



QATra Irrigation System

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ECEN 404: Electrical Design Lab II

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Outline:



Introduction and Problem Statement



Proposed Solution



Technical standards, constraints and risks



Performance criteria



Existing solutions



Visual Prototyping, Program Code and Experimental Testing



Conclusion

Introduction & Problem Statement:

QATra is an advanced irrigation system that is able to reduce water consumption by checking the soil moisture and controlling the amount of water dispensed.

A mobile application, where the user can view the daily water content of the soil and gets notified when the plants are watered, is used in our system.

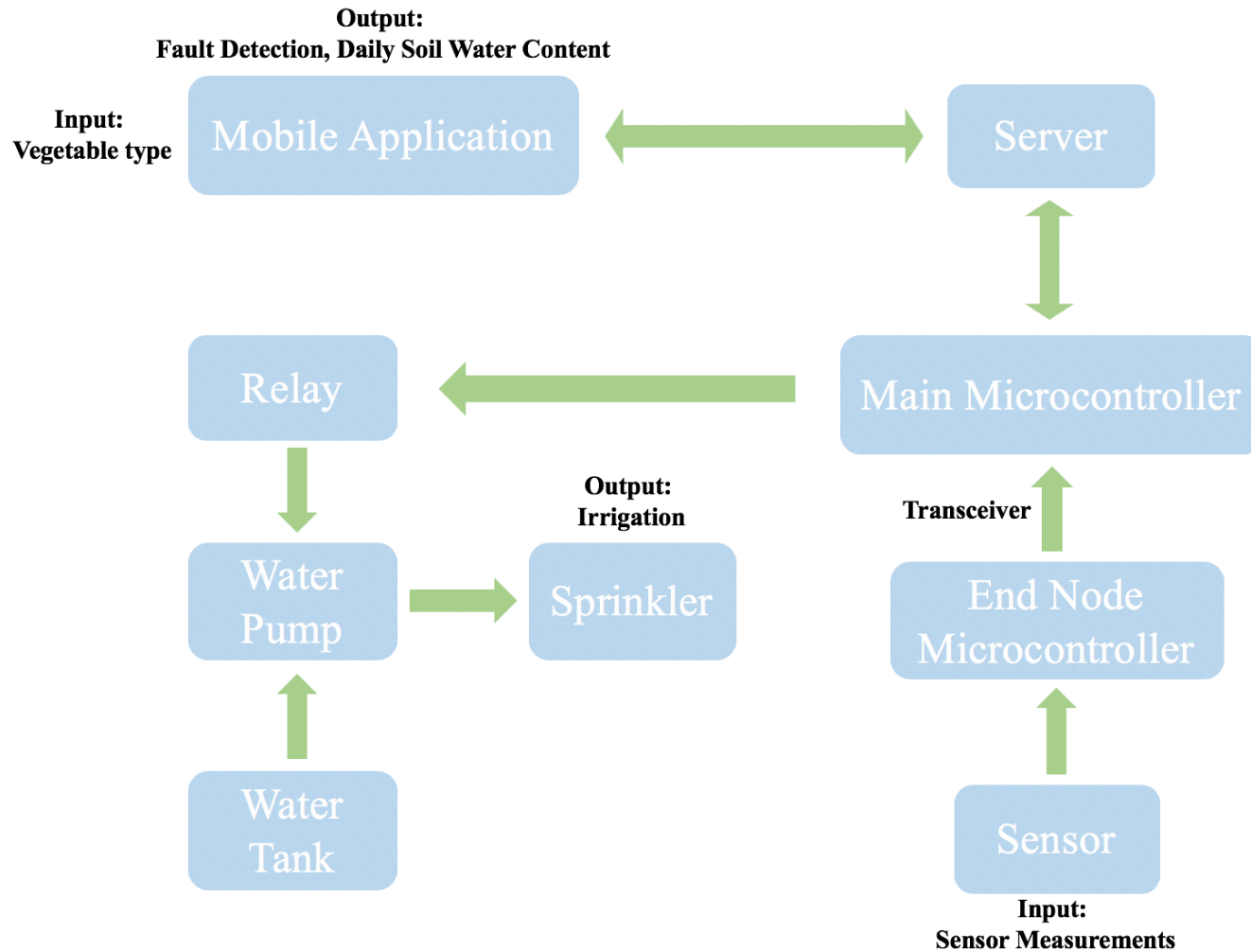
The user is informed in case of a fault in the system and can control the irrigation system using the application.

