DATA ACQUISITION COMMUNICATION DESIGN APPLIED TO POULTRY FARMING

PROJECT INTRODUCTION

In livestock farming, especially poultry, the large-scale production and high efficiency requirements make animals vulnerable to infections. Besides production and efficiency, farmers also care about improving animal welfare. In general, farmers are interested in technology that can contribute to a better animal welfare, but it has to be practical and at low cost. Observing animal behaviour, tracking environmental conditions and smelling deceases are methods to discover anomalies among poultry. It is desired to discover anomalies at an early stage whereby the farmer and veterinarian can intervene and take actions to, for example, stop the spreading of an infection. Therefore, data acquisition in poultry houses is essential – to measure is to know.

Artificial Intelligence is a technology that can make certain predictions to achieve a smart surveillance system. However, AI without data is useless. This assignment is about data acquisition within poultry houses using sensors, microcontroller boards, edge computing, and distributed cloud-based services for storing and monitoring the data. The data must be made ready for AI processing.

This assignment is part of a large-scale project, *OBSeRVeD – Odour Based Selective Recognition of Veterinary Diseases*, in which Dutch research institutes participate and contribute to developing a *smart nose* for poultry farming. The smart nose is being developed by Saxion research groups and other universities. The odour (air particles) is analysed for infections and other anomalies using intelligent algorithms. Within Saxion, the research group of Ambient Intelligence (AmI) contributes in developing an ICT platform that acquires sensor data in the field, provides participants the sensor data via the cloud and performs Artificial Intelligence to detect infections.

ASSIGNMENT OBJECTIVES

The aim of this assignment is to develop a data acquisition system, consisting of two sensor-units (with multiple sensors) that communicates with an edge computer, and the edge computer communicates with cloud-based services using MQTT-based communication protocols. Both communication protocols have to be designed and implemented. The SparkPlug specification by the Eclipse Foundation has to be used for designing communication protocols. This way, the data has to made available to the participants in the OBSeRVeD project. The participants will use the data for further research.

The assignment task will include, but are not limited to:

- Designing communication protocols between the sensor-units and the edge computer, and between the edge computer and a cloud-based database and a web-based dashboard.
- Setting up a database and a dashboard using respectively influx and Grafana.
- Developing an user-friendly dashboard application implementing various features.
- Developing software in the C/C++ programming language for the sensor-units.
- Developing software (programming language to be determined) for the edge computer that becomes a bridge between sensor-units and cloud-based services; the database (Influx) and dashboard (Grafana).

This assignment has a research aspect with respect to investigating the Sparkplug specification and designing communication protocols that fulfils the requirements. The requirements are related to real-time, secure, reliable, robust and scalable aspects. These requirements are determined in association with the researchers at AmI.

The student can define his/her own assignment according to the project requirements, internship requirements, personal preferences and interest. AmI and the education coordinator must approve the assignment. The student will be working according to an Agile development methodology.

The assignment will be carried out at the Ambient Intelligence research group, under the regular supervision of a researcher. The research will be carried out at the Ambient Intelligence lab in Enschede.

PRACTICAL INFORMATION

Student profile: from HBO-ICT, ACS or EE with experience in C/C++ programming and interest in developing IoT (cloud-based) applications.

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