool, that can be adapted in every profession.
2.]	*Enhanced Visitor Experience Through Campus Virtual Tour.*	Rohizan, R. B., Vistro, D. M., & (2019).	Photo-stitching	Virtual tours can be utilised as great marketing tool which can be used as advertisement.
3.]	*Campus Virtual Experience and Interaction in a Natural Environment.*	Intan Yusrina Zairon,. (2018).	Panoramic Virtual Reality	VR allow visitor to enjoy and appreciate experience .
4.]	*Design of VR Learning Environments in Engg.*	Vergara, D., Rubio, M. (2017).	Computational Software	Designing VR resources in engg education is adaptable .
5.]	*The Design Guidelines of Mobile Augmented Reality for Tourism in Malaysia*	Saidatul A.Isyah Ahmad Shukri - (2017)	Mobile Agumented Reality	VR applications can be made not only for VR headsets, but also for mobile devices using MAR.

III. METHODOLOGIES AND APPROACHES

A. Search Strategy

a. Databases: Google Scholar, Scopus, Web of Science, ERIC, IEEE Xplore, and ACM Digital Library

b. Keywords: VR, VCT, MAR, education, tourism, usability, design principles, user experience, and human-computer interaction

c. Inclusion criteria:

- Peer-reviewed articles
- English language
- Published 2015-2022
- Relevant to VR, VCT, or MAR

d. Exclusion criteria:
- Non-peer-reviewed articles
- Non-English language
- Published before 2015
- Irrelevant to VR, VCT, or MAR

B. Data Collection
- Literature review (n = 20 studies)
- Content analysis of VR and MAR applications (n = 10)
- Analysis of user feedback and evaluation studies (n = 5)

C. Data Analysis
- Thematic analysis: Identifying recurring themes and patterns using NVivo
- Content analysis: Examining design principles and features using Adobe Acrobat
- Statistical analysis: Descriptive statistics and inferential statistics using SPSS

D. Tools and Software
- NVivo (qualitative data analysis)
- SPSS (quantitative data analysis)
- Adobe Acrobat (PDF analysis)
- Google Scholar (literature search)
- EndNote (reference management)

E. Study Selection
- Peer-reviewed articles
- English language
- Published 2015-2022
- Relevant to VR, VCT, or MAR
- Sample size and population relevance

F. Quality Assessment
- Study design and methodology
- Sample size and population
- Data analysis and interpretation
- Conclusion validity

G. Limitations
- Limited generalizability due to diverse study contexts
- Potential bias in study selection and data analysis
- Limited access to full-text articles

H. Future Directions
- Conducting meta-analyses to synthesize quantitative findings
- Exploring the impact of VR and MAR on learning outcomes
- Investigating the effectiveness of design principles in VR and MAR applications.

IV. FINDINGS AND TRENDS

Enhanced Learning through Immersive VR Experiences: VR can greatly improve learning by offering immersive, 3D environments that are particularly valuable in preparing students for future careers, even in fields that do not yet exist. The integration of VR technology into education, as exemplified by systems that combine hardware like Raspberry Pi and VR gadgets, creates a more interactive and engaging learning experience. The use of real-time databases, such as Google Firebase, further enhances the accessibility and synchronization of VR content, ensuring a seamless learning experience [16].

Positive Reception of Virtual Campus Tours: Virtual campus tours, created with tools like 3DVista and integrated with panoramic views, narration, and clickable hotspots, have been positively received by students. Usability studies and feedback from participants indicate that these virtual tours not only promote the campus but also improve user engagement and satisfaction. These findings suggest a growing acceptance and demand for VR-based campus experiences that go beyond static visuals and basic information [17].

Promoting Environmental Awareness through VR: Virtual campus tours can effectively showcase natural and scenic elements of campus environments, such as forests and water features. Low-fidelity interface designs combined with prototype development help bring these natural spaces to life. The trend in using VR to simulate natural environments highlights the potential for virtual applications to foster a deeper appreciation of outdoor and scenic locations that are traditionally hard to capture through conventional portals or static graphics [18].

VR's Prevalence in Engineering and Design: Engineering stands out as one of the fields most significantly impacted by VR, accounting for a substantial share of VR research and applications. This trend reflects the versatility of VR in supporting complex simulations and visualizations required in engineering education. Furthermore, the development of structured guidelines, such as general flowcharts for designing VR applications, can be adapted for broader educational purposes beyond engineering [19].

