Detection of Vanishing Points

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Motivation

• Camera orientation/localization
• Video compass
• Navigation
• …
Vanishing Points

• Manhattan worlds
• Parallel lines in 3D can intersect after perspective projection to 2D
• Vanishing points (regular/ideal, gauss sphere,...)
Our Solution

- Hough based method
- **Piecewise linear mapping**
  - Line is mapped to a **polyline**
- Regular/ideal point is mapped to a **regular point**
Parallel Coordinates

• Coordinate axes are mutually parallel
• A point is represented by a polyline
• Representations of collinear points intersect in a common point

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Parallel Coordinates

- Regular point represented by a point
- Ideal point represented by a point
Diamond space

- Four different transformation (different axes arrangement)
- Four subspaces
- All points representations are **regular**
Algorithm

1. Manhattan image
Algorithm

2. Edge points
Algorithm

3. Edgelets
Algorithm

4. Accumulation
Algorithm

5. Search for maxima
Algorithm

6. Remove lines

... repeat
Algorithm

7. Vanishing points with corresponding edgelets
Algorithm

7. Orthogonalization

• camera parameters required!
• max response in accumulator
• orthogonal in 3D world
Results on YUD

98.04% success rate at 10° angular error tolerance with average error 1.41°

[Casc1D] B. Li: Vanishing point detection using cascaded 1D hough transform from single images, 2012
Pros/Cons

Pros
• ideal/regular points mapped to regular points
• piecewise linear mapping
• simple accumulation and maxima search

Cons
• linear structures required
• dependent on edgelets detection

You can map infinite plane to a finite subspaces using piecewise linear mapping

http://medusa.fit.vutbr.cz/pclines/

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