



Agricultural Research
Organization (ARO),
The Volcani Centre, Israel



Institute of Agricultural
Engineering

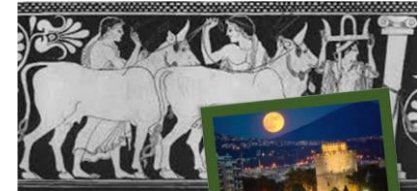


Precision Livestock
Farming (PLF) Lab
חקלאות מדייקת בחיות משק

Evaluation of Cow Feed Mass by Photogrammetry

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Volcani Agricultural Research Organization
Israel

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Existing Systems

GrowSafe, Canada C-Lock, South Dakota Hokofarm, the Netherland



Price ~7000\$ for station

Volcani ARO, Halachmi, 1998

Pro: immediate mass measuring

Cons: station for each of ~100 cows =>

price, infrastructure, farm routines 2

Feed Mass Evaluation by Volume



Shelley, Kentucky



Shelley, Kentucky

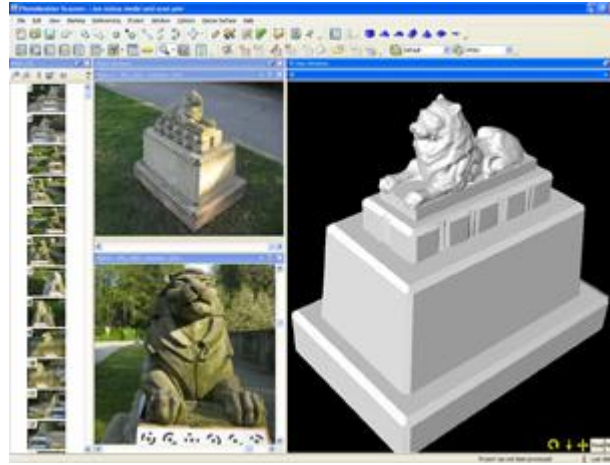


Bloch, Volcani

Special conditions or high-cost sensor

Photogrammetry

Finding common features and triangulation



Needed:
RGB camera
software

Image Processing

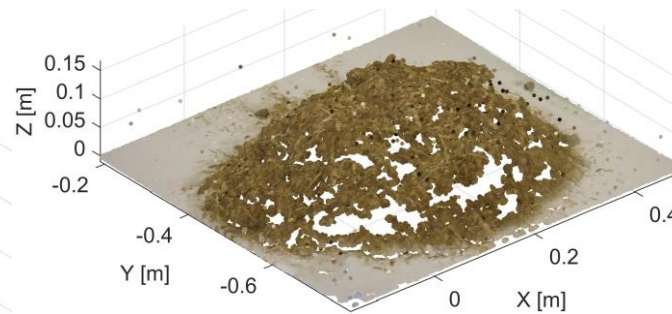
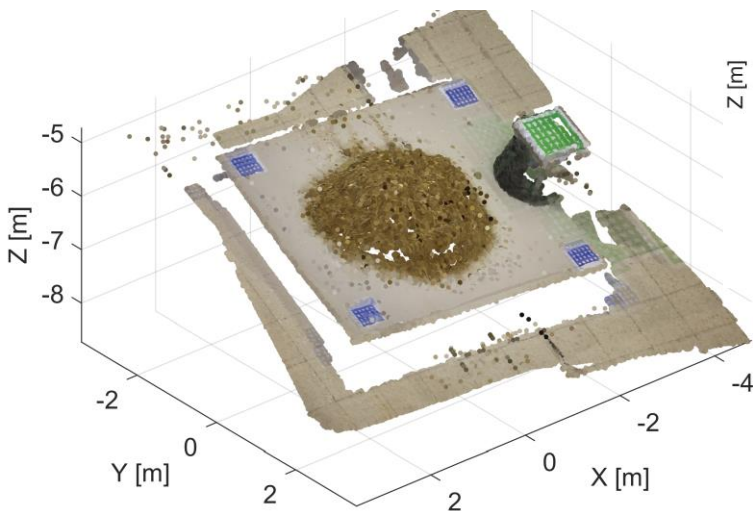