Growing Use of Augmented Reality in Tourism: Augmented Reality (AR), particularly in tourism, has seen advancements with mobile-based applications that use geo-location and GPS technology. Research highlights a focus on reducing cognitive overload and improving learnability by refining AR design guidelines. This trend points to a wider adoption of AR to offer contextually relevant, interactive experiences for tourists, enhancing engagement and providing real-time, location-based information [20].

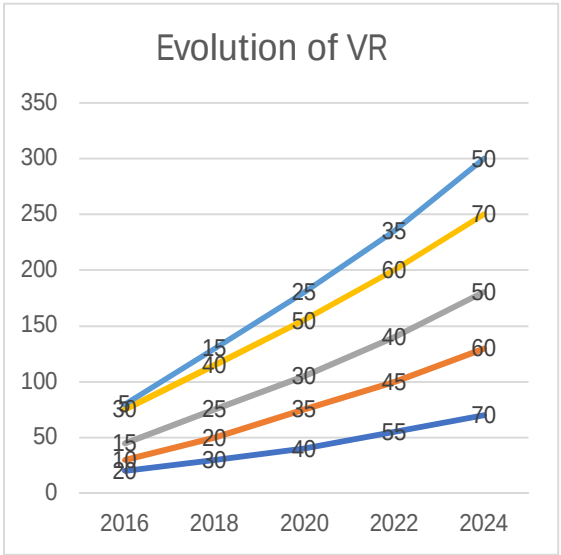


Fig4: Evolution of VR

V. CHALLENGES AND GAPS

The literature review highlights several challenges and gaps in the current studies on VR and AR applications in education and tourism:

1) Technical Complexity and Accessibility: Many VR and AR systems require specialized hardware (e.g., VR headsets, high-resolution cameras, and devices like Raspberry Pi). However, these tools can be costly and are not always accessible to all educational institutions, particularly those with limited budgets. This financial barrier can limit the scalability and broader adoption of immersive technologies across various regions and institutions.

2) Limited Research on Long-Term Impact: Most studies focus on short-term user satisfaction and engagement rather than examining the long-term impacts of VR and AR on learning outcomes and knowledge retention. The absence of longitudinal studies leaves a gap in understanding how these technologies affect students' learning over extended periods.
3) Usability and User Experience Challenges: Some VR applications, especially those with complex interfaces or low-fidelity prototypes, may not be intuitive for all users. While usability testing has been conducted in some studies, more work is needed to refine user interfaces and enhance accessibility for people with diverse abilities and technical backgrounds. User feedback often highlights usability issues that remain unaddressed in VR and AR environments.
4) Lack of Standardized Evaluation Metrics: Evaluation methods for VR and AR applications vary widely across studies, making it challenging to compare findings or draw broader conclusions. Studies often rely on small sample sizes or subjective questionnaires, which may not capture the full scope of user experiences or provide a consistent measure of effectiveness.
5) Environmental and Contextual Limitations: While VR is valuable for creating immersive learning experiences, it may not fully replicate the authenticity of real-world interactions, especially in fields requiring hands-on practice (e.g., laboratory sciences). Additionally, AR applications in tourism may face limitations in delivering accurate information in real time, due to connectivity issues or limited location-based data.
6) Challenges in Generalizing Findings Across Disciplines: Many studies are field-specific (e.g., engineering or tourism) and may not apply universally across different educational disciplines. This limitation restricts the generalizability of findings, making it difficult to assess the potential of VR and AR applications in other fields that might benefit from similar approaches.
7) Ethical and Privacy Concerns: The use of VR and AR in educational settings raises privacy and ethical concerns, especially when collecting user data for personalized learning experiences. There is limited discussion in current studies regarding data security measures or guidelines for handling sensitive user information.

VI. CONCLUSION

In conclusion to our exploration and analysis of the existing system have highlighted significant limitations, including platform dependency, which adversely impacts system performance and accuracy.

These findings underscore the need for improvement in flexibility and usability. In subsequent phases, we aim to address these challenges by implementing targeted solutions to enhance the system's versatility and robustness. This phase has established a strong foundation, paving the way for refining and expanding the project's scope in future stages.

