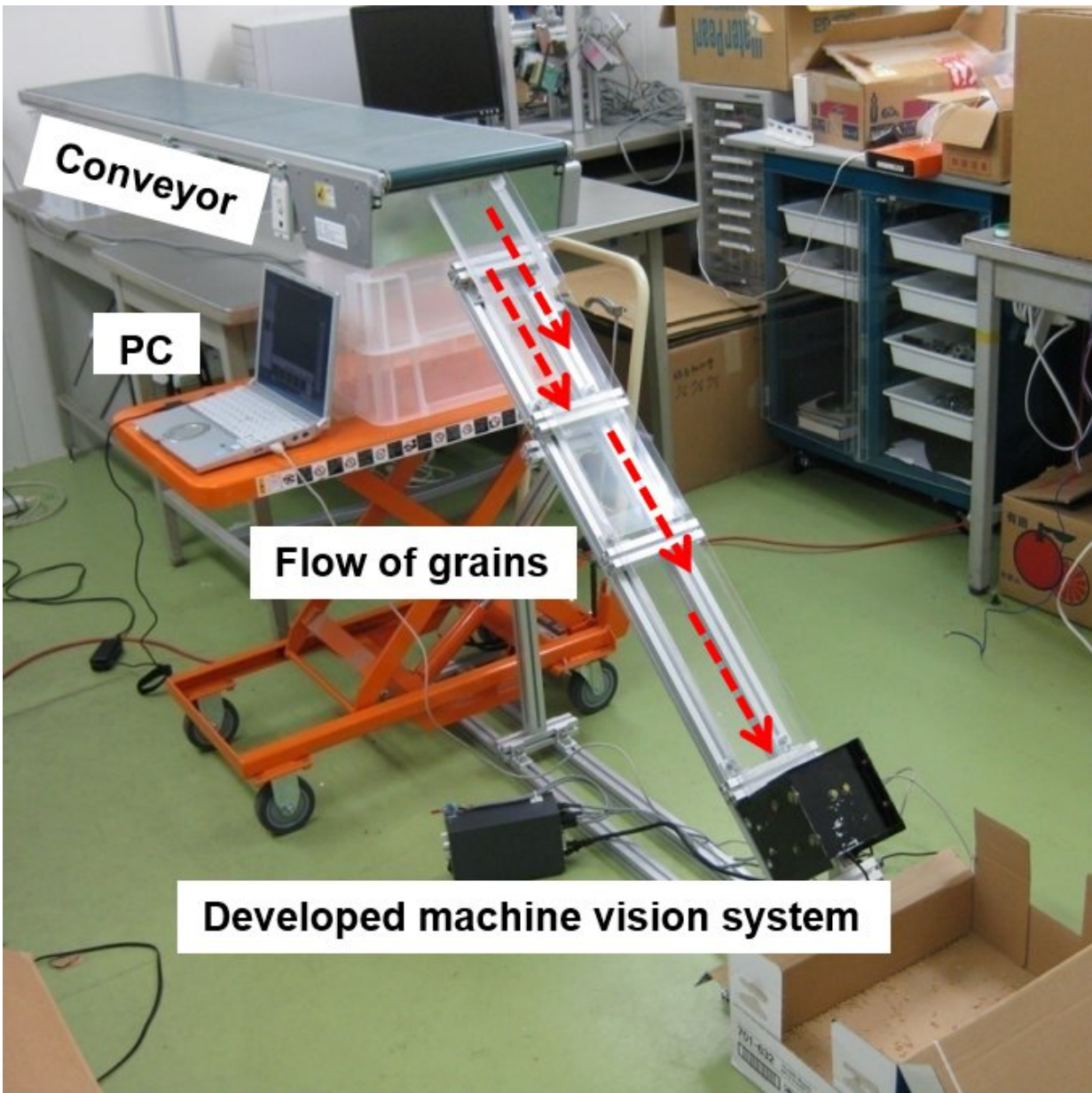# New machine evaluates soybean at harvest for quality

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Experimental setup of the image acquisition system. Credit: University of Illinois

When a field of soybeans is ready to harvest, speed is of the essence. But harvesting grinds to a halt every time the combine operator has to climb down out of the cab to manually check for quality—whole, un-split beans without stray husk material. Researchers from Kyoto University and University of Illinois recently developed a machine to automate the process, evaluating bean quality on the fly, so harvesting can go on uninterrupted.

"The main objective was to develop an efficient, compact, on-board quality-monitoring system to evaluate soybeans as they are harvested, providing the combine operator with real-time grain quality information," says Md Abdul Momin, lead scientist on the project.

Momin explains that when the threshing speed is too high, the soybeans split or break as they are harvested. This is undesirable because whole beans are considered to be higher quality and bring a higher price.

"Without this machine, operators need to periodically stop threshing and manually check the tank to evaluate the quality and make adjustments," Momin says. "With this machine, operators can look at a screen and make adjustments as they go, without stopping."

The machine, which includes a high-speed camera, is mounted inside the tank of the harvester. It takes images of the beans as they pass by and a computer program analyzes the beans in real time. One key is that it is a double-imaging system. It uses a combination of both front and back lighting so the camera can see the complete shape of the beans, making it possible to identify those that are truly split.

Momin tested the system first in the laboratory and then in field conditions. The prototype is currently in the hands of a Japanese company that is working to develop a higher-speed camera and ultimately to produce the machine.

"The same system can be used in the processing industry with a $100 web camera, making it very affordable," Momin says. "Mounting it inside of the combine is more ambitious because it needs a super high-speed camera to evaluate the soybeans as they pass rapidly by."Momin says soybean growers in Japan are eager to use this new technology to evaluate beans during the harvest. They believe it will improve the process by doing much of the sorting and cleaning of the soybeans before they reach the processing plant.

The study, "Machine vision based soybean quality evaluation," is published in *Computers and Electronics in Agriculture*.

More information: Md Abdul Momin et al, Machine vision based soybean quality evaluation, *Computers and Electronics in Agriculture* (2017). DOI: 10.1016/j.compag.2017.06.023

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