The Promise and Problems of Food Scanners

A new generation of mobile sensing approaches offers significant advantages over traditional platforms in terms of test speed, control, low cost, ease-of-operation, and data management, and requires minimal equipment and user involvement. The marriage of novel sensing technologies with cell phones enables the development of powerful lab-on-smartphone platforms for many important applications including medical diagnosis, environmental monitoring, and food safety analysis. This paper reviews the recent advancements and developments in the field of smartphone-based food diagnostic technologies, with an emphasis on custom modules to enhance smartphone sensing capabilities. These devices typically comprise multiple components such as detectors, sample processors, disposable chips, batteries and software, which are integrated with a commercial smartphone. One of the most important aspects of developing these systems is the integration of these components onto a compact and lightweight platform that requires minimal power. To date, researchers have demonstrated several promising approaches employing various sensing techniques and device configurations. We aim to provide a systematic classification according to the detection strategy, providing a critical discussion of strengths and weaknesses. We have also extended the analysis to the food scanning devices that are increasingly populating the Internet of Things (IoT) market, demonstrating how this field is indeed promising, as the research outputs are quickly capitalized on new start-up companies.

A device, [*SCiO*](https://www.consumerphysics.com/myscio/), from Israel, was founded by people with optical engineering backgrounds. They have raised over $2.7 million on Kickstarter in 2014. It uses a technology similar to *TellSpec*’s but is designed to identify the molecular content of foods, medicines, and even plants. It illuminates an object; optical sensors detect the reflected light; and the device analyzes it using an algorithm and a cloud–based database that is constantly updated. The company promises that in milliseconds the ingredients and molecular make–up of the foodstuff will appear on the user’s smartphone. The device was scheduled for shipment in 2015, but disappointed backers, but still hasn’t shipped. On top of the delays, experts in applied science criticized both SCiO and TellSpec for overstating what their inventions can do.

There are two major issues. One is size, because the device must be hand–held to become popular. With current technology this means engineers have to sacrifice sensitivity and accuracy in order to achieve a convenient size. The other issue is the algorithm. *SCiO* sends data to the cloud which then sends its calculation back to the device. But to simplify what the algorithm has to do, users need to tell the scanner specifics – like whether the sample is a solid food, a liquid, or vegetable. These inconveniences are the price of keeping the scanner small.

There isn’t any promising hand–held food scanners on the horizon besides these, but there is no reason to believe a solution will not arise in the coming years. The challenge is not when a workable device comes along but what we will do with the large amount of data it generates.

Diabetes patients would know how many carbohydrates their food contains. But knowledge doesn’t change behaviour alone, otherwise nobody would smoke by now. Knowledge supported by gaming or technologies revealing our lifestyle choices to our family members or caregivers might do. Patients with rare genetic metabolic disorders such as phenylketonuria would know what to avoid at all cost. People with allergies could avoid dangerous meals. Having a good diet would not rely on the experience we bring with us from childhood and what we have learned since then. Instead, it could be based on informed decisions.