Images from different angles to point cloud

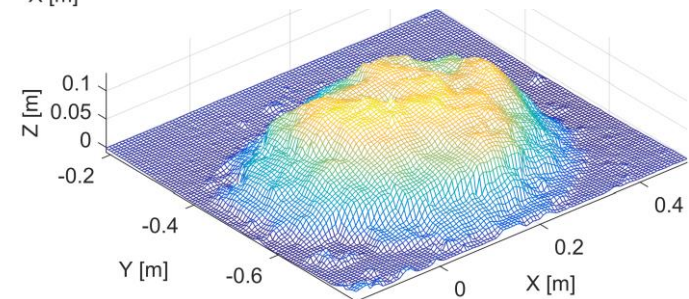


16 images

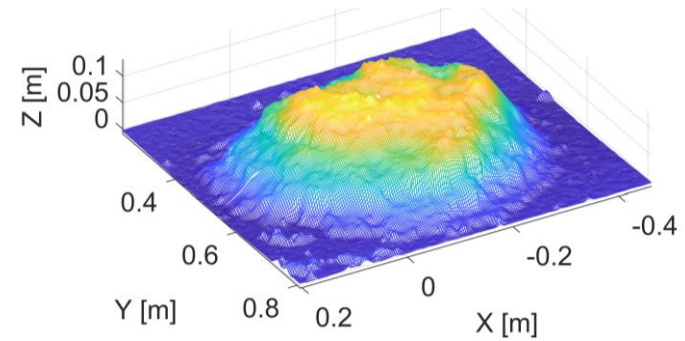
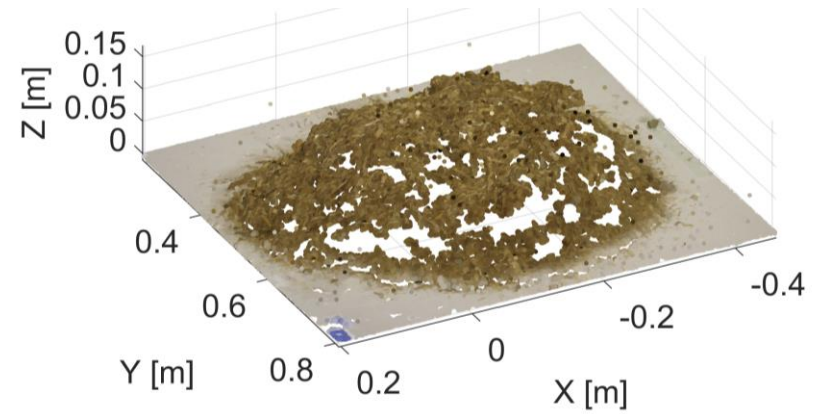
Point cloud



Ready for
integration

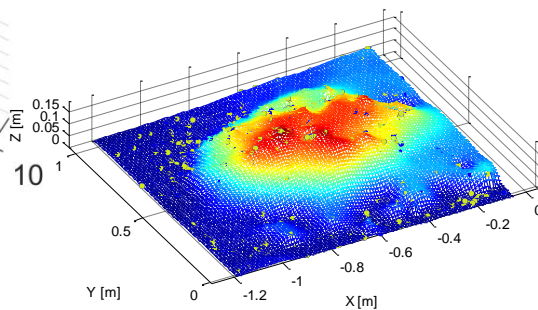
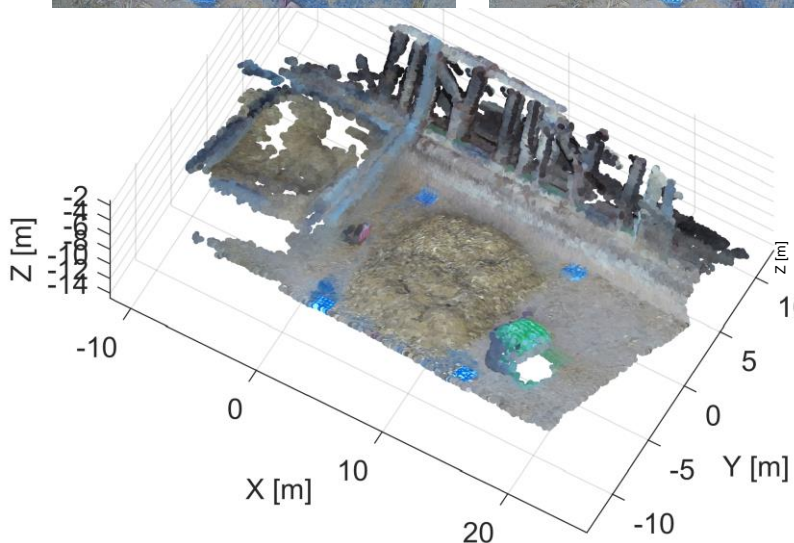


