



INSTITUTE FOR COMPUTER SCIENCE
KNOWLEDGE-BASED SYSTEMS GROUP

Master's thesis

TODO:

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Zusammenfassung

Abstract

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0.1 TSDF

In modern SLAM approaches the mapping aspect is often times neglected in the sense that aligned point clouds are used as a map of the environment. Even in the case of subsampled point clouds, the memory requirements are far greater than generated meshes while preserving less detail than their mesh counterpart.

Many robotics applications in large scale environments benefit from a closed surface representation of the surroundings, both for navigation and localization. One class of closed surface representations are Signed Distance Functions, an implicit surface representation where the signed distance is the orthogonal distance of point x to the boundary of set Ω in metric space. The functions value decreases while approaching the intersection with set Ω , where the signed distance value is zero, while the sign determines whether or not x is positioned interior or exterior of Ω . *Truncated* Signed Distance functions take this concept further and set a maximum signed distance value, therefore truncating the function.

Typical neighborhood search in N-D space involves specific data structures like KD-Trees that allow neighborhood search after construction, but never faster than $O(n \log n)$. (Truncated) Signed Distance functions allow distance values between voxels to be interpolated easily based on voxel indices. This property results in a pseudo-continuous representation ideally suited for the extraction of polygonal models using the well-known Marching Cubes algorithm [1]

Bibliography

- [1] W. E. Lorensen and H. E. Cline. Marching Cubes: A High Resolution 3d Surface Construction Algorithm. In *ACM SIGGRAPH '87*, 1987.

Erklärung zur selbstständigen Abfassung der Masterarbeit

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Titel der Masterarbeit: Erzeugung von Cesium 3D Tiles aus
LVR2 Large-Scale-Meshes für LOD-Rendering

Ich versichere, dass ich die eingereichte Masterarbeit¹ selbstständig und ohne unerlaubte Hilfe verfasst habe. Anderer als der von mir angegebenen Hilfsmittel und Schriften habe ich mich nicht bedient. Alle wörtlich oder sinngemäß den Schriften anderer Autoren entnommenen Stellen habe ich kenntlich gemacht.

Osnabrück, 29.08.2022

Ort, Datum

Unterschrift

¹Bei einer Gruppenarbeit gilt o. für den entsprechend gekennzeichneten Anteil der Arbeit.