THE 6TH CIGR INTERNATIONAL CONFERENCE 2024

ICC JEJU, KOREA

PROGRAM BOOK

CIGR 2024

DIGITAL AGRICULTURE

MAY 19-23

Day 1, May 20 (Mon.) I Scientific Program

Plenary 1 Digitalization and the transformation of agriculture

CLAUS GrØn SØRENSEN (Aarhus University)

10:15-11:00 Tamna A (5F)

Chair(s): JOHN SCHUELLER (University of Florida)

Plenary 2 Advances in AI and digital agriculture with status on technology adoption in the U.S.

STEVEN J. THOMSON (USDA-NIFA)

11:00-11:45 Tamna A (5F)

Chair(s): JOHN SCHUELLER (University of Florida)

S3-1 Technical Section 3: Plant Production

13:00 - 14:30 Halla A (3F)

Chair(s): NOBORU NOGUCHI (Hokkaido University)

S3-Key-01
13:00-13:30

Automation and robots in tree fruit orchards

Author MANOJ KARKEE (Washington State University)

S3-1-01
13:30-13:45

4-Wheel Independent-driven weeding robot with adjustable tread

Author WOOYUNG KIM (Chonnam National University)

Co-author(s) ANDONG HUANG (Department of Convergence Biosystems Engineering, Chonnam National University)
RATTANA SENG (Chonnam National University)
KYEONG-HWAN LEE (Chonnam national University)

S3-1-02
13:45-14:00

Development of an automated Inter-row weeding robot equipped with AI-driven crop recognition techniques

Author PHAM THI QUYNH ANH (Institute of Agricultural Machinery, NARO)

Co-author(s) KUMPEI OTA (Institute of Agricultural Machinery, NARO)
TAKANOBU YOSHIDA (Institute of Agricultural Machinery, NARO)

S3-1-03
14:00-14:15

Research progress on key technologies and equipment for strawberry harvesting mechanization

Author JIE GUO (Zhejiang University)

Co-author(s) ZHOU YANG (South China Agricultural University)
MANOJ KARKEE (Washington State University)
YUFEI LIU (Zhejiang University)
XUPING FENG (Zhejiang University)
YONG HE (College of Biosystems Engineering and Food Science, Zhejiang University)

S3-1-04
14:15-14:30

Distance estimation and object tracking using a multi-camera system for a soft manipulator

Author SYED USAMA BIN SABIR (Washington State University)

Co-author(s) ARIEL NICOLE RAMOS (Washington State University)
MANOJ KARKEE (Washington State University)

4-Wheel Independent-Driven Weeding Robot with Adjustable Tread

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Abstract

To automate labor-intensive and repetitive weeding tasks using robots, our consortium is currently developing a 4-wheel independent-driven type weeding robot. It is equipped with a Cartesian manipulator integrating a laser beam irradiating module or a module capable of precision spraying of liquid herbicides for weed removal. In agricultural fields where various crops are cultivated, there is a need for a 4-wheel independent-driven mobile platform with adjustable tread, suitable for fields with varying ridges and furrows and requiring efficient navigation in narrow-field areas. We propose a 4-wheel independent-driven mobile manipulator with an arm frame supporting adjustable tread. The proposed tread adjustment system allows enabling an overall tread adjustment range of 900mm to 1500mm. For control purposes, we derive a kinematic system model for a swerve drive system that adopted adjustable tread and for synchronization of the angular velocity of the arm link and the wheel's rotation speed to reduce the load in adjusting the thread. We present the autonomous navigation accuracy of the weeding mobile manipulator with the arm frame. The results include the accuracy track width of thread adjustment control and show the effect of reducing load through synchronization of arm frame angular velocity and wheel angular velocity in thread adjustment. In future work, we plan to integrate visual perception systems for real-time autonomous path generation based on field recognition. Additionally, we aim to integrate a manipulator system equipped with a laser module or herbicide spraying module, along with weed recognition systems, to perform robotic weeding tasks in field environments.

Keywords: Weeding Robot, 4WID 4WSD Mobile Manipulator, Adjustable Tread

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