Development of a 3D Food Tracker for Health Care

Student

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Introduction: Studies show that up to 50% of patients in care facilities suffer from malnutrition, which increases the risk of complications, length of hospital stay and costs. A research project at ETH Zürich aims to tackle this problem. The idea is to use a food tracker that can automatically determine the amount of food consumed by a patient. The food tracker shall use a depth camera to scan a patient's food tray and analyse the plate's contents before and after each meal. A first existing device supposed to accomplish this functionality has shown various limitations. The goal of this project is to analyse the shortcomings, to propose improvements and to realize a prototype that validates the new approach.

Approach: The first step was to work out the hardware and software requirements together with the team at ETH. The Raspberry Pi Compute Module 4 on an IO board was used for the platform (Fig. 1). The computer interacts with the other system components, including the camera, a scale, a speaker and status lights (Fig. 2). To link the patients to their meal, QR codes were used. During operation, the food tracker searches for those codes (Fig. 3) and determines the next action with a series of logical queries. The collected data is finally uploaded to the cloud for further processing.

Result: Due to the use of QR codes and the developed logic queries, data collection has been largely automated. All the user has to do is to hold the meal with the patient card under the food tracker's camera. The food tracker indicates with a status light and a sound whether the meal has been successfully scanned. Thanks to the good collaboration with the team at ETH, almost all requirements were met by the end of the project. Only the duration of the data acquisition, currently at 2.7 seconds, is still above the target value of one second. To speed this up, various suggestions were made, such as moving certain tasks to a separate thread. In conclusion, this work proves the viability of a fast and easy-to-use food tracker product that actively supports staff with patient care.

Fig. 1. Prototype of the newly developed food tracker.
Own presentment

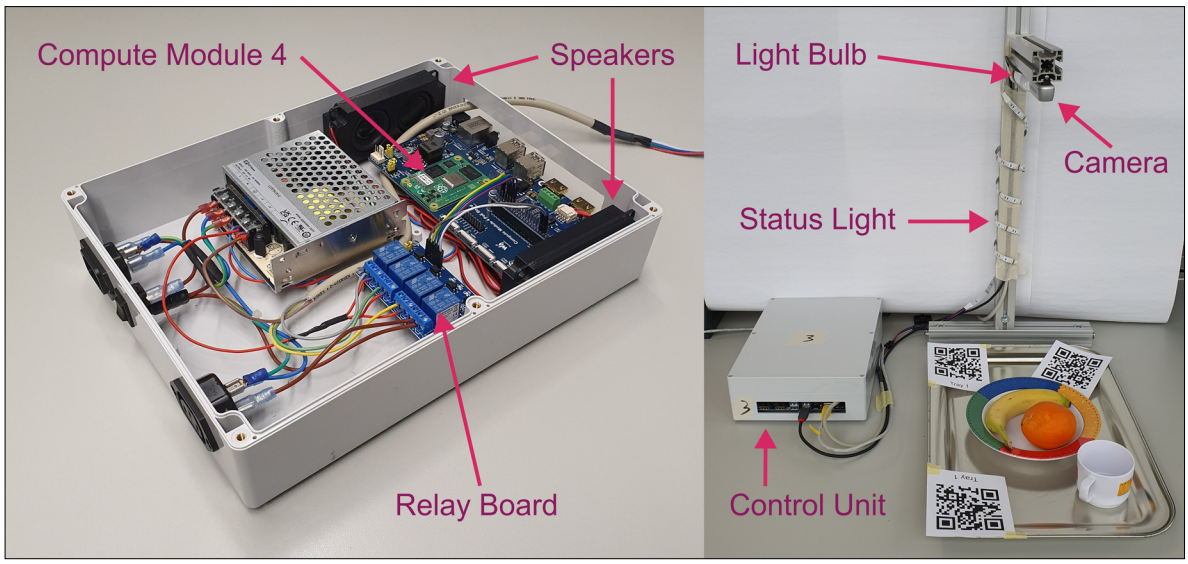

Fig. 2. Deployment diagram of the food tracker device.
Own presentment

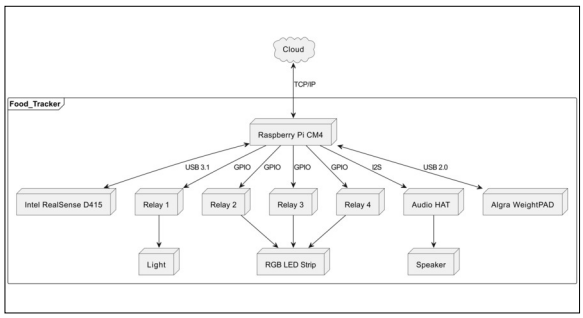

Fig. 3. Colour image and colourized depth map of a food tray.
Own presentment

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Subject Area
Embedded Systems

Project Partner
ETH Zürich, Schwerzenbach, ZH