Design Project

EEG 326 2024/2025

Design and Construction of Automatic Water Shower System for Hogs

Background/Introduction/Motivation for the Work

Among farm animals, pigs (hogs) are particularly vulnerable to heat stress due to their limited ability to regulate body temperature. Unlike other animals, hogs do not sweat efficiently and rely on external means such as wallowing in mud or access to water to cool themselves. In hot climates, or during the dry season, excessive heat can lead to discomfort, decreased feed intake, slower growth, reproductive issues, and even mortality. Traditional cooling methods, such as manual spraying or water troughs, are often inefficient and labor-intensive. They may also result in water wastage, increased labor costs, and inconsistent cooling. Automating this process can significantly improve both animal welfare and operational efficiency. An automatic water shower system is a sustainable farm solution that activates based on the presence of animals or ambient or animal temperature, offering a smart, responsive, and resource-efficient approach to livestock cooling. This project aims to design and construct an electronic control system that activates a water spray for hogs when certain environmental conditions are met. The system will rely on a combination of analog and digital electronic components to sense, process, and actuate responses, making it a practical application of core concepts in electronic circuits. The project comprises the design and construction aspect:

A. **Design part:**

   You are required to design a water control system that activates based on ambient or local temperature. Select appropriate sensors and design analog and/or digital control circuits for the water shower system. You must use an appropriate ESP32 controller to acquire temperature and humidity data and activate the water shower when the temperature exceeds a predefined threshold. Investigate the most probable temperature that may lead to heat stress in hogs and design the water shower system to activate based on this temperature and/or humidity level.

To earn full marks, you are expected to conduct a literature review to identify similar existing designs, and then develop your own innovative and unique solution that differs from current implementations.

In your design the following task are required.

1. Use **Fritzing** or **Proteus** to design a circuit that acquires temperature and humidity values and activates a water shower.
   Hint: You may consider using a solenoid or motorized water control valve adapted to a ½- to 1-inch pipe and shower system, along with appropriate sensors and a microcontroller.
2. Model the system using the **Wokwi platform** (www.wokwi.com), where the functionality of the controller can be tested through virtual programming of the microcontroller system.

B. Construction

3. Implement a prototype of the designed system
4. Conduct a performance evaluation of the system by performing repeated measurements of say 100 trials to calculate the system reliability.

Deadline

July 30th, 2025 (Design and Construction)