

NOVEL TECHNIQUES FOR FOOD TRACEABILITY SYSTEM

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Abstract

Food traceability is important for food control according EU Regulation. Implementing real-time food traceability requires the use of novel networking solutions and computer embedded systems. This paper introduces a new technique for active food traceability based on energy-efficient wireless sensor networks - Long Range Wide Area Networking (LoRaWAN) technology.

Our network infrastructure is for active food traceability based on existing Internet of Things technologies. LoRa is used as technology for communication due to the fact that its end nodes allow secure communication up to 5 km in urban area. A model for a modern infrastructure for food traceability has been developed.

Based on the proposed model for network infrastructure for active food traceability a block diagram of such a traceability system has been synthesized. The main modules of our food traceability system include LoRa end node, Lora gateway, The Things Network, application server, router and mobile device. Special attention has been paid to the selection and the design of our LoRa sensor end node for food traceability by using modern microcontroller ATmega32u4, RN2483 transmitter, TCS34725 colour sensor and BME280 environmental sensor. An exemplary use of our end module for food traceability is active monitoring of meat products. The schematics and algorithmic diagram of the designed food traceability sensor end node are given. We have developed a web application in Python for real-time monitoring of meat products during storage sensor data like temperature, colour and humidity. The flowchart diagram of our web application for active food traceability is given. A graphical user interface for monitoring of technological parameters temperature (from -20 °C to +40 °C), relative humidity (from 0 to 100%), lighting (from 0 to 100%) and colour (R = 0 - 255, G = 0 - 255, B = 0 - 255) is proposed.

The proposed system is open hardware and software and allows expansion with different types of sensors and dashboards. The novel technique adapts working models and technologies for new food traceability cases. Our sensor end node is reusable and reprogrammable for different real-time traceability of food products.

Key words: *Internet of Food, LoRaWAN, Food Traceability, Computer systems.*