The project addresses environmental issues, cuts labor costs, encourages smart innovations and boosts cultivation.

Proposed Solution



Proposed Solution (cont'd)



Technical Standards

- Enhanced ShockBurst [1]
- IEEE 802.11b/g/n



Network
topology

Star, tree and mesh



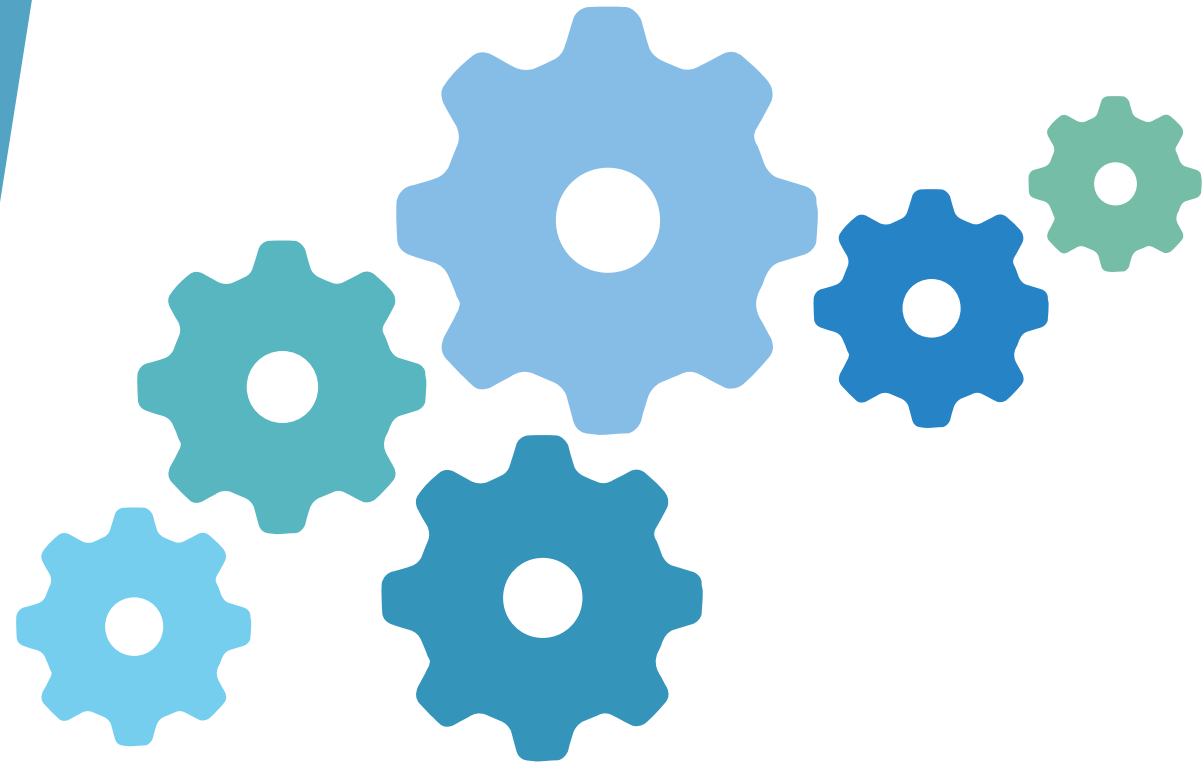
Frequency
2.4Ghz



Range
Up to 100m

How is this relevant to QATra?

Constraints



- **Resources Constraint**
- **Technical Constraint**
- **Health and Safety Constraint**
- **Environmental Constraint**
- **Social Constraint**

Risks

Wi-Fi



Central Microcontroller

Performance Criteria:



