

Urna Semper
Instructor's Name
January 21, 2016

“Range Finding” Review

There are about 10 range finding techniques introduced in the paper. They are mainly divided into 2 parts:

Firstly, Direct and active range findings: ultrasonic and light time-of-flight estimation, triangulation systems.

Secondly, Passive monocular image-based range finding such as

- texture gradient analysis
- photometric methods
- occlusion effects
- size constancy
- focusing methods

1. Contrived lighting ranging methods:.

A. Striped Lighting: the scene is lit by a sheet of light usually produced with a laser beam light source and a cylindrical lens(or standard slide projector). The light is scanned across the scene to produce a single light stripe for each position. The strips are shows displacement along a stripe which are proportional to depth.

- Advantages(AD): accuracy can be improved as more accurate depth measurements can be made with larger displacements.

- Disadvantages(DIS): 1. larger parts viewable from source are not seen from TV so depth can not be measured.. 2. have strike identification problem and cause restrictions.

Grid Coding:the locations and orientations of planar areas of polyhedral solids are extracted through linear frequency domain filtering applied to images of scenes illuminated by a high contrast rectangular grid of lines.

2. Depth from texture gradient

Disadvantages: 1. the regions must be uniformly textured. Prior segmentations is required. 2. restricted to higher textured scene. 3. computational cost is high.

3. Ranging from focusing: Knowledge of the focal length and focal plane to image plane distances permits evaluation of focal plane to object distance (range) for components of the 3-D scene in sharp focus.

AD: prior segmentations is not required. simple computational formulas.

DIS: increasingly inaccurate

4. SURFACE ORIENTATION FROM IMAGE BRIGHTENS

using a reflectance map to capture relationship between image intensity and surface orientation.

AD:: online analysis using table look-up is rapid.

DIS: the surface cannot be analyzed reliably and restrict to objects with one type.

5. range from stereo disparity:

Do matching of two points between two images to derive the depth relationship.

AD: more reliable and expedient to preselect match portions. also the algorithm is flexible

DIS: must have sufficient visual information. Also, uniformity of intensity match is impossible and limited field is captured.

6. range from camera motion:

AD: camera motion is not restricted to limited lateral displacement. its optimized and applied independently for each surface

7. moire fringe range contours:

pattern formed by using illumination to represent contour of equal range.

AD: different range levels can be produced simply by changing the phase of the pitch.

DISs: absolute range to a partially occluded surface cannot be recovered if there is no range contour continuum to that surface.

8. simple triangulation range finder: use one spot at a time triangulation.

AD: easy to construct

DIS: missing parts problem caused by directional occlusion. and not accurate

9. time-of-flight range finders: ultrasonic/ laser range finders.

AD: can calculate absolute range and easy to achieve. support reliable scene segmentation and not restricted to domain specificity.

DIS: not suitable for producing medium to high resolution range pics.