**SMART WATER MANAGEMENT**

*During the past decade, water needs have increased unpredictably in India. Increasing demand of water supply has become a major challenge for the world. Wasteful usage of water, climatic changes and Urbanization has further depleted the resource. Conservation and management of the resource must be given utmost importance. In this paper, we present an IoT design for water monitoring and control approach which supports internet based data collection on real time bases. The system addresses new challenges in the water sector -flow rate measuring and the need for a study of the supply of water in order to curb water wastage and encourage its conservation. We also measure the quality of water distributed to every household by deploying pH and conductivity sensors. The traditional water metering systems require periodic human intervention for maintenance making it inconvenient and often least effective.For shortcoming of the existing models for