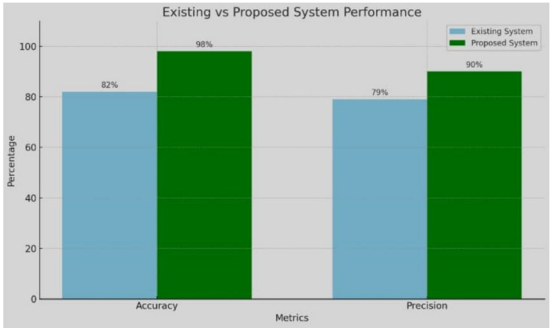


Fig6: Comparison Graph

VII. FUTURE ENHANCEMENT

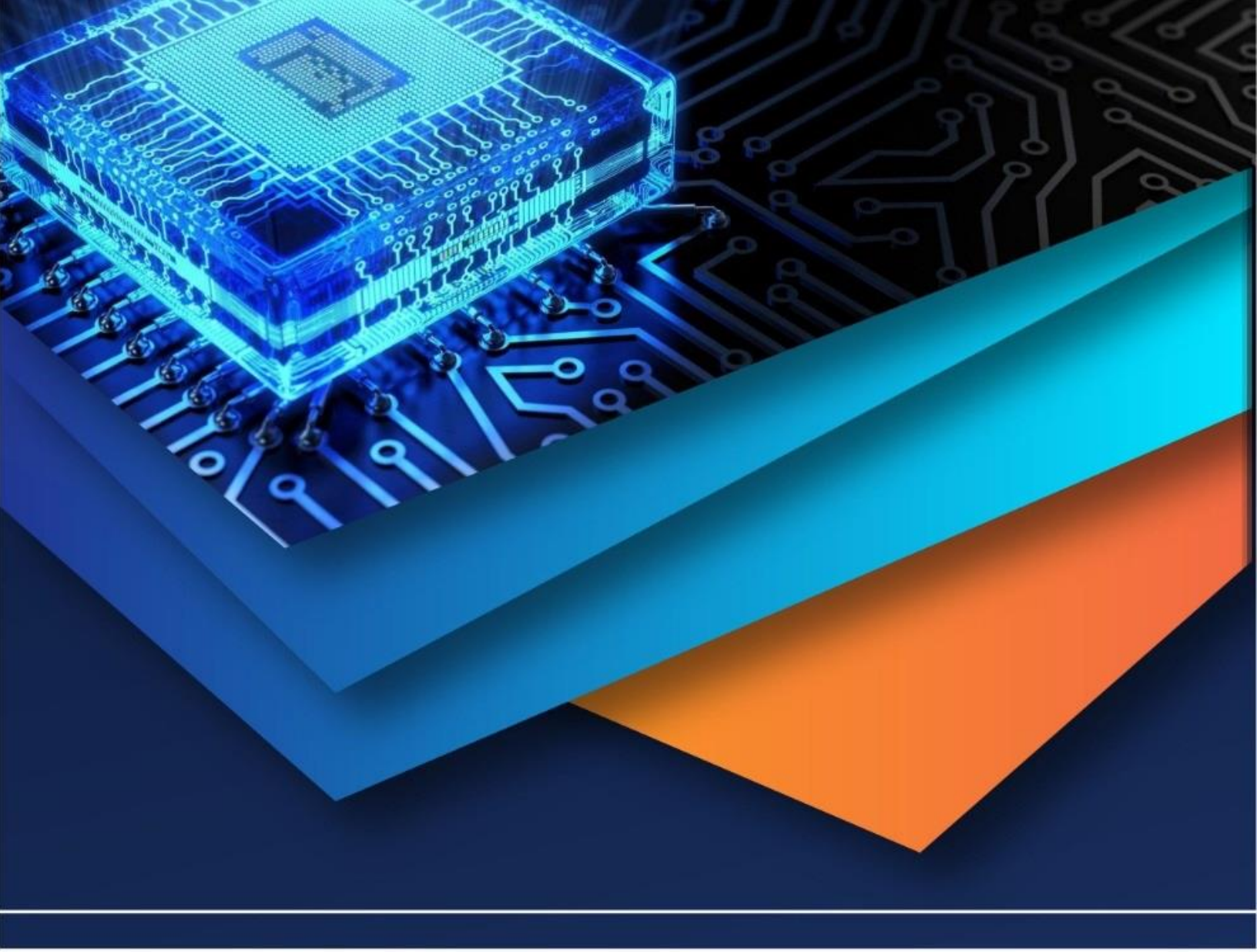
Future enhancements may include automated location detection within the tour, support for multiple transport modes like cycling or driving, and the inclusion of a **search bar** that allows users to instantly navigate to specific locations. Adding **3D interactive maps**, voice-guided exploration, or basic usage analytics are also viable paths to further enrich the experience.

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