German Research Center for Artificial Intelligence

SHIVAA

Strawberry Harvester: an Innovative Vehicle for Applications in Agriculture

System Description

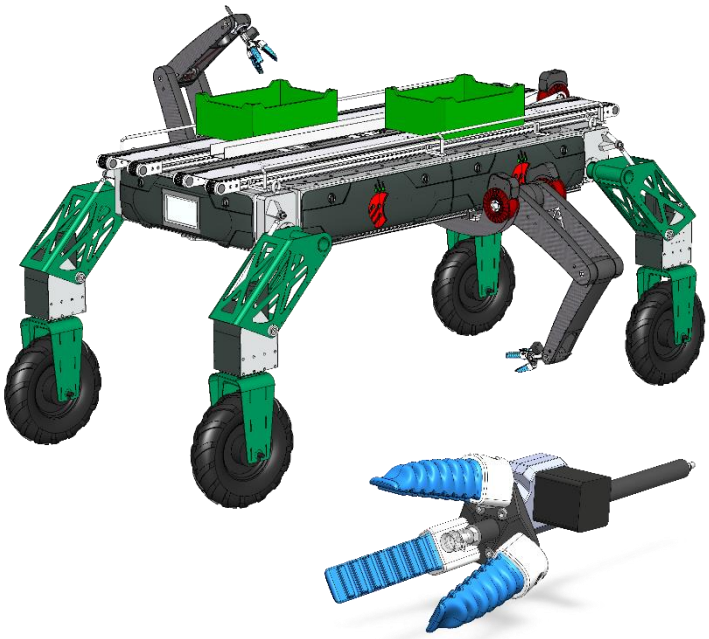
The robot SHIVAA is being developed for the fully autonomous harvesting of strawberries grown in open field.

Positioned at the edge of a field, the robot uses a 3D camera to autonomously recognize the structure of the field and move to the first row of plants. Once there, different cameras, which also process invisible light, identify the position and the ripeness of the strawberries.
Two grippers are used to pick the ripe fruits from the plants under the robot. Like a human being, the fingers of the gripper enclose the strawberry and separate it with a twisting movement. The robot arm and gripper quickly move to the crate above and gently place the strawberry.

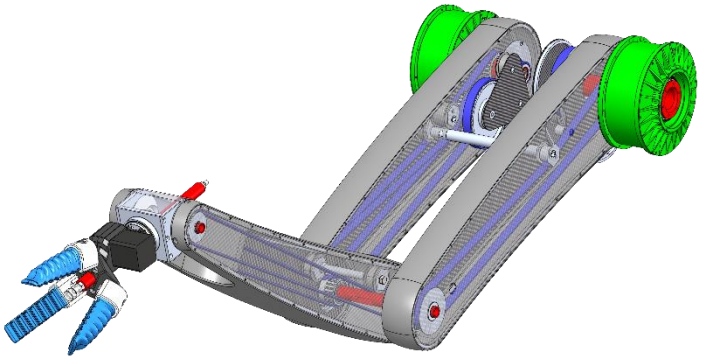
SHIVAA has been deliberately developed for use in the open field, where an organic end product is achieved by planting the strawberries naturally.
There, the robot can also pick alongside humans and thus be seamlessly integrated into a company. Additionally, night operation is possible, where constant artificial lighting creates even more favorable conditions for the robot's image processing algorithms.

Technical Details

- **Size:** 245 x 120 x 100 cm (LxWxH)
- **Track width:** 100 cm (convertible)
- **Weight:** 150 kg (without harvested good)
- **Battery Capacity:** >8h
- **Velocity:** 6 km/h
- **Suspension:** passive (continuous ground contact of all wheels)
- **Steering:** Ackermann-steering
- **Robot arms:** 4-DOF, additionally mounted on a linear rail
- **Arm weight:** 5 kg, of which only 2 kg are moved
- **Arm cinematics:** Belt coupling for load distribution
- **Gripper:** Three fingers (pneumatically actuated)
- **Cameras:** Depth camera and color filter cameras
- **Electronics:** modular in exchangeable compartments



Computer model of robot SHIVAA and its gripper. The gripper is mounted on the robot arms and actuated by compressed air



An ingenious belt routing in the arm distributes the forces to all four motors and reduces the moving mass

Application: Agriculture

Projects: **RoLand**
Automation in environmentally friendly agriculture through autonomous cost-efficient robots for outdoor strawberry harvesting.
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