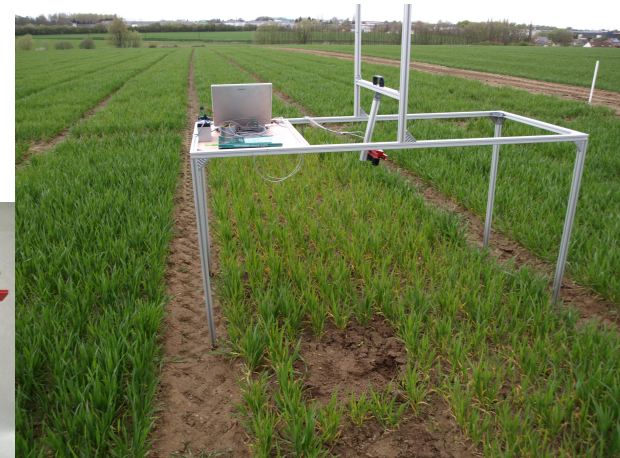


# **Assessment of plant leaf area measurement by using stereo-vision**

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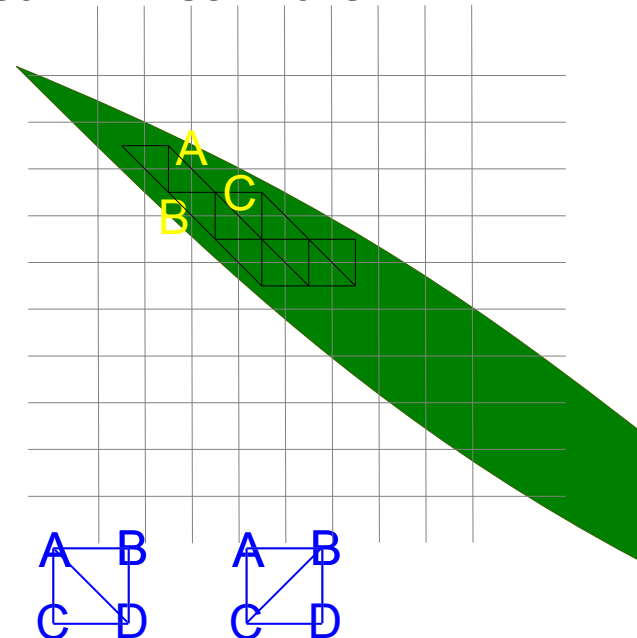
- Leaf Area Index and Average Leaf Angle are important agronomic parameters for crop grow monitoring
- Their measurement is tedious and require a high work load
- An alternative method should be quicker and present a similar precision
- 2D solution present a saturation problem



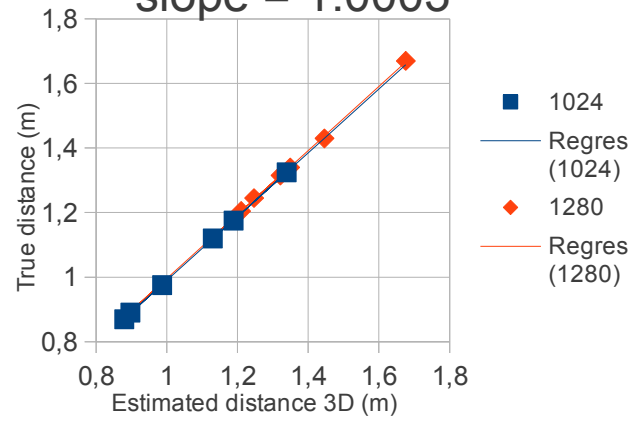
- Histogram equalization
- Images rectification
- Computation of xyz coordinate of each pixel (“modified H. Hirschmuller algorithm”)
- Image segmentation (Leaves/Soil)
- Computation of the areas  $\sum_{triangles} |\vec{AB} \times \vec{AC}| / 2$ 
  - Leaves
  - Total : based on the mean leaf z plane
  - LAI = Leaf Area / Total Area
  - ALA : mean of  $\alpha$

$$CP = \vec{AB} \times \vec{AC}$$

$$\alpha = \text{acos} \left( \frac{CP_z}{|CP|} \right)$$



$r = 0.9997$   
slope = 1.0003



# Results

- Good estimation of the mean distance
- Over-estimation of the measured area
- Both for the laboratory and for the filed tests

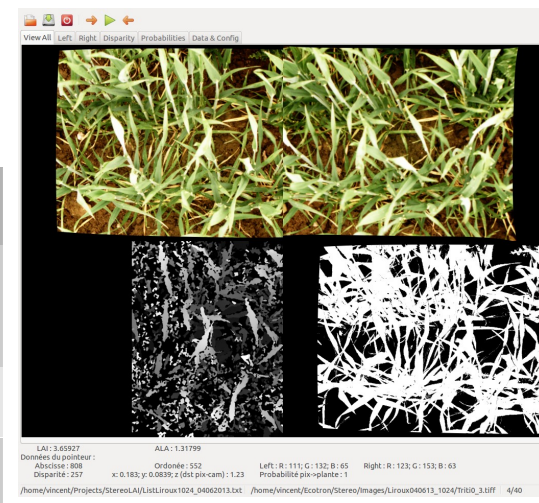
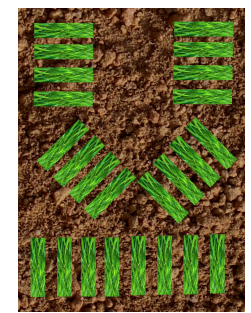


Image sizes	1024*768	1280*960		
	relative (%)	m <sup>2</sup>	relative (%)	m <sup>2</sup>
Accuracy	34	0.0053	49	0.0075
Precision	10.9	0.0017	15.8	0.0024

- Analysis of the error :  $\sigma_z \approx 3.4 \cdot 10^{-4}$
- $\Rightarrow$  estimation of LAI via regression  
 $r = 0.93$ ,  $\sigma_{LAI} = 0.39$ , similar to manual measurements