**ENVIRONMENTAL
(DIRECT)**



**PUBLIC HEALTH
(INDIRECT)**



**ECONOMIC
(INDIRECT)**



**SAFETY
(DIRECT)**



**SOCIAL, GLOBAL &
CULTURAL
(INDIRECT)**



**POLITICAL
(INDIRECT)**







**ETHICAL
(DIRECT)**



**WELFARE
(INDIRECT)**

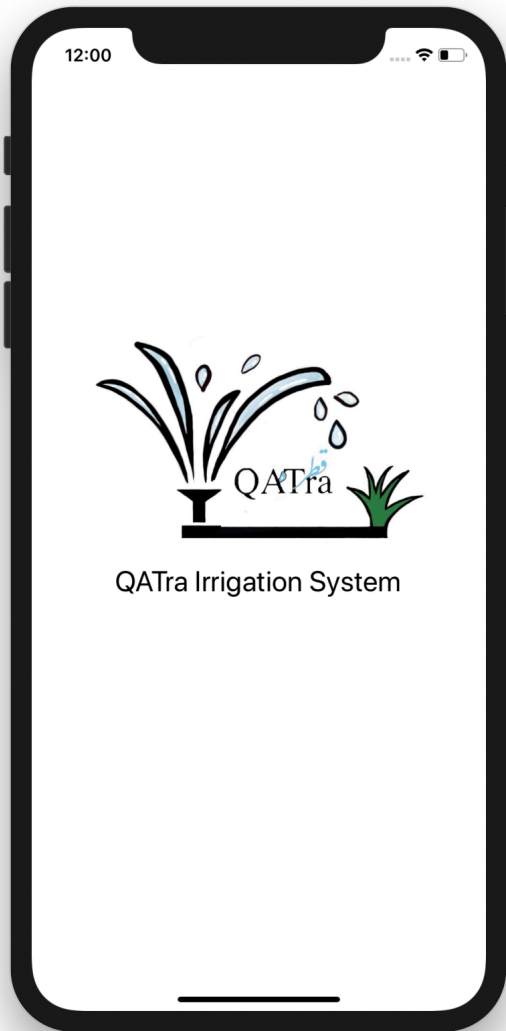
Existing Solutions

	Controllers		Systems	
Product	Rachio 3 [3]	BlueSpray [4]	Conventional Irrigation System	QATra
Product Photo				
Cost	\$228 - \$232	\$294.99 - \$349.99	≈ \$3000 - \$4000	\$520
Number of Zones	8 or 16	8, 16 or 24	Unlimited	Unlimited (additional cost will be added) *
Weather Intelligence	Yes	Yes	No	No
Fault Detection	No (leakage only if flow meter was added) **	No	No	Yes
User Interface	IOS, Android and web browser	web browser	None	IOS Application

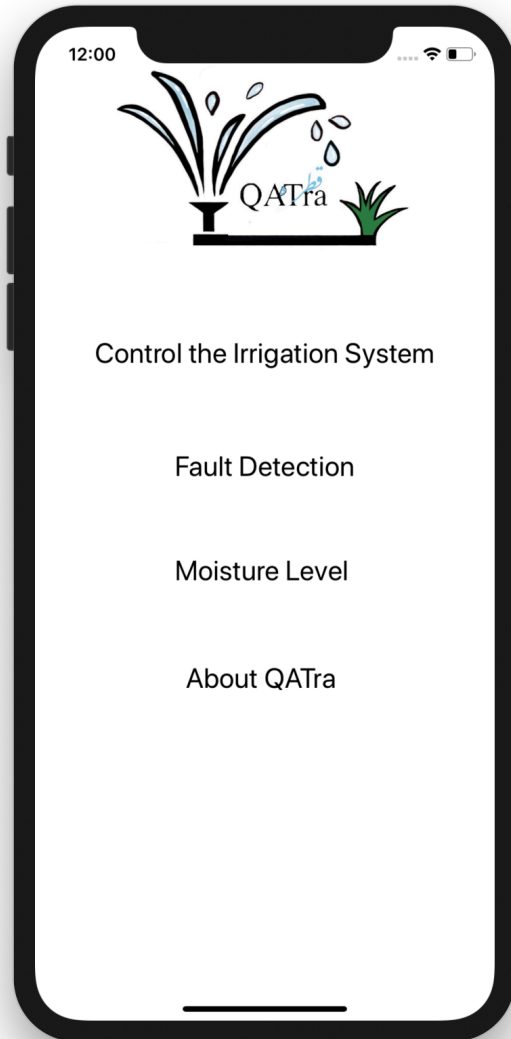
*Our prototype will contain only 4 zones. However, due to star network topology unlimited number of zones can be added.

