Lytx, Inc. is seeking a graduate student (MS or PhD) in computer science with a specialty in machine vision to solve the following problem:

Objective:

Given a camera fixed in a vehicle and, using only a target, determine the following:

a) the distance from the ground to the center of the camera, in cm
b) The distance from the center of the camera to the center of the vehicle, in cm
c) the vertical vanishing point in the image such that points describing a pair of parallel lines which are separated by a distance of 12 feet can be determined
d) the horizontal row of the image that represents the end of the vehicle’s hood, described by two points to account for image skew

Deliverables:

1. C source code that, given a YUYV formatted image, returns the following:
   a. Distance from ground in cm (a)
   b. Distance from center of vehicle in cm (b)
   c. Left line x, y (c1, c2)
   d. Right line x, y (d1, d2)
   e. Horizontal line x, y (e1, e2)
2. Tolerance analysis indicating maximum expected measurement error for each parameter

Notes:

1. a and b (above) are distances from the center of the lens and not the center of the image
2. Camera resolution is 1280x720 pixels; other camera parameters (pixel size, aperture, etc.) are known. Lens FOV is fixed.
3. Images coordinates are such that (0, 0) is the upper left-hand corner of the image
4. The camera may be rotated slightly around the z-axis in either direction
5. The camera may be rotated slightly around the x-axis in either direction
6. The camera will generally be angled between 0 and -5 degrees around the y-axis, but this will vary
7. Targets may be moved during the procedure
8. Solution should attempt to require the minimum number of measurements that require human intervention (i.e. movement of the target)
9. Others have used checker-board type targets to create lines to determine the image’s vanishing point:

![Images of targets]

Applicants can email me directly at lpiva@lytx.com.