

Innovation in sensortechnology

Level detection of wine bottles by camera



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De gezamenlijke opleiding industrieel ingenieur is een
initiatief van UHasselt en KU Leuven.

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KU LEUVEN

Introduction

- Automated bottling process
- Consistent filling
- Need for Quality control
 - Large equipment
 - Expensive
 - Not portable



Mobile filling station

- Future of wine bottling
- Mobile plant
- Onsite bottling
- Cost efficiënt
- Problem:
 - No room for fill level detector



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→ Smaller detectors



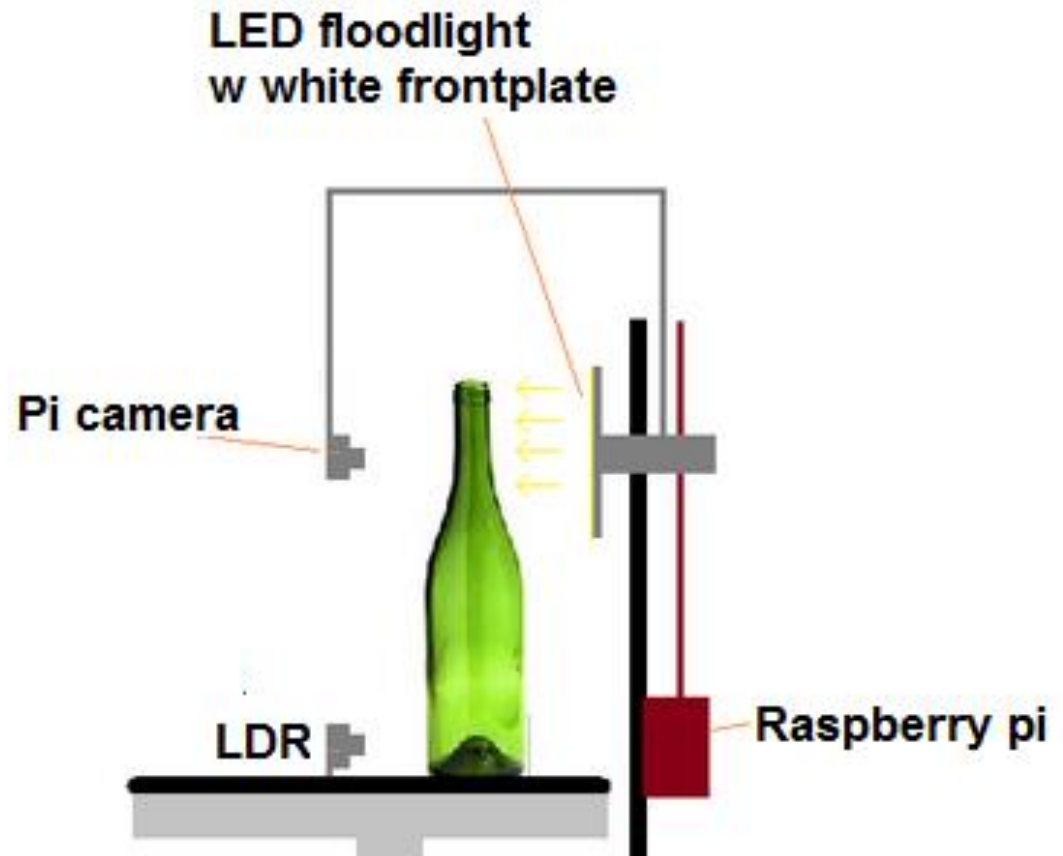
Ullage

- = Unfilled space in a container
- Consistent level = happy customer
- Indicates state of the wine
 - Important for resellers/auction houses

Ullage level (in/cm)	Appearance	Assessment
0.12 in (0.3 cm)	High up to the cork	<i>Normal level for young wines</i>
0.2 in (0.5 cm)	High in neck	<i>Good condition for any age</i>
0.6 in (1.5 cm)	Top of the shoulders	<i>Normal for older wines. Good condition for wines over 15 years</i>
1 in (2.5 cm)	Upper part of shoulders	<i>Generally okay in older wines, especially those over 20 years</i>
1.18-1.38 in (3-3.5 cm)	Mid to mid-low shoulders	<i>Possible oxidation. Price should reflect the risk.</i>
2.36-2.75 in (6–7 cm)	Low shoulders to below shoulders	<i>Extremely risky. Possibly undrinkable</i>

