

Comprehensive Dataset for Automatic Single Camera Visual Speed Measurement

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- **Algorithm 1 (page 2)** – Algorithm of computation of real world distance of arbitrary two points on the road plane.
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Algorithm 1 Computation of distance of two points (p_1, p_2) on the road plane for given calibration (u, v, c, λ) . The focal length is represented f , capital variables denotes coordinates of points on the sensor in 3D world and \bar{P}_i represent coordinates of points p_i on the road plane.

Input: Points $p_1 = [p_1^x, p_1^y, 1], p_2 = [p_2^x, p_2^y, 1]$
Input: Vanishing points $u = [u_x, u_y, 1], v = [v_x, v_y, 1]$
Input: Principal point $c = [c_x, c_y, 1]$, scene scale λ
Output: Distance d between p_1 and p_2 in meters

$$f = \sqrt{-(u - c) \cdot (v - c)}$$

$$U = [u_x, u_y, f], V = [v_x, v_y, f], C = [c_x, c_y, 0]$$

$$W = [W_x, W_y, W_z] = (U - C) \times (V - C)$$

$$w = \left[\frac{W_x}{W_z} \cdot f + c_x, \frac{W_y}{W_z} \cdot f + c_y, 1 \right] = [w_x, w_y, 1]$$

$$\rho = [w_x, w_y, f] - C$$

$$\rho = \rho / \|\rho\| = [a, b, c]$$

$$\rho = [a, b, c, 10]$$

for all $i \in \{1, 2\}$ **do**

$$P_i = [p_i^x, p_i^y, f]$$

$$g_i = P_i - C$$

$$t_i = -\frac{\rho \cdot [c_x, c_y, 0, 1]}{[a, b, c] \cdot g_i}$$

$$\bar{P}_i = C + t_i \cdot g_i$$

$$d = \lambda \cdot \|\bar{P}_1 - \bar{P}_2\|$$

	GPS		RADAR		
	mean	med.	mean	med.	95 %
Session 1	1.94	1.11	1.05	0.86	2.62
	2.67	1.44	1.37	1.14	3.37
Session 2	2.11	1.63	1.14	0.94	2.80
	2.35	2.06	1.33	1.12	3.22
Session 3	1.75	1.15	0.78	0.66	1.94
	4.94	2.43	1.31	1.19	3.26
Session 4	1.43	1.03	1.22	1.01	3.17
	1.68	1.10	1.28	1.15	3.34
Session 5	1.30	1.19	1.04	0.87	2.63
	1.71	1.40	1.33	1.15	3.34
Session 6	1.52	0.76	0.96	0.83	2.29
	2.43	1.35	1.33	1.13	3.23
TOTAL	1.64	1.19	1.07	0.89	2.67
	2.18	1.42	1.33	1.14	3.23

Table 1: Results of GPS and RADAR speed measurement errors for every session separately. The first row for each session contains absolute errors in km/h and the relative errors in percents are in the second row. We do not report the 95 percentile for the GPS measurement as there is low number of measurements (maximally twenty).

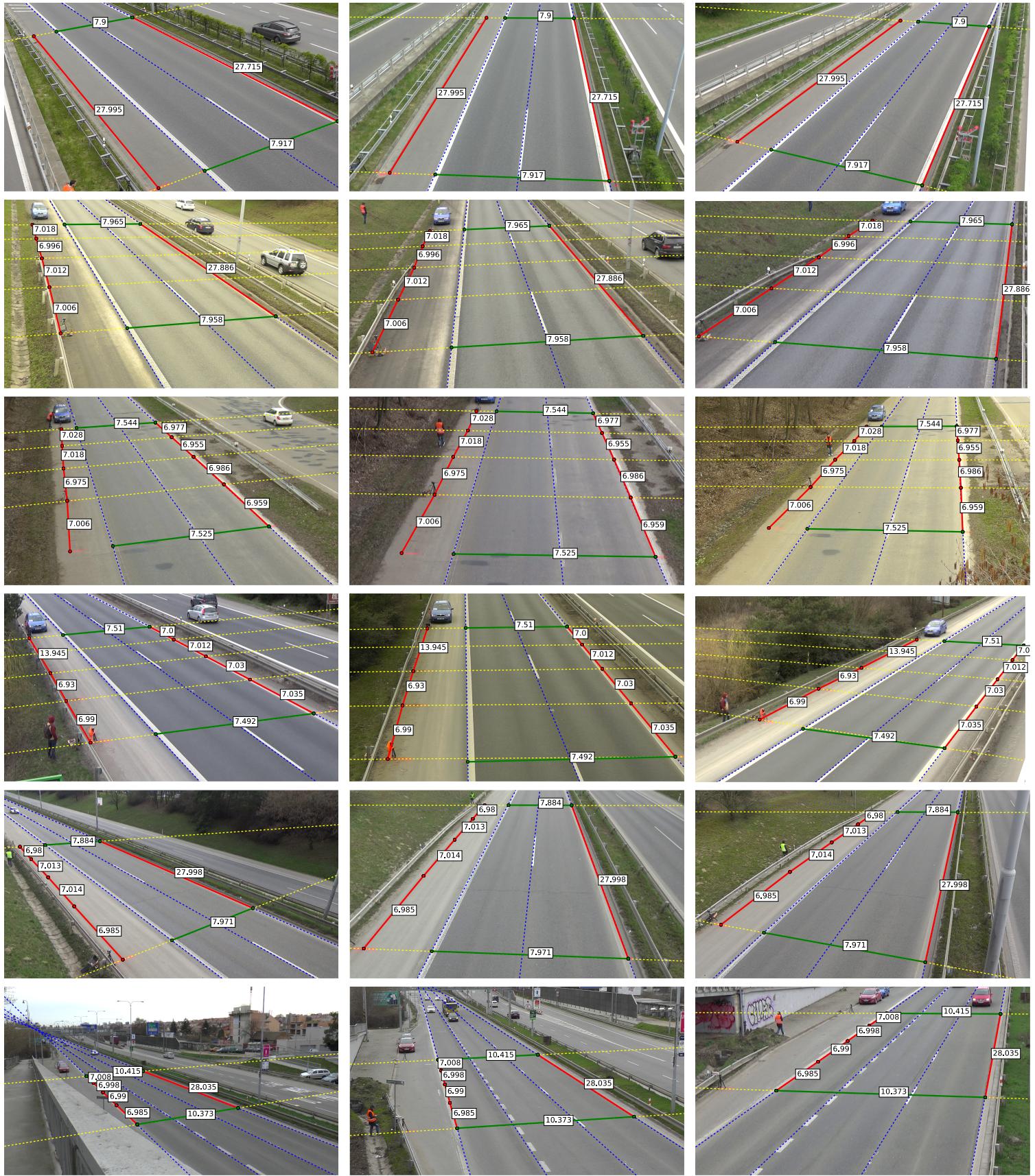


Figure 1: Top to bottom: Session 1 – Session 6, left to right: cameras from left to right for given session