IoT-Enabled Smart Agriculture System

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Real-Time Performance

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Reliability

Security

User-Friendly

Maintainability

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Technologies

IoT Sensors:

Soil Moisture Sensors: Used to measure the amount of moisture in the soil to determine when irrigation is needed.

Temperature and Humidity Sensors: Monitor environmental factors that influence crop health and irrigation needs.

Light Intensity Sensors: Track sunlight levels for crop growth optimization.

Database and Storage:
A SQL-based database (MySQL managed via phpMyAdmin) is used to store sensor data and system logs, which can later be retrieved and analyzed through SQL queries.

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System Architecture

Sensor: Responsible for collecting environmental data.

IrrigationController: Controls the irrigation system based on soil moisture.

FertilizationController: Controls the fertilization system based on soil conditions.

DataLogger: Stores sensor data and system logs.

AlertSystem: Sends alerts to farmers when thresholds are exceeded.

UserInterface: Allows farmers to monitor system status and configure settings.

CloudStorage: Stores data for later retrieval and analysis.

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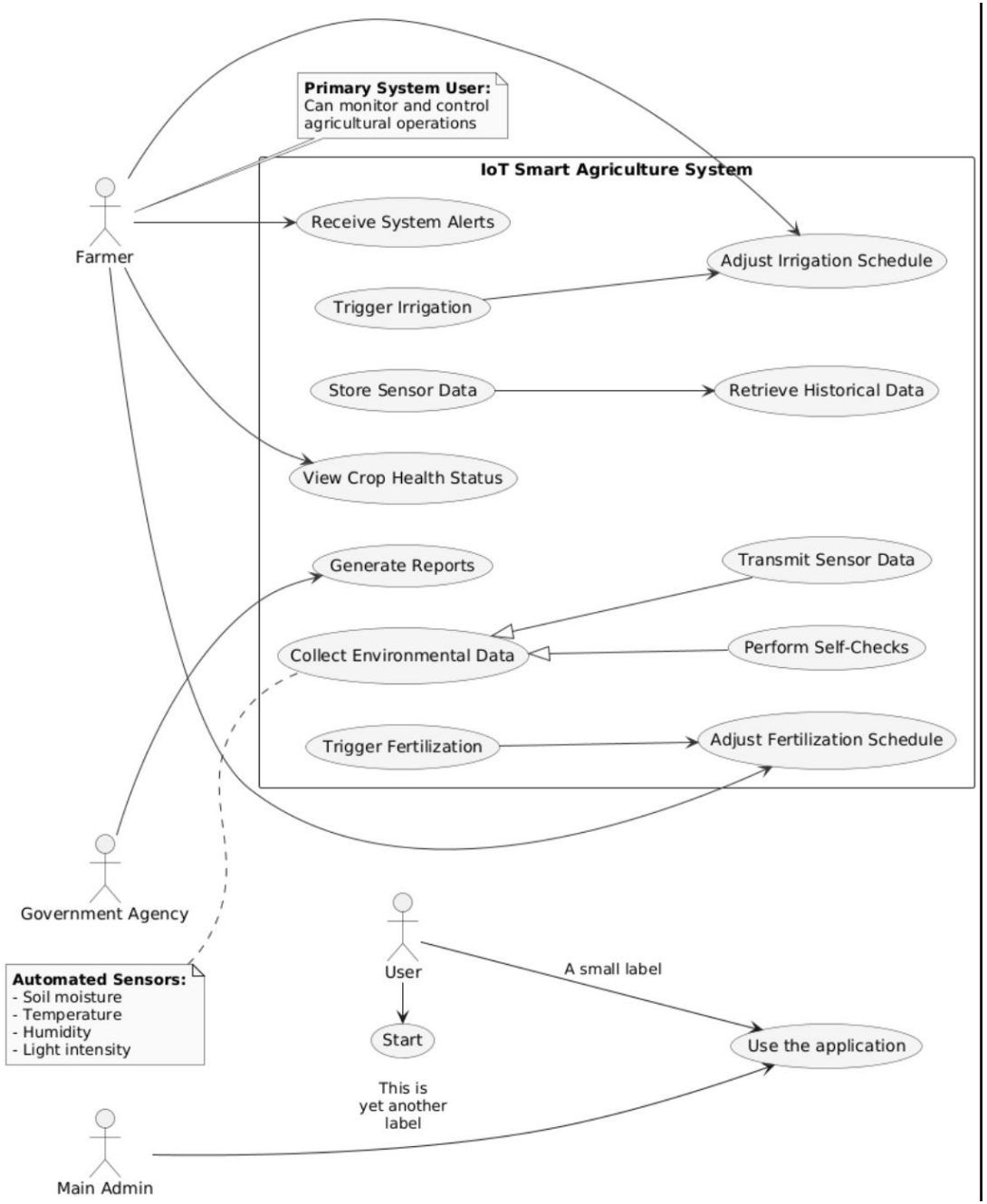
Use Case Diagram


