AI-Powered Smart Agriculture System for Optimized Plant Care

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Introduction

- Water waste in irrigation and agriculture
- Roughly 60% of irrigation water is wasted due to inefficient practices.
- AI can solve these problems efficiently.

Research Questions

How can we make a low-cost and easy to use system for all farmers?
Why is Reinforcement learning better than other AI models for these types of systems?

Novelty

- Implementing Reinforcement learning (Q-learning) into agriculture
- System can monitor different microclimates

Results & Expected Outcomes

Date	Time	Soil Temp (°F)	Soil pH	Soil Humidity (%)
3/4/2025	8:00 AM	72.5	6.8	45
3/4/2025	2:00 PM	75.6	6.7	38
3/4/2025	8:00 PM	71.2	6.8	50
3/5/2025	8:00 AM	71.6	6.9	48
3/5/2025	2:00 PM	77	6.7	36
3/5/2025	8:00 PM	70.3	6.8	52
3/6/2025	8:00 AM	71.1	6.8	42
3/6/2025	2:00 PM	74.3	6.7	35
3/6/2025	8:00 PM	70	6.8	55
3/7/2025	8:00 AM	73	6.8	43
3/7/2025	2:00 PM	76.5	6.7	30
3/7/2025	8:00 PM	70.7	6.8	58
3/8/2025	8:00 AM	72.1	6.8	40
3/8/2025	2:00 PM	77.9	6.7	28
3/8/2025	8:00 PM	71.4	6.8	60
3/9/2025	8:00 AM	71.6	6.9	41
3/9/2025	2:00 PM	75.2	6.8	33
3/9/2025	8:00 PM	71.1	6.8	57
3/10/2025	8:00 AM	72	6.8	39
3/10/2025	2:00 PM	77.4	6.7	27
3/10/2025	8:00 PM	71.2	6.8	61

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Row 1: Temperature=22.5°C, Humidity=45.0%, pH=6.8 --> No Water Needed
Row 2: Temperature=24.2°C, Humidity=38.0%, pH=6.7 --> No Water Needed
Row 3: Temperature=21.8°C, Humidity=50.0%, pH=6.8 --> Needs Watering
Row 4: Temperature=22.0°C, Humidity=48.0%, pH=6.9 --> No Water Needed
Row 5: Temperature=25.0°C, Humidity=36.0%, pH=6.7 --> No Water Needed
Row 6: Temperature=21.3°C, Humidity=52.0%, pH=6.8 --> No Water Needed
Row 7: Temperature=21.7°C, Humidity=42.0%, pH=6.8 --> No Water Needed
Row 8: Temperature=23.5°C, Humidity=35.0%, pH=6.7 --> No Water Needed
Row 9: Temperature=21.1°C, Humidity=55.0%, pH=6.8 --> No Water Needed
Row 10: Temperature=22.8°C, Humidity=43.0%, pH=6.8 --> No Water Needed
Row 11: Temperature=24.7°C, Humidity=30.0%, pH=6.7 --> Needs Watering
Row 12: Temperature=21.5°C, Humidity=58.0%, pH=6.8 --> No Water Needed
Row 13: Temperature=22.3°C, Humidity=40.0%, pH=6.8 --> Needs Watering
Row 14: Temperature=25.5°C, Humidity=28.0%, pH=6.7 --> Needs Watering
Row 15: Temperature=21.9°C, Humidity=60.0%, pH=6.8 --> Needs Watering
Row 16: Temperature=22.0°C, Humidity=41.0%, pH=6.9 --> No Water Needed
Row 17: Temperature=24.0°C, Humidity=33.0%, pH=6.8 --> No Water Needed
Row 18: Temperature=21.7°C, Humidity=57.0%, pH=6.8 --> No Water Needed
Row 19: Temperature=22.2°C, Humidity=39.0%, pH=6.8 --> Needs Watering
Row 20: Temperature=25.2°C, Humidity=27.0%, pH=6.7 --> Needs Watering
Row 21: Temperature=21.8°C, Humidity=61.0%, pH=6.8 --> Needs Watering
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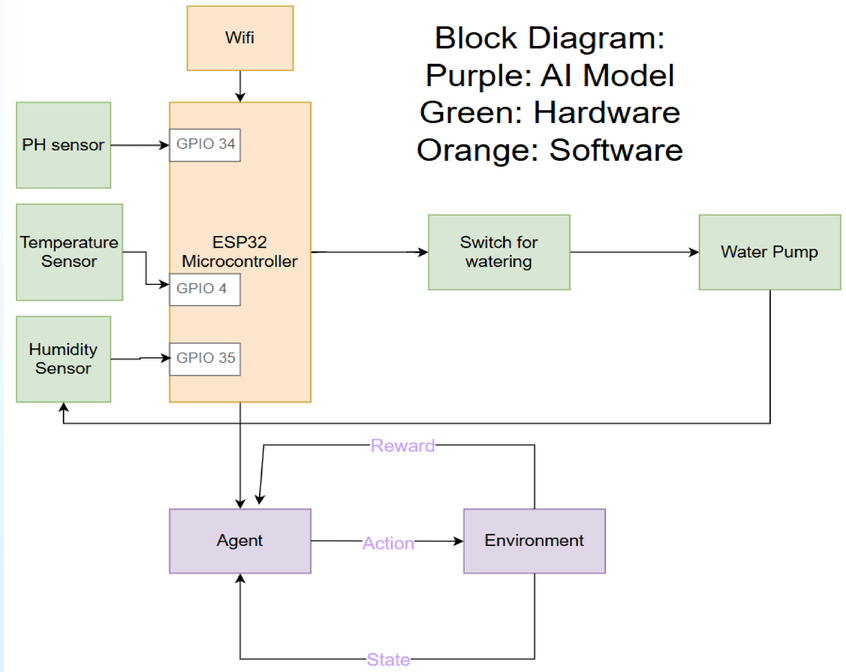
Methods



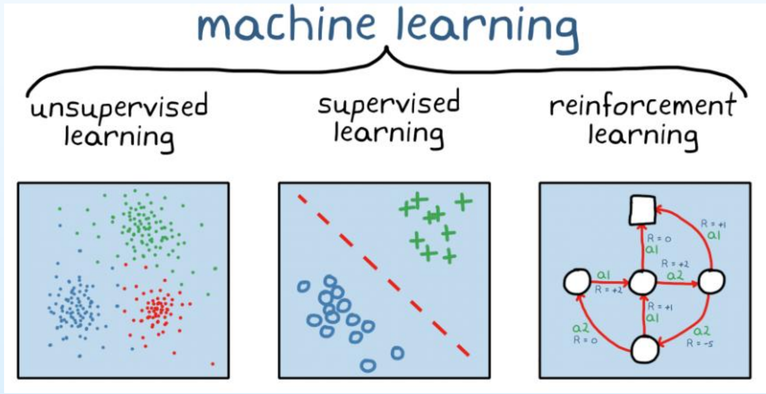
Item	Price
Sensors	$60
Microcontroller	$15
Miscellaneous	$20

- Table shows the low-cost system
- Minimal parts needed to complete
- All sensors in one part

- Data collected in indoor environment
- Data put into code every time new data comes in
- Ranges adjust and Q-learning model adapts

Challenges/Next Steps

- Which AI model to use for maximum efficiency?
- Original microcontroller not working
- Figure out how many systems you would need across a whole field/garden



Conclusion

- AI will improve public health and safety for farming
- Reinforcement learning will help with adaptability
- How can cameras help the AI model?

References

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