



QATra Irrigation System

Instructor: Dr. Ali Ghrayeb
Mentor: Dr. Hazem Nounou

Fatima Al-Janahi

Maryam Al-Emadi

Noof Al-Sayed

Roqayya AlYousef

Outline

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- Project Design
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- Timeline
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Introduction

Different references had irrigation systems with different components...

Reference [1] has:

- Moisture sensors
- Microcontrollers

Reference [2] has:

- Moisture sensors
- Microcontrollers
- Website

Reference [3] has:

- Microcontrollers
- Different sensors (temperature, humidity and soil moisture)

Reference [4] has:

- Automated wireless sensor
- Linux board
- Web interface/ Web page

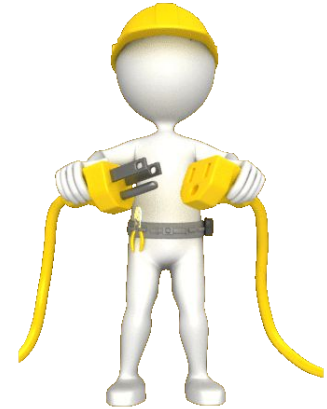
Reference [5] has:

- Sprinkler controller device
- Mobile Application
- Access to weather forecast

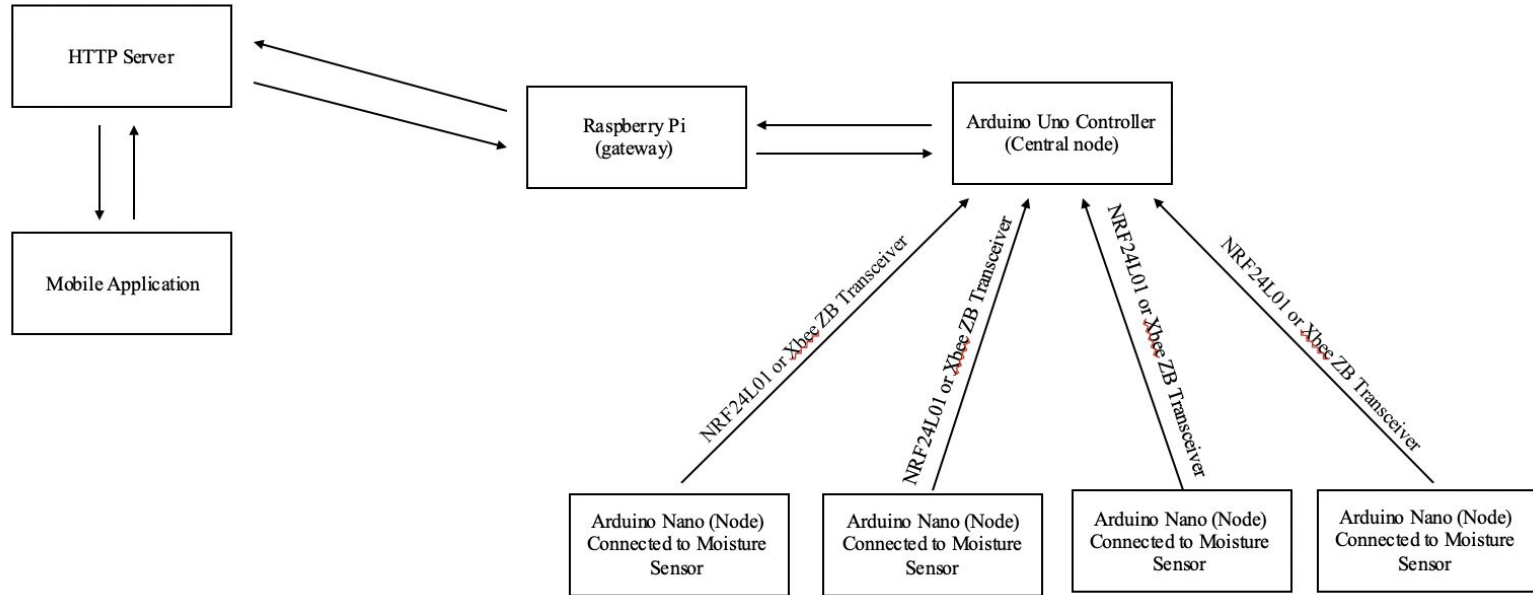
Advanced irrigation system with: fault detection, control each sprinkler individually (instead of the whole system) and the ability to manage the irrigation system automatically and manually.

Problem Statement

QATra is an advanced irrigation system that has the ability to reduce water wastage by checking the soil moisture to control the amount of water dispensed. A mobile application, where the user can view the daily water content of the soil and get notified when the plants are watered, is used in our system. The user can control the irrigation system and informed in case of a fault in the system. The project addresses environmental issues, cuts labor costs, encourages smart innovations and boosts cultivation.



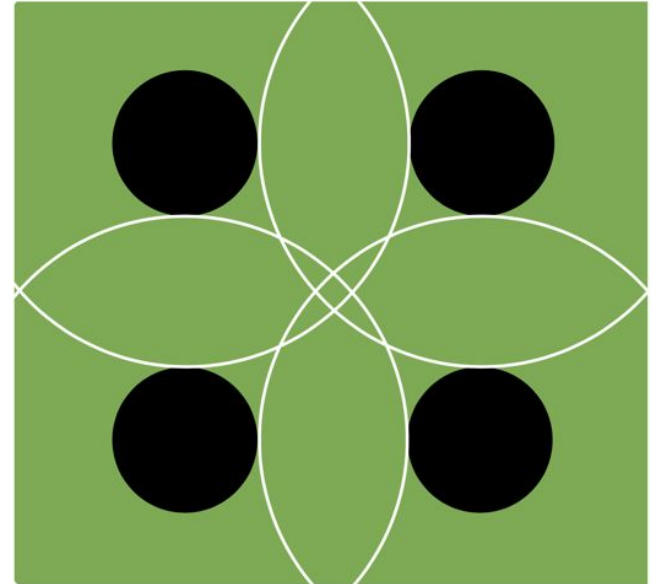
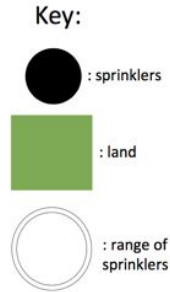
Project Design



Existing IEEE 802.15.4 Standard: Zigbee

Hardware Design

- Minimum threshold: on
- Maximum threshold: off
- Distance between sprinklers = radius of the range [6]



Software Design

Application Connection:

- Sensor readings transmission
- Establishing an HTTP server

Application Features:

- Control of the sprinklers
- Keeps record of soil water level
- Notification of faults in system



Design Constraints

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



Estimated Budget and Justificatio



Figure 2: NRF24L01 transceiver to develop WSN \$6.00 [2]

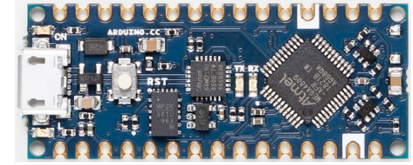


Figure 1: Arduino Nano Used as end Node \$9.90 [1]

- Total estimated budget for suggested hardware components = \$541.08

- Total estimated budget for suggested software components = \$1000

- Justification:

- Four end nodes are needed.
- Battery supply for the end nodes.
- Gateway from the central node to the mobile application.

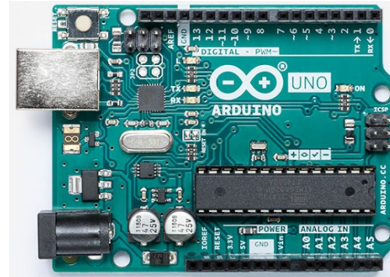


Figure 4: Arduino Uno Used as Central Node \$22.00 [4]



Figure 3: Raspberry Pi Used as gateway \$35.00 [3]



Figure 5: Router to create WLAN \$191.74 [5]

[1] *Arduino Nano Every*. [Online]. Available: <https://store.arduino.cc/usa/nano-every>. [Accessed: 14-Sep-2019].
[2] "Wireless Module NRF24L01, 2.4 Ghz RF transceiver, SPI," *RobotDynam*. [Online]. Available: <https://robotdynam.com/wireless-module-nrf2401-2-4-ghz-rf-transceiver-spi.html>. [Accessed: 14-Sep-2019].
[3] "Buy a Raspberry Pi 4 Model B - Raspberry Pi," *Buy a Raspberry Pi 4 Model B - Raspberry Pi*. [Online]. Available: <https://www.raspberrypi.org/products/raspberry-pi-4-model-b/>. [Accessed: 14-Sep-2019].
[4] *Arduino Uno Rev3*. [Online]. Available: <https://store.arduino.cc/usa/arduino-uno-rev3>. [Accessed: 14-Sep-2019].
[5] "Leading Cambium Networks dealer in Nairobi," *City Telecommunication*. [Online]. Available: <https://www.citytelecomcentre.com/product/linksys-wrt1200ac-ac1200-dual-band-smart-wi-fi-wireless-router-wrt1200ac/>. [Accessed: 14-Sep-2019].

Timeline

Month	September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project Proposal	In Progress	Finished																														
Team Working Agreement	In Progress	Finished																														
Proposal Presentation	Not Started	In Progress	Finished																													
Website Launching	Not Started																															
Customer Needs Survey	Not Started	Not Started	In Progress	In Progress	Finished																											
Ethnographic Study Video	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress																										
Benchmarking	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished																								
Functional Modeling	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished																							
Ordering Components	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	Finished																							
Final Progress Report I	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished																					
Final Website I	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	Finished																					
Final Presentation I	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	Finished																				
Build the Hardware Design	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	Finished						
Build the Mobile Application	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress					
Test the Final Prototype	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished					
Final Progress Report II	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished			
Final Website II	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	In Progress	Finished		
Final Presentation II	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	Not Started	In Progress	Finished	Finished	

Timeline Keys	
Not Started	
In Progress	
Finished	

Conclusion

- Water scarcity is a major issue in Qatar.
- There is a world demand to increase the cultivation of agricultural land.
- QATra irrigation system is a proposed solution to reduce water wastage.
- QATra consists of different features that make it user and environment friendly.
- QATra encourage innovation to benefit future generation.



References:

- [1] O. K. Ogidan, A. E. Onile, and O. G. Adegboro, “Smart Irrigation System: A Water Management Procedure,” *Agricultural Sciences*, vol. 10, no. 01, pp. 25–31, Jan. 2019.
- [2] Abba, Namkusong, Lee, and Crespo, “Design and Performance Evaluation of a Low-Cost Autonomous Sensor Interface for a Smart IoT-Based Irrigation Monitoring and Control System,” *Sensors*, vol. 19, no. 17, Aug. 2019.
- [3] G. Shruthi, B. S. Kumari, R. P. Rani, and R. Preyadharan, “A-real time smart sprinkler irrigation control system,” *2017 IEEE International Conference on Electrical, Instrumentation and Communication Engineering (ICEICE)*, 2017.
- [4] P. H. Tarange, R. G. Mevekari, and P. A. Shinde, “Web based automatic irrigation system using wireless sensor network and embedded Linux board,” *2015 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2015]*, 2015.
- [5] “Raise the Bar on Smart Watering,” *Rachio*. [Online]. Available: <https://www.rachio.com/rachio-3/>. [Accessed: 08-Sep-2019].
- [6] Irrigation tutorials. (2019). *Determining Landscape Sprinkler Locations*. [online] Available:<https://www.irrigationtutorials.com/sprinkler-coverage-nozzle-selection-sprinkler-spacings/>.