**Those items are sold separately from the main product with additional cost.

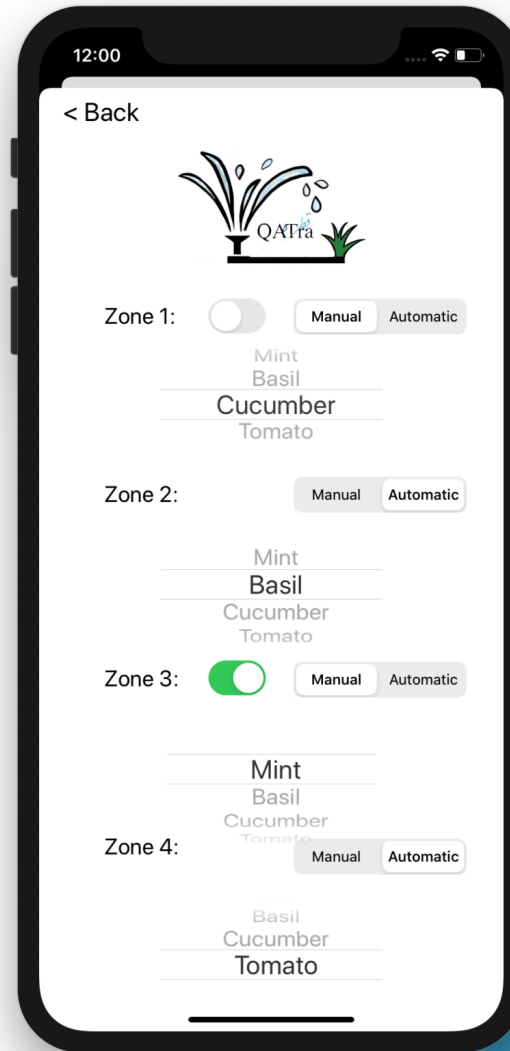
Visual Prototyping



iPhone 11 — 13.3