Laboratory Conditions



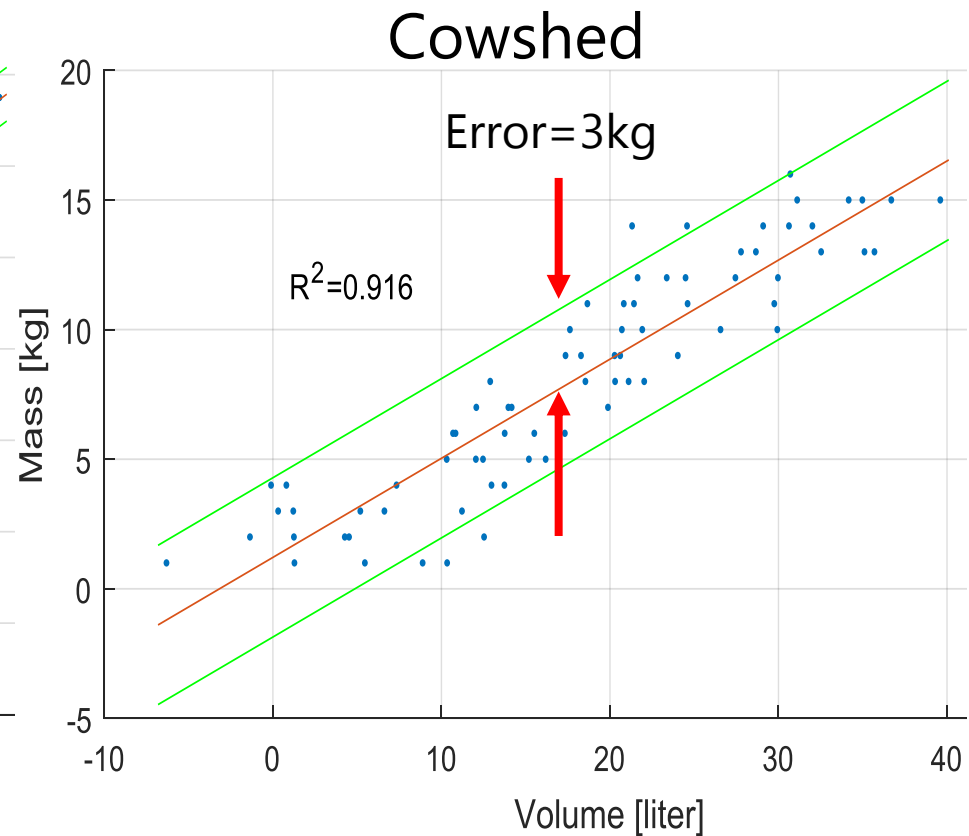
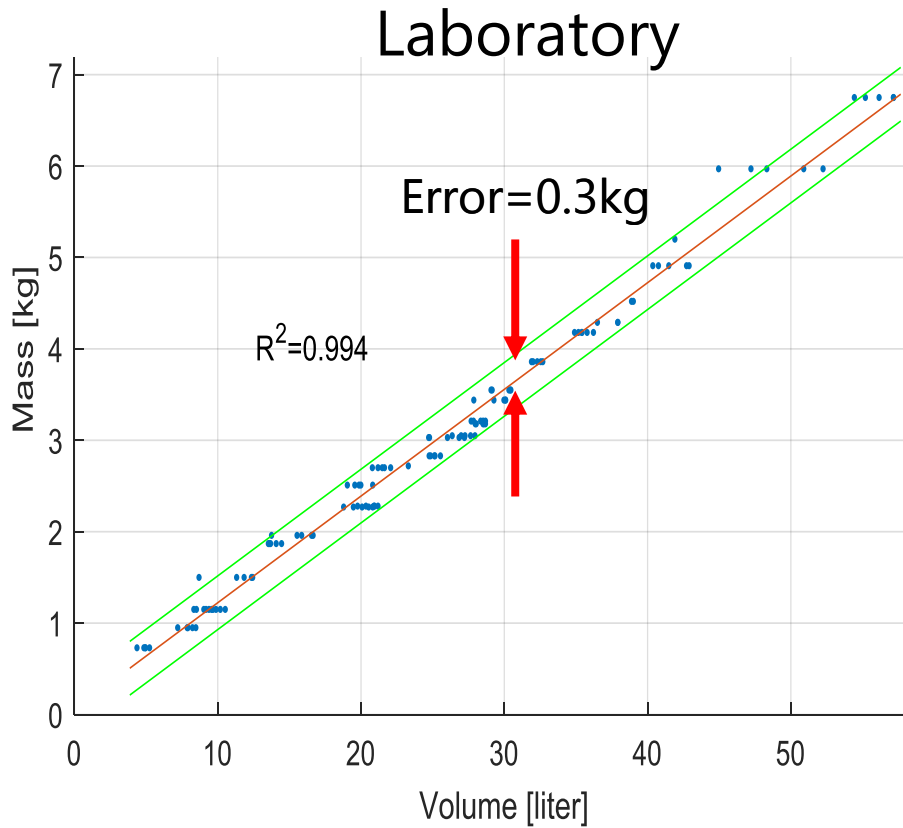
8MP manual camera