Primary System User:
Can monitor and control agricultural operations
IoT Smart Agriculture System
Farmer
Receive System Alerts
Adjust Irrigation Schedule
Trigger Irrigation
Store Sensor Data
Retrieve Historical Data
View Crop Health Status
Generate Reports
Transmit Sensor Data
Collect Environmental Data
Perform Self-Checks
Trigger Fertilization
Adjust Fertilization Schedule
Government Agency
Automated Sensors:
- Soil moisture
- Temperature
- Humidity
- Light intensity
User
A small label
Start
Use the application
This is yet another label
Main Admin

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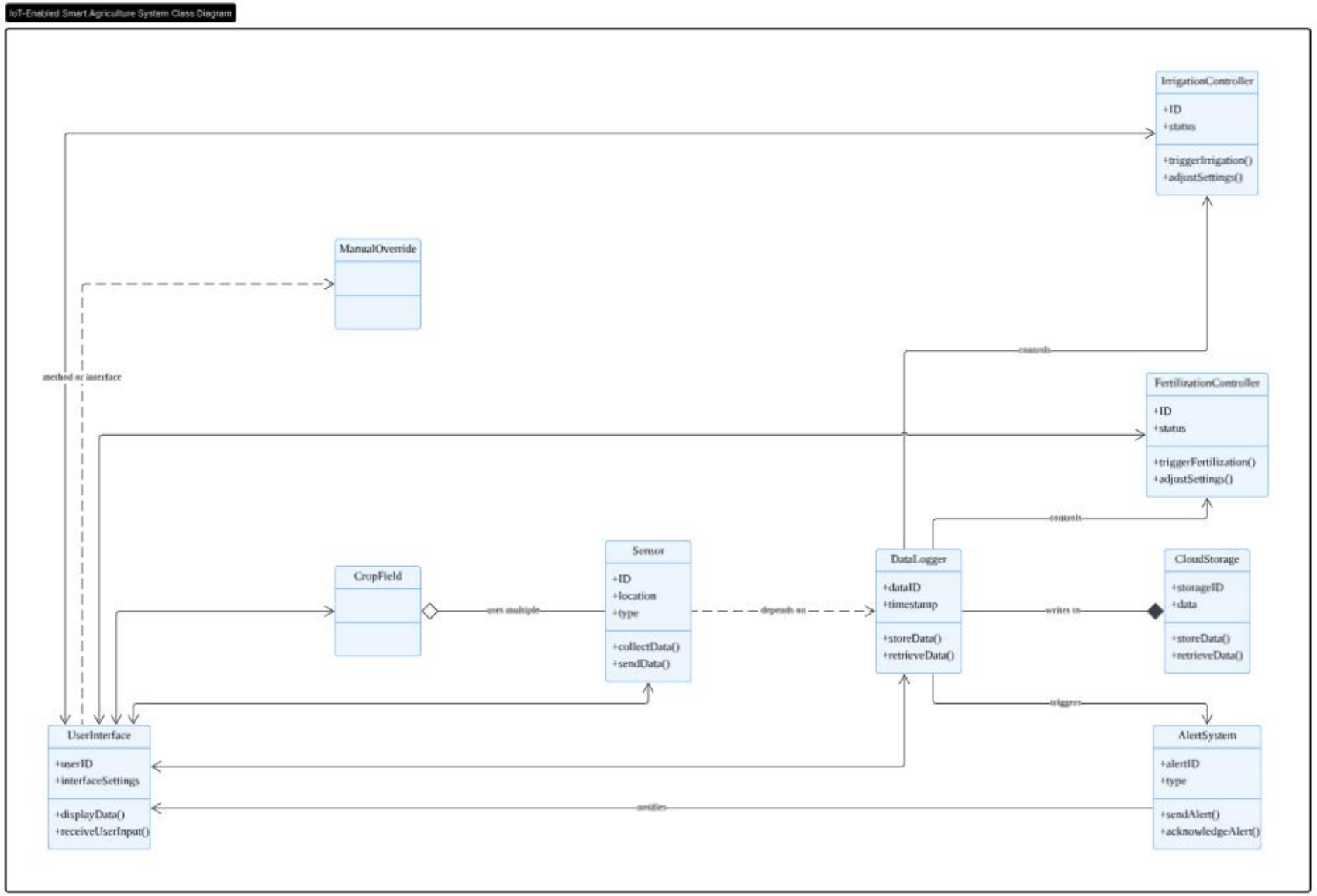
Class Diagram

