

## Q 6

We can find H using using concept of vanishing point and cross ratio.

First we find coordinates of head and base of person and christ, and horizon using `ginput()` function. Then we find vanishing point in the direction (say  $d$ ) of line joining base of christ and base of person, denoted by 'vanishing\_point' variable. Then we find intersection point (denoted by 't' variable) of line passing through head of christ and parallel to 'd', with line passing through person in the vertical direction. Cross product in homogeneous coordinate is used to find such lines and point of intersection.

We use concept cross ratio between 't', vanishing point in the direction of height of person (from image we can see that this is at infinity in image coordinates), base of person and head of person between real world and image coordinates. We use euclidean norm in cross ratio calculation. Note that distance between 't' and base of person in real world is H (height of christ). Equation of cross ratio, after simplification, can be seen in code.

**Note that real height of person is very sensitive to selection of pixels using `ginput()` that is if actual point in image and selected pixel for that point differ even by 2-3 pixels, there is significant change in height of the person.**

For the following values of selected pixels, we get height of person as 181.02 cm (for different values of selected pixel, height ranged from 178 cm to 184 cm)

```
person_base = [747, 799, 1];  
person_head = [747, 219, 1];  
christ_base = [427, 680, 1];  
christ_head = [427, 421, 1];
```

```
horizon = [0, 1, -583];
```

### How to run code :

Go to output folder of Q6. Open terminal and execute command 'octave myMainScript.m'

`ginput()` part of code is commented by default and above mentioned values are used in calculation.