Cowshed Conditions



5MP security camera

Mass Volume Dependence



3σ error

4%

20%

Feed Density Measuring

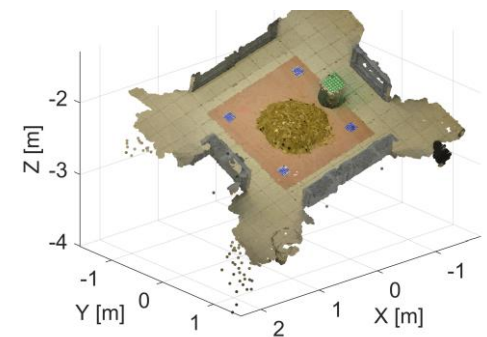
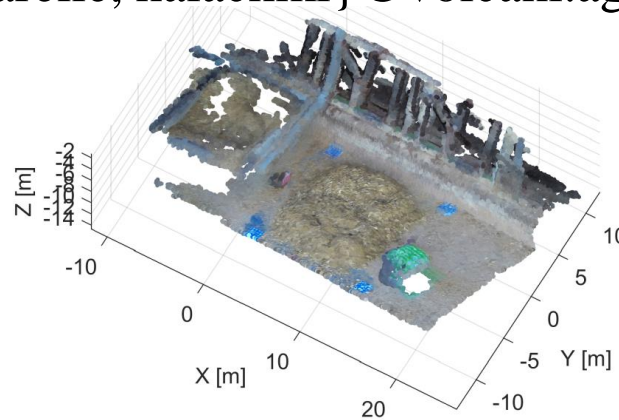


Low cost scales, visual cow recognition, automatic cleaning

Conclusions

1. Error limit is 0.3kg
2. Actual conditions are tough but the equipment can be improved
3. No change in cowshed infrastructure and routines
4. Integrated system: cow recognition, feeding area separation, ...

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¿Questions?