Design-Level Class Diagram



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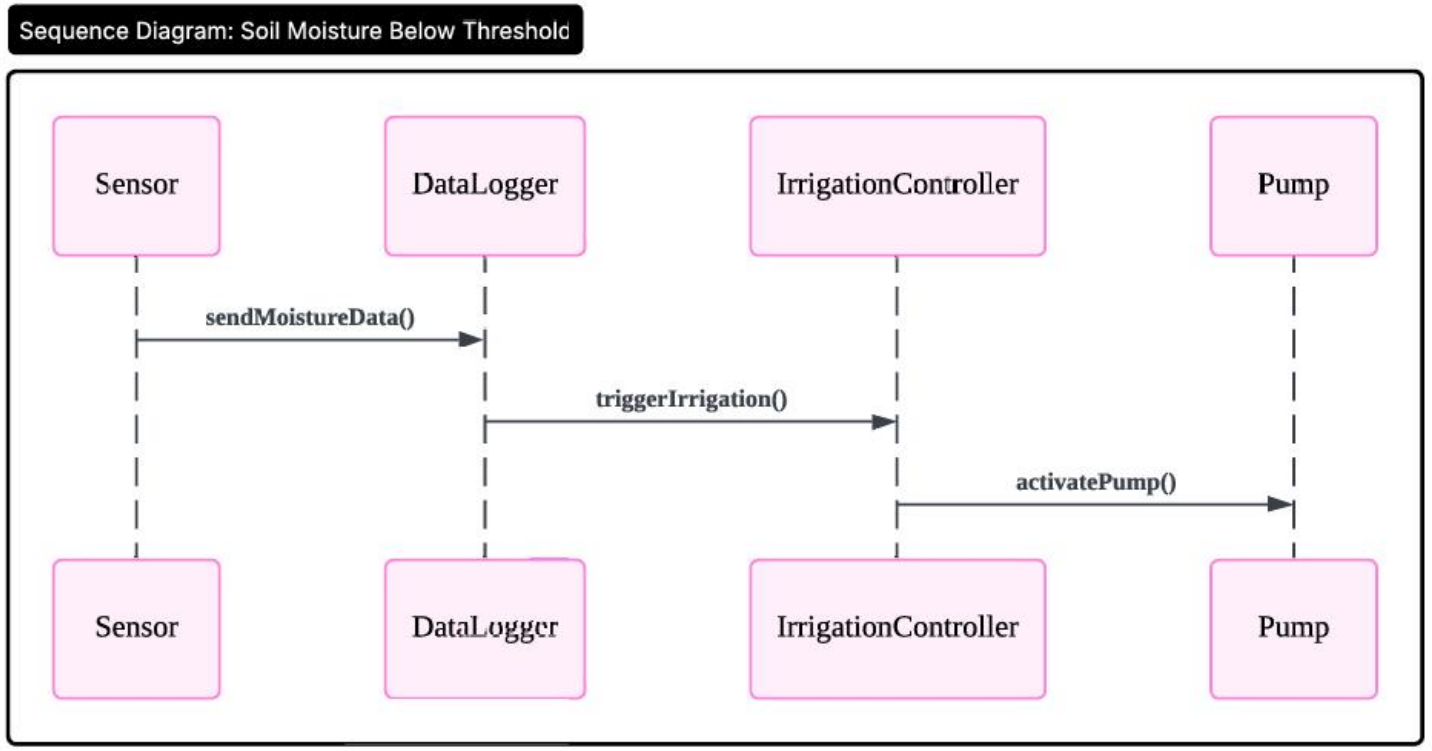
Sequence Diagram

