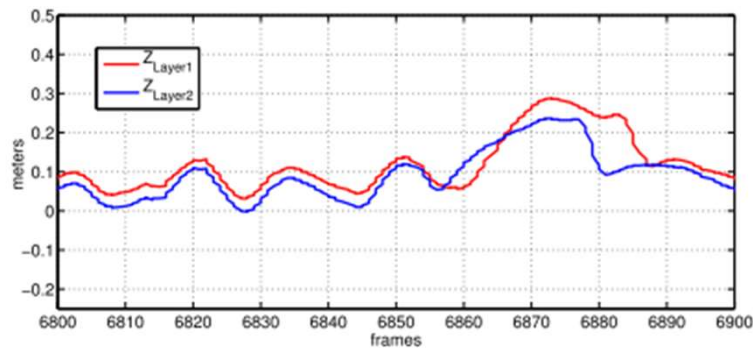
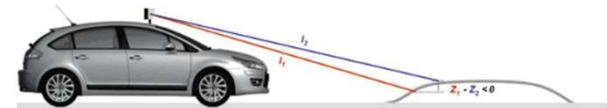


Literature Reference

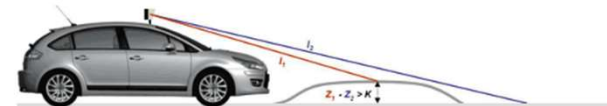
- (2012) Free Space and Speed Humps Detection using Lidar and Vision for Urban Autonomous Navigation
 - [Link](#)
 - Bump/pothole on the road result in difference in Z-coordinate
 - $Z_{\text{lower_layer}} - Z_{\text{upper_layer}}$
 - Pothole: positive \rightarrow negative
 - Bump: negative \rightarrow positive



(a) When the vehicle is driving in a road without speed humps, the difference between layers in Z axis is very small.



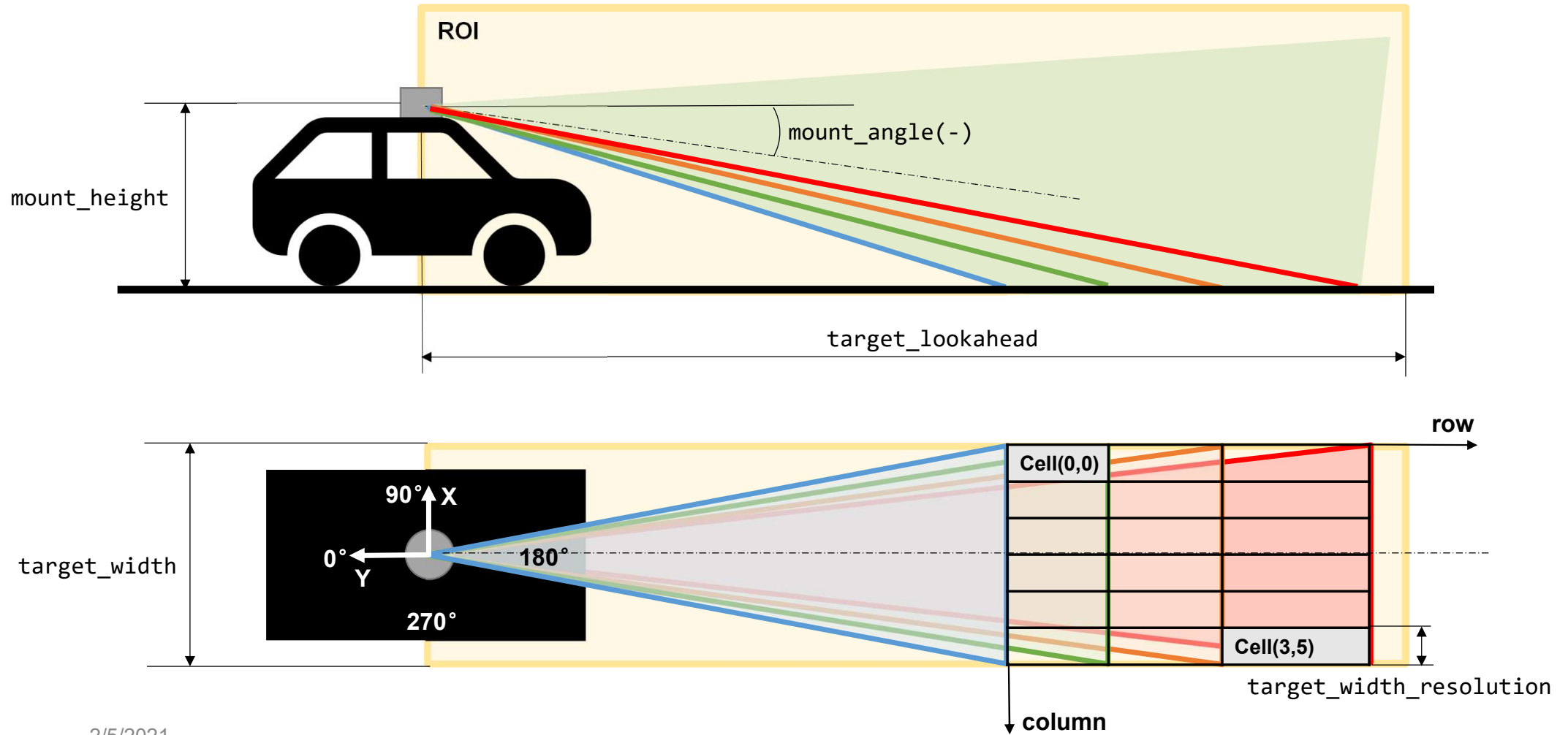
(b) When the vehicle is approaching a speed hump, the difference between layers in Z axis start raising but it is difficult to differentiate a speed hump and uphill.



(c) When the laser beam impacts behind speed hump, the difference between layers in Z axis is large and easy to detect.

Fig. 8. Road surface estimation.

Definition



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