Laser Shows if Fruit's Beauty is Only Skin Deep

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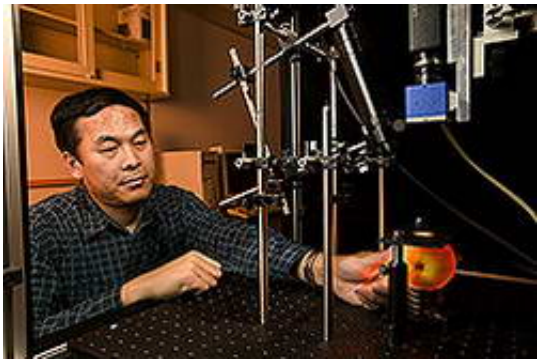

The produce industry is working with the Agricultural Research Service (ARS) to make sure that fruits and vegetables taste as good as they look. They're counting on "machine vision" tools that can predict the quality of fruit or vegetable flavor--right after picking and in the packing plant--without ever touching the product. Machine vision uses optical sensors to inspect objects.

Image: Using a multispectral imaging system to collect light scattering from the fruit, visiting assistant professor Yankun Peng (from Michigan State University) estimates apple firmness.

Today, batches of fruits and vegetables are judged by sample tastings, but there is no guarantee that all of the produce in the batch will taste the

same. Samples are also tested for firmness by mechanically stabbing them with a thick, steel probe. With both methods, the tested produce has to be thrown away.

While there are machine vision tools that can check skin-deep traits like size, color and bruising, it is difficult to judge deep, internal qualities like taste and texture of apples and many other fruits. Now Renfu Lu, an agricultural engineer with the ARS Sugar Beet and Bean Research Unit in East Lansing, Mich., has developed machine vision prototypes that "taste" every single piece of produce from right after harvest to when it passes by on the packing line.

Lu and ARS colleagues on the campus of Michigan State University have tested their laser prototype on apples and peaches. It should work with any produce that is at least as large as an apple or peach. The detector focuses four laser beams, each a different light wavelength, into one sharp beam that shines into individual fruits.

Laser light photons momentarily scatter all the way to the fruit's core and back. The amount of light bounced back after interacting with tissue reflects firmness. Peaches and apples are separated by whether they are soft, firm or hard.

Since scattered light also indicates the amount of light absorbed by the fruit, and that absorption is affected by sugar levels in the fruit, this technology can be used to predict flavors, such as sweetness in apples.

Source: Agricultural Research Service