When Soil Moisture Below Threshold



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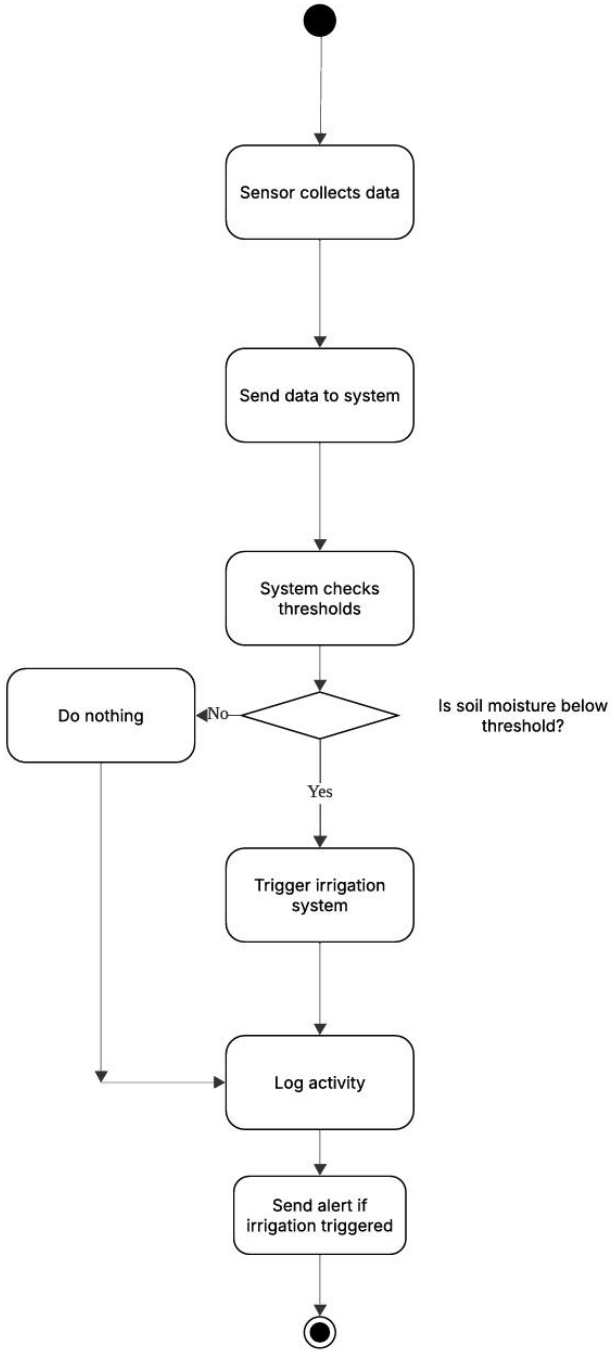
Activity Diagram



Data Flow:

Sensor collects data

Data sent to the system

System checks thresholds

If below threshold → Trigger irrigation

Log the activity and send an alert

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Database

	表	操作	行数	类型	排序规则	大小	多余
☐	alerts	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	crop_field	浏览 结构 搜索 插入 清空 删除	1	MyISAM	utf8mb4_0900_ai_ci	2.0 KB	-
☐	fertilization_controller	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	irrigation_controller	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	manual_override	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	sensor	浏览 结构 搜索 插入 清空 删除	2	MyISAM	utf8mb4_0900_ai_ci	3.0 KB	-
☐	sensor_data	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	system_logs	浏览 结构 搜索 插入 清空 删除	0	MyISAM	utf8mb4_0900_ai_ci	1.0 KB	-
☐	users	浏览 结构 搜索 插入 清空 删除	2	MyISAM	utf8mb4_0900_ai_ci	2.1 KB	-

users:
Stores information about system users, including admins and farmers. Supports role-based access control.

		user_id	username	password	role
☐	编辑 复制 删除	U001	admin1	admin_password_hash	admin
☐	编辑 复制 删除	U002	farmer_lee	farmer_password_hash	farmer

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Future Prospects

1. Intelligent Algorithm Enhancement
Integrate machine learning and AI for crop health prediction models and dynamic resource optimization

2.Technology Integration Expansion
Incorporate drone-based aerial monitoring for coordinated ground-air surveillance

3.Industry-Academia-Research Collaboration
Partner with agricultural research institutions to continuously improve sensor accuracy
Develop feedback mechanisms to enhance real-time system responsiveness

4.Sustainable Development
Explore green solutions such as solar-powered systems
Develop carbon footprint monitoring modules for agriculture

Thanks