

## **Taking Their Pick**

Getting up early. Working the field. Hoping. Just some of the things that can go into farming. The CROPS project, funded by the European Commission, hopes to make it a little easier.

CROPS, which stands for Clever Robots for Crops, incorporated robots into farming tasks, from picking certain crops to spraying, and finished in September 2014 after almost four years.

## **Multiple Crops to Choose From**

So how did they go about making robots for farming crops? Take sweet peppers, for example. Platforms are adjusted to height of the crop and the manipulator—the robot arm—picks the fruit with a metal gripper, says Jan Bontsema, coordinator for CROPS. “The gripper gets the fruit precisely where the peduncle is—that’s the part where sweet pepper goes to the main stem,” Bontsema says. “There are heating pipes on the floor and the platform runs on those pipes.” In addition, cameras are both on the platform and on the grippers. “It’s needed because no two fruits are in the same position,” he says.

According to the project’s web site, the final prototype for a manipulator was created from fully integrated drive modules. It claims that this makes it easily possible to change the kinematic configuration. In addition, it says, the platform also contains “a compressor for the pneumatics, the control electronics, the computers and the sensors for fruit and obstacle detection are mounted.”

For another crop, apples, it was a similar process to sweet peppers, Bontsema says, but with a modification of the system because the wall of fruit is tight and the row of trees is very straight.

Precision spraying was also a goal. “For this robot, there are less degrees of freedom and the intersector is lower and detecting disease in leaves,” Bontsema says. Looking not unlike a moving hair dryer, if the leaf is infected then it brings the manipulator with the intersector to the leaf and sprays. “The arm and the height has enough freedom to go close to the tree,” Bontsema says. “The closer you can spray, the less chemical you need.”

According to the site, it uses a multispectral R-G-NIR camera for disease detection in crops and adds: “Disease symptoms identification in R-G-NIR images is based on the algorithmic combination of two approaches: one based on the value of two spectral indexes calculated at pixel level, and the other based on relative variations (local gradients) of grey level intensity in the normalized red channel.”

It also says that the obstacle detection ability is right now “limited to detect and map hard obstacles such as the plant stems and non-target fruit.”

Bontsema says they have a new project on the way so the robot work is far from over. And who knows? Maybe robots may one day have that much more to do with the fruits and vegetables on your table.