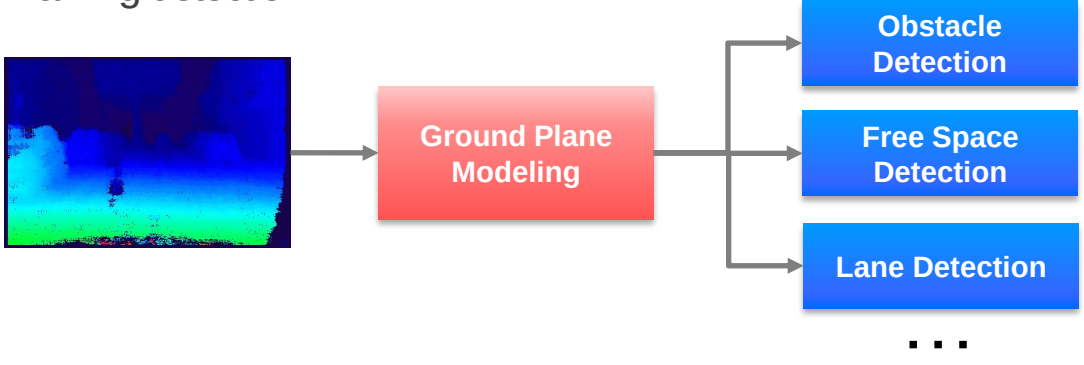
Ground Plane Estimation

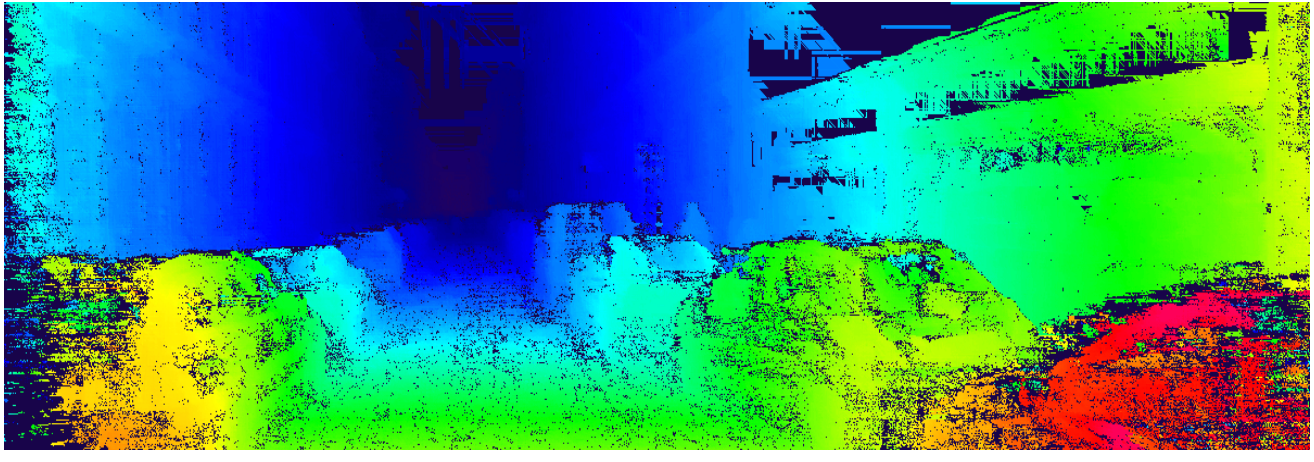
- **Ground Plane (GP) estimation is essential in automotive applications**
  - Obstacle detection
  - Free space detection
  - ROI (Region of Interest) segmentation to reduce complexity of algorithms, e.g.,
    - Lane detection
    - Road marking detection



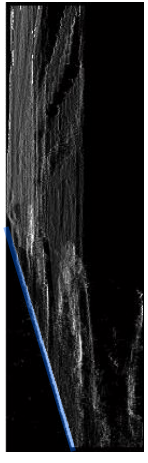
- **GP estimation using disparity map is simple, yet effective**
  - V-Disparity map approach

V-Disparity Map

- **Every row of a V-disparity map is a disparity histogram of the same row in a disparity map**
  - Size of (disparity range x height)
  - Vertical surfaces, i.e. object, appear as vertical line segment
  - Ground plane appears as a slanted line segment
  - Ground plane is simply estimated by modeling this slanted line segment

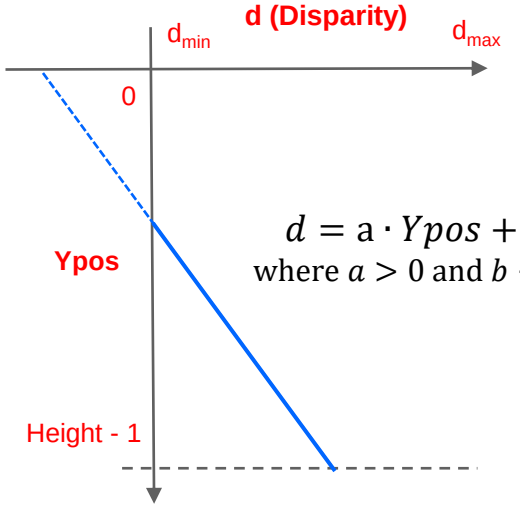


Disparity map

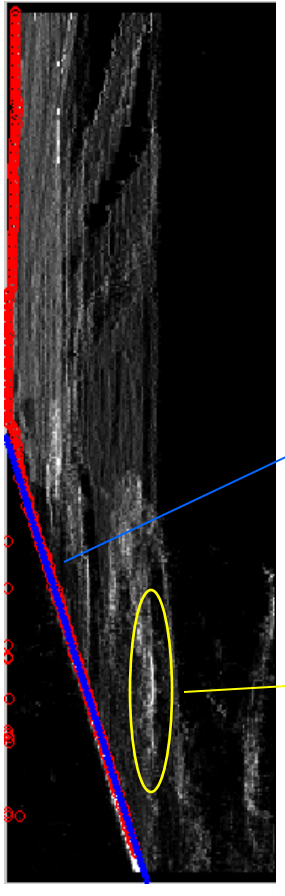


V-Disparity map

Ground Plane Modeling



$$d = \mathrm{a} \cdot Ypos + b,$$
where $a > 0$ and $b < 0$



d_{min}, Farthest d_{max}, Closest

- In each row, GP has the smallest disparity
- GP is modeled as a slanted line segment
- Objects appears as a vertical line segment

Ground Plane Estimation - Examples