3D reconstruction of the surgical scene using structured light

RODRIGUES, Marcos

Available from Sheffield Hallam University Research Archive (SHURA) at:
http://shura.shu.ac.uk/5196/

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version


Repository use policy

Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in SHURA to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.
Marcos A Rodrigues
Geometric Modelling and Pattern Recognition Research Group - GMPR
Sheffield Hallam University, Sheffield UK
m.rodrigues@shu.ac.uk
www.shu.ac.uk/gmpr

3D RECONSTRUCTION OF THE SURGICAL SCENE USING STRUCTURED LIGHT
The technique: Camera + projector
Visible + NIR
The core of the technology: Stripe indexing and generation of 3D data

captured image  (1) locate stripe pixels  (2) index stripes  (3) map to 3D space

quadrilateral structure in the indexed stripe pixels
Steps in 3D reconstruction

Pre-processing operations (2D):
- image acquisition (visible and NIR)
- image filtering
- stripe indexing/image correspondence

Post-processing operations (3D):
- generation of 3D point cloud and triangulation
- noise removal, hole filling, mesh smoothing
- mesh subdivision
- pose normalization / registration
- inclusion in an AR system
3D post-processing: hole filling
3D post-processing: smoothing
Pose registration
Need external markers for liver registration
Performance and the future

- Real-time performance
- Tracking features and registration to a standard pose
- Embed into AR systems

Future work:
- Embedding the design into DSPs
- New optics
- Develop methods for 3D image compression