# Multimodal inverse perspective mapping

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Two critical components of driver assistance systems and autonomous vehicles are road and obstacle detection. Recent years have shown that Inverse Perspective Mapping (IPM) can be used as a preprocessing mechanism that significantly facilitates those components. The method consists of mapping images taken from onboard cameras to a new coordinate system where perspective effects are removed. However, in classical IPM, the presence of obstacles on the road disrupts the accuracy of the mapping.

The current paper proposes an extension to IPM in which data from a laser range finder is fused with images from the cameras, so that the mapping is not computed in the regions where obstacles are present. Tests were conducted in laboratory as well as in the field using the ATLASCAR, an autonomous vehicle research platform from UA shown in Fig. 1. The proposed approach is capable of producing mosaic images created from information of multiple cameras: Fig. 2 shows an IPM image generated from the three cameras onboard the ATLASCAR. Results show that the proposed technique considerably improves the accuracy as well as the computation time when compared with the classical IPM.

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**FIGURE 1**
The ATLASCAR full scale robotic platform. It is equipped with an active perception unit (A), a stereo rig (B), three LRF (C, D, H), a thermal vision camera (F), GPS (G) and an inertial measurement unit (E).

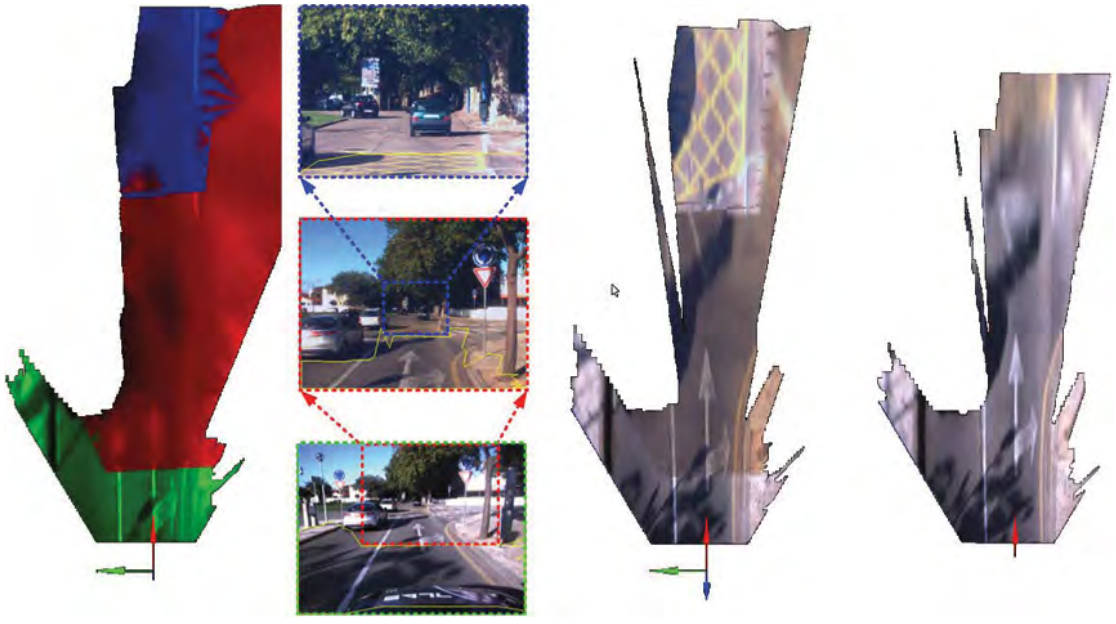

**FIGURE 2**
Using the proposed IPM approach in real scenarios. (a) Images of the three cameras on-board the ATLASCAR; (b) The distribution of mapping for each camera ; (c) IPM using just green camera; (d) IPM using all cameras.