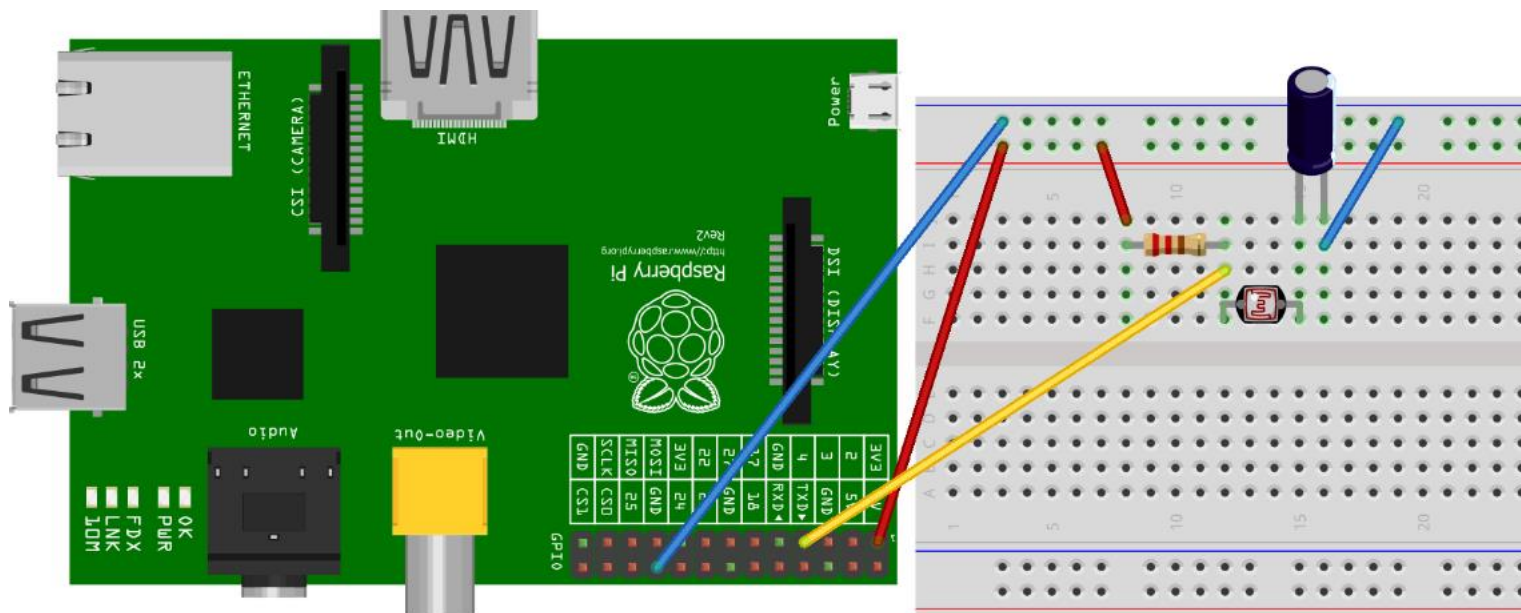
Portable level detection of wine bottles

- Raspberry Pi
- Camera module (Pi NOIR)
- LDR
- LED



Reading LDR

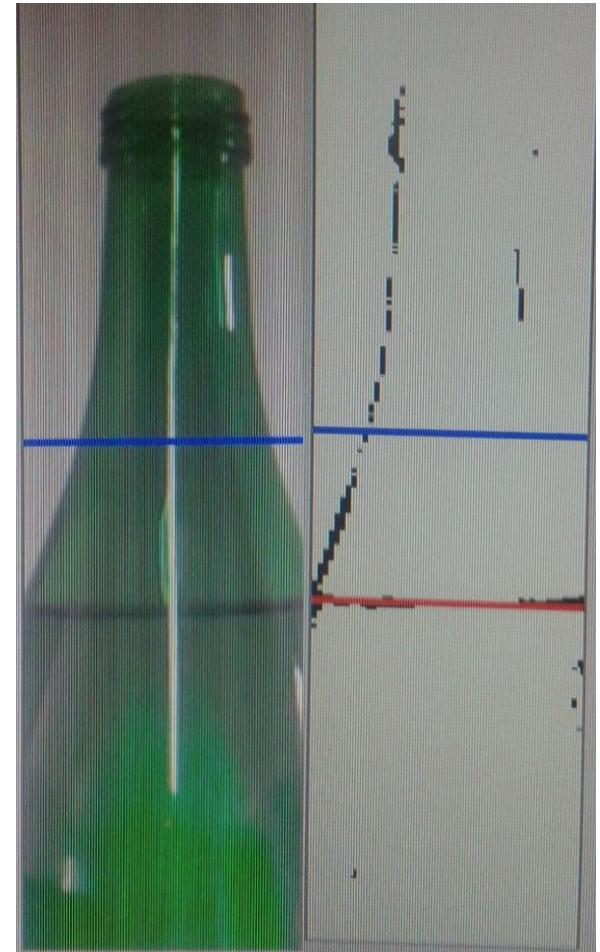
- LDR without ADC
- Charge/discharge circuit.
 - $T = R \cdot C$
 - 1 cycle \rightarrow charge capacitor
 - Count cycles until capacitor is discharged.



Results

- Left = original image
- Right = image after processing

- Blue line = wanted level
- Red/green line = measured level



Conclusion

- Level detection with cheap setup
- Portable system