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# Automated Suckering of Vines with a Mobile Robot and a Torque-controlled Suckering Tool

Dario Stuhne, Ivo Vataavuk, Ivan Hrabar, Goran Vasiljević, Zdenko Kovačić

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# Outline

- Introduction
- Design approach
- System description
- Performance analysis
- Conclusion

# Robotics in agriculture

- growing demand for food, global labor shortage
- **working in agriculture is hard!**
- manual work → mechanization → robotization
- unstructured and uncertain
- vineyard management → **suckering!**

# Suckering

*What is it?*

*When does it take place?*

*What kind of activity is that?*

*Why is it important?*



# Design approach

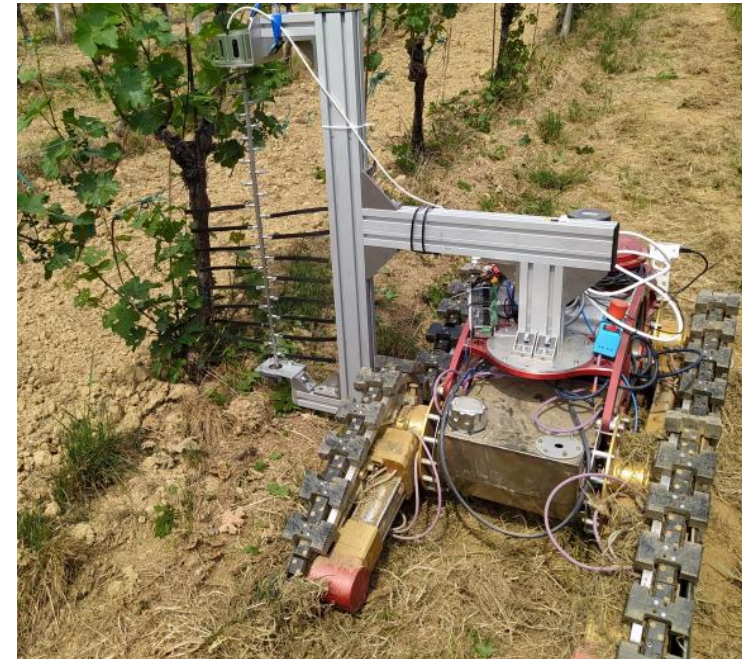
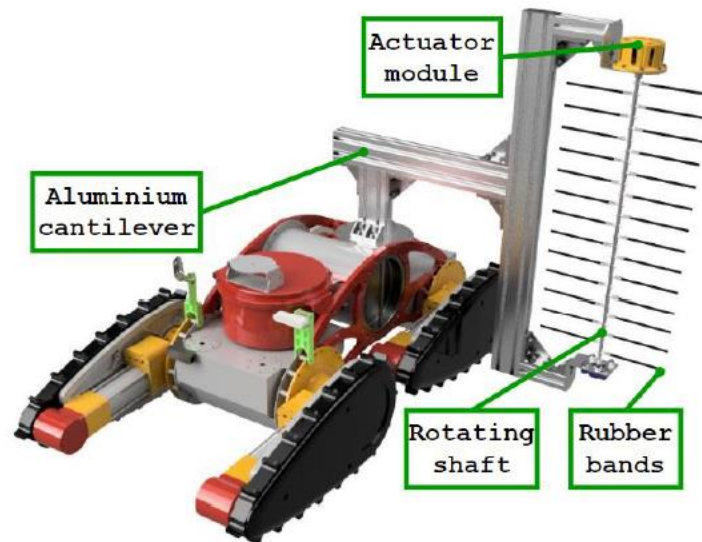
- suckering time
  - novelty vs efficiency
- prevention of vine damage
  - torque control
- vine/trunk adaptability
  - compliant structures
  - soft materials





# System description

- vertical arrangement of rubber bands
- modularity
- torque control ( $\tau_{ref} \leftrightarrow \tau_{load}$ )



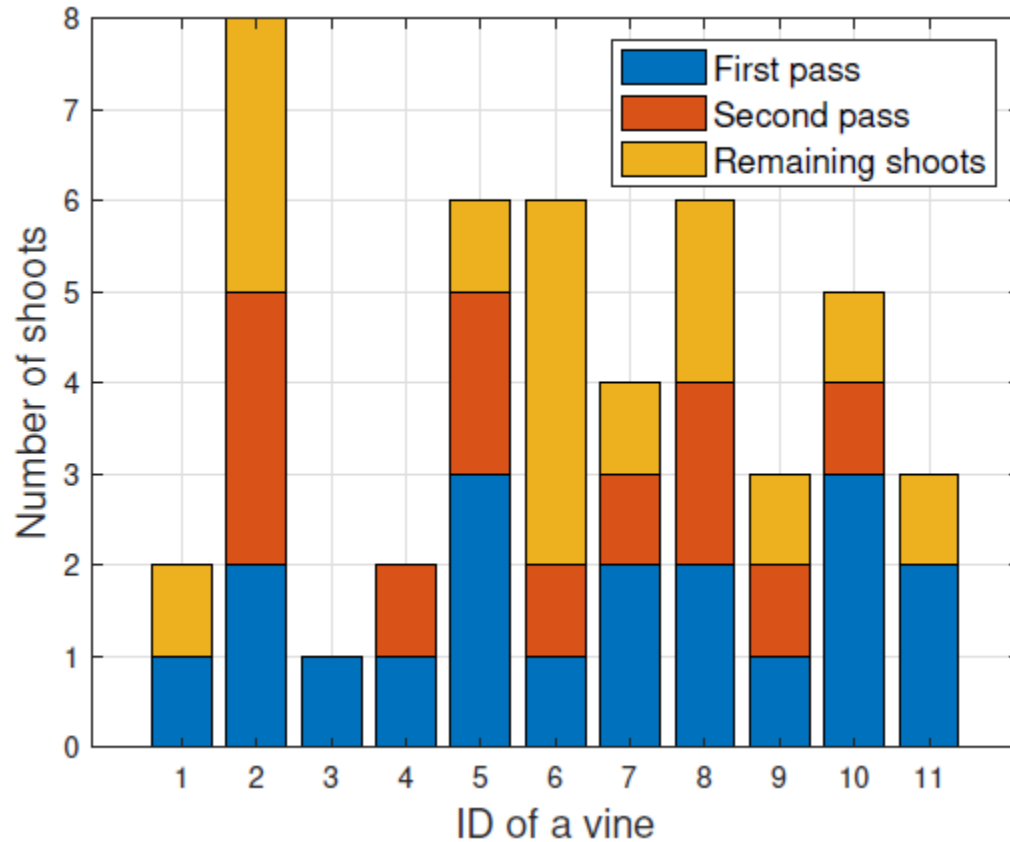
# Experimental procedure

- key metrics
  - suckering efficiency  $\eta$  (%)
  - suckering rate  $r_{ST}$  (vines/h)
- test field – vineyard Jazbina





# Performance analysis



$$\eta = 67\%$$



**before** suckering on a vine ID=2 – right side perspective



**after** suckering on a vine ID=2 – right side perspective



# Conclusion

- implementation of a torque-controlled suckering tool
  - high efficiency compared to state-of-the-art solutions (**67%**)
  - high suckering rate (**86>20!**)
- further experiments (spring season 2023) → **more comprehensive!**
- good basis toward autonomous suckering

# Thank you for your attention!

For more info about HEKTOR project, please check the website (<https://hektor.fer.hr/en/homepage/>) or scan the QR code

