

Dynamic Scene Modeling and Rendering: A Survey of Methods and Applications

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Abstract—In the field of video-based 3D reconstruction, significant progress has been made achieved based on using techniques such as Neural Radiance Fields (NeRF) [1] of Gaussian Splatting [2]. NeRF is well-known for its high-quality render, implicit representation, and flexible extensibility, whereas Gaussian excels in real-time rendering and fast training. Despite these advantages, there still exists many areas worth optimizing. For instance, traditional NeRF suffers from low rendering efficiency, often requiring seconds to tens of seconds per frame due to computationally intensive volume sampling, while Gaussian Splatting struggles to capture fine details and microtextures, particularly in the presence of complex reflections or translucent materials. Other methods, including NSFF, TensorRF, and COLMAP, also present their own trade-offs. To provide a comprehensive evaluation of different video-based 3D reconstruction techniques across diverse scenarios, we *Group#2* conducted an exhaustive survey to systematically analyze the strengths and weaknesses of existing approaches. The corresponding contributions are available at [git@github.com:8arbato/Academic-English-Group-Paper.git](https://github.com:8arbato/Academic-English-Group-Paper.git)

Index Terms—Deep learning, video-based, 3D reconstruction.

I. Introduction

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$$a + b = \gamma \tag{1}$$

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Please use “soft” (e.g., `\eqref{Eq}`) cross references instead of “hard” references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

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- The word “data” is plural, not singular.
- The subscript for the permeability of vacuum μ_0 , and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
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- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
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- There is no period after the “et” in the Latin abbreviation “et al.”.
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An excellent style manual for science writers is [?].

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a) *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. ??”, even at the beginning of a sentence.

TABLE I
Table Type Styles

Table Head	Table Column Head		
	<i>Table column subhead</i>	<i>Subhead</i>	<i>Subhead</i>
copy	More table copy ^a		

^aSample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

Acknowledgment

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

References

- [1] B. Mildenhall, P. P. Srinivasan, M. Tancik, J. T. Barron, R. Ramamoorthi, and R. Ng, “NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis,” arXiv preprint arXiv:2003.08934, 2020. [Online]. Available: <https://arxiv.org/abs/2003.08934>
- [2] J. Kerbl, A. Wang, F. Rousselle, and V. Koltun, “3D Gaussian Splatting for Real-Time Radiance Field Rendering,” arXiv preprint arXiv:2304.08914, 2023. [Online]. Available: <https://arxiv.org/abs/2308.04079>