Jambavantha: smart irrigation system

GREENER FIELDS, BRIGHTER FUTURE

PROJECT OVERVIEW

Overview

Jambavantha is an AI-powered smart irrigation and soil nutrition management system. It empowers farmers with real-time soil monitoring, AI-based decisions, weather-aware irrigation, and wireless remote sensor data all accessible via a web or mobile interface.

Problem statement

Traditional farming suffers from resource wastage, lack of data, and inconsistent yields. There is an urgent need for intelligent systems that can optimize water and fertilizer usage.

Proposed solutions

- Smart Irrigation with local and remote sensors (NRF24L01).

- Weather-aware auto shutoff via OpenWeather API.

- AI-assisted fertigation using Gemini API.

- Real-time multilingual web/mobile data.

Hardware Components

- ESP8266: Main microcontroller
- NRF24L01: Wireless sensor data transmission
- Soil Moisture Sensor: Analog local sensing (A0)
- Relay Module: Pump control (GPIO 0)
- Power Supply: For ESP8266 and peripherals

Software Architecture

- Control loop handles sensor polling, decision-making, and web UI

- Web Server Endpoints: '/', '/status', '/control', '/set_timer'

- AI Prompt sent to Gemini API based on soil thresholds and weather data

Installation guide

1. Connect soil sensor to A0, relay to GPIO 0, NRF24L01 to GPIOs 4 & 5.

2. Flash code with correct WiFi and API credentials.

3. Access the ESP8266 IP in browser for control and monitoring

Web Interface Features

- Mode toggle: Manual / Auto

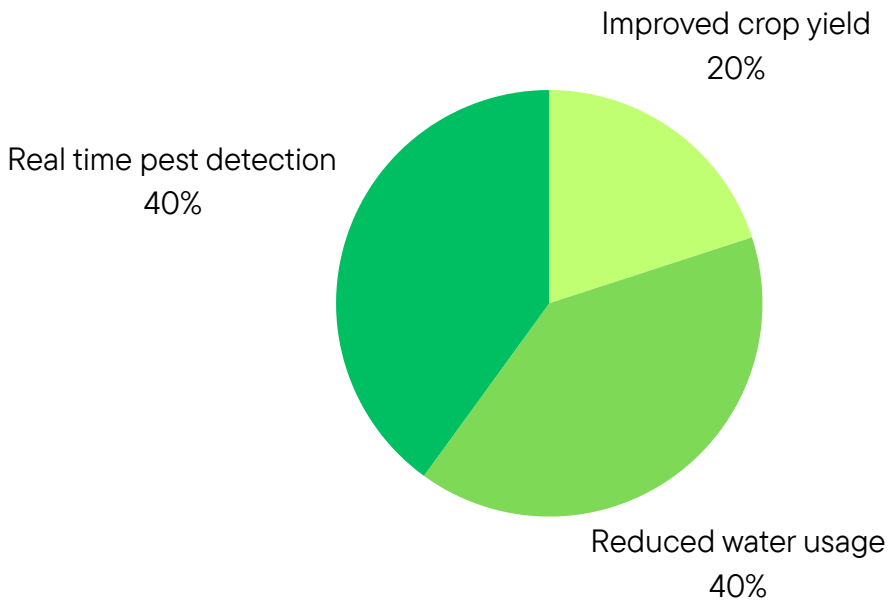
- Pump control and timer setting

- View sensor data and AI irrigation advice

System Features

- Manual & Auto modes
- AI-based pump control
- Fertilizer dosing based on nutrient detection
- Real-time alert system

Case Studies



Impact and Social Responsibility

- Empowers smallholder farmers with affordable tech

- Partnerships with NGOs and local governments

- Supports sustainability and rural development

Maintenance Schedule

- Monthly: Calibrate sensors, inspect wiring

- Seasonal: Adjust thresholds and inspect pump

-Ongoing: Monitor AI output and API usage

Trouble Shooting

- WiFi not connecting: Check credentials/router

- No AI response: Validate API key and connectivity

- Relay not working: Check wiring and pin definition

- Sensor erratic: Clean or replace sensor

Example AI Response

PumpStatus: off Recommendation: No irrigation needed.

Reason: Adequate soil moisture.

Team Details

- Ankit Kumar (Team Leader)

- Ajay Gupta

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