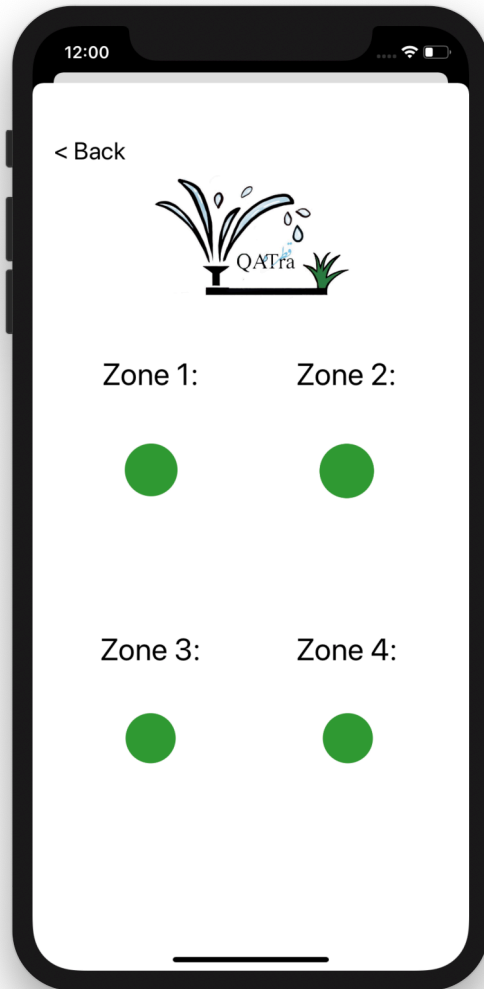


iPhone 11 — 13.3

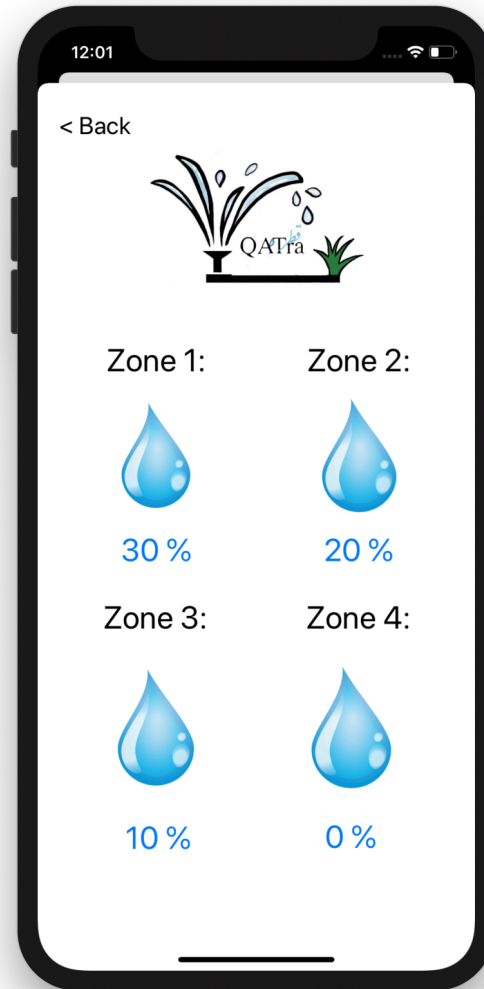


iPhone 11 — 13.3

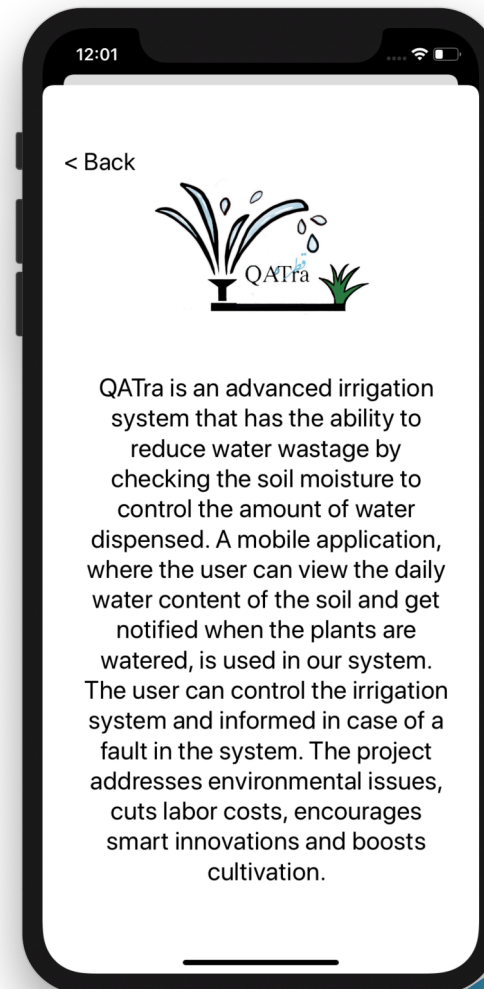
Visual Prototyping (Cont'd)



iPhone 11 — 13.3



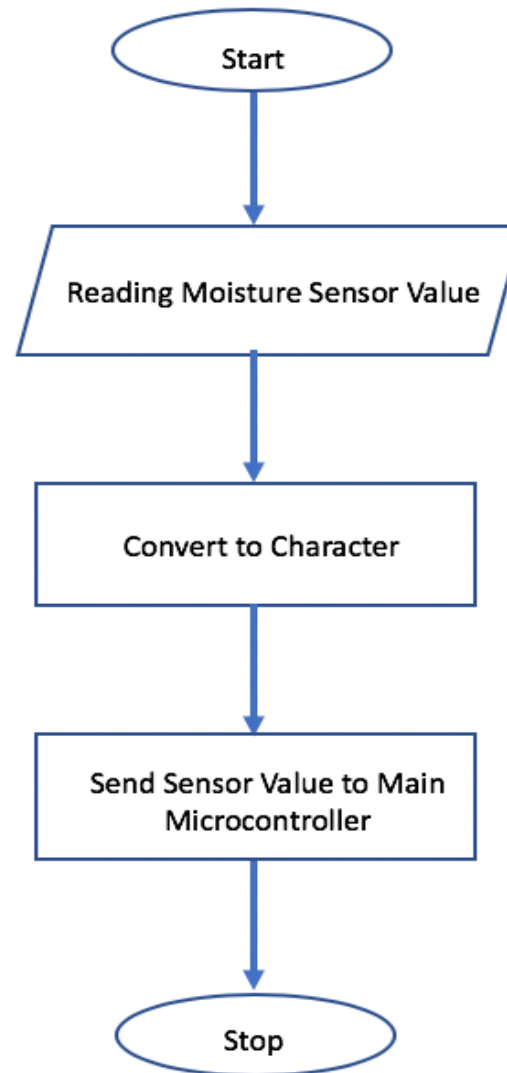
iPhone 11 — 13.3



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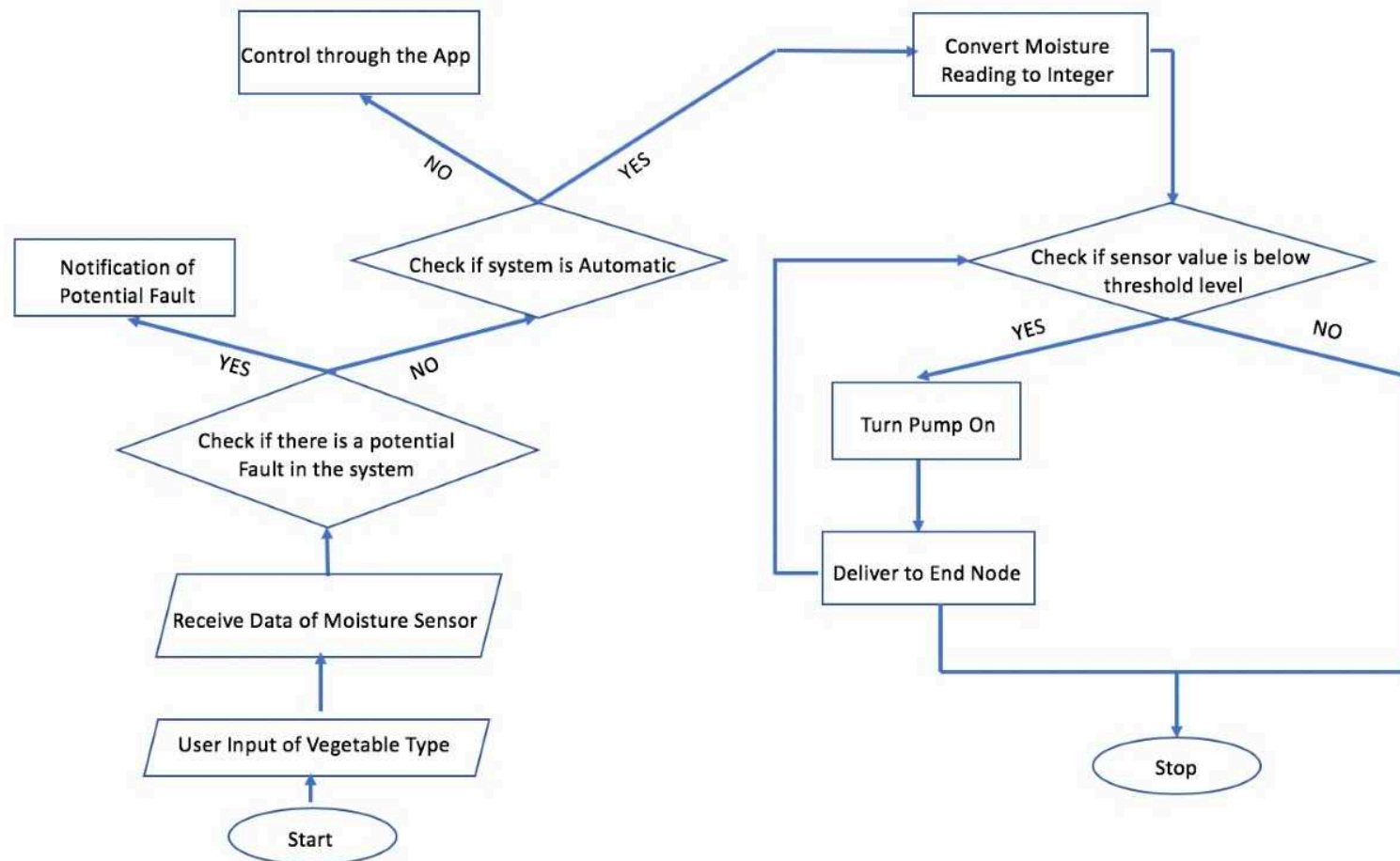
Program Code

► End Node:

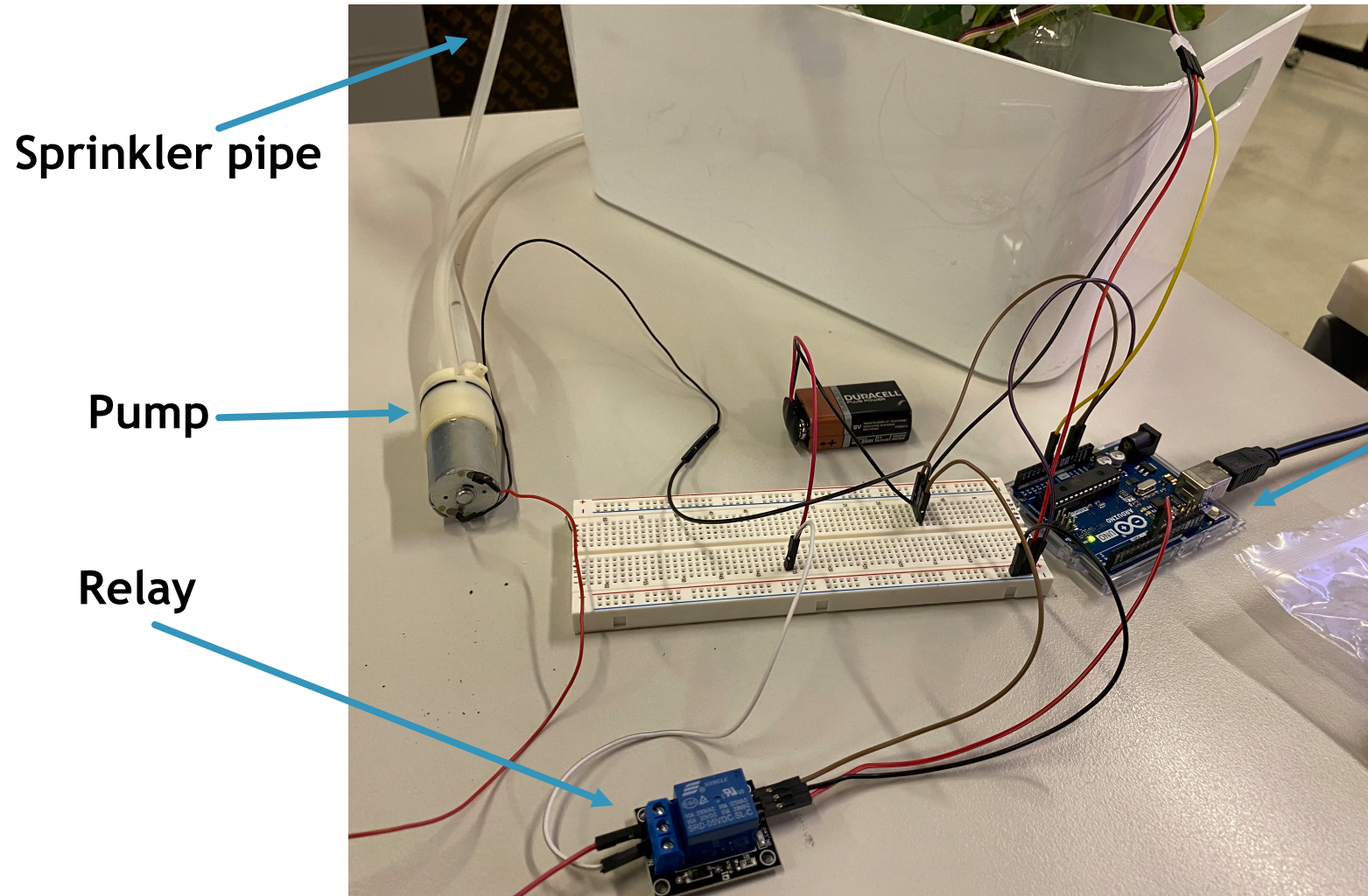


Program Code

► Main Microcontroller:



Experimental Testing



Microcontroller

Conclusion

Next steps:

- Implementing the fault detection algorithm in the main microcontroller code.
- Securing the connection between the different parts of the system.
- Resuming the testing to ensure reliable operation of the system.

Qatar National Vision 2030 aims to achieve sustainable development to ensure a better life for future generations. QATra hopes to contribute to this vision.

References

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- ▶ [3] “Raise the Bar on Smart Watering,” Rachio. [Online]. Available: <https://www.rachio.com/rachio-3/>. [Accessed: 11-Nov-2019].
- ▶ [4] “Web Based, Wireless (Wifi) Irrigation Controller,” BlueSpray. [Online]. Available: <https://www.bluespray.net/>. [Accessed: 11-Nov-2019].
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- ▶ [6] B. Icons, “Colorful Electronic Parts’ by Bias Icons,” *Iconfinder*. [Online]. Available: https://www.iconfinder.com/icons/3406897/arduino_board_circuit_circuit_diagram_electronic_components_mcu_icon_sensor_icon. [Accessed: 03-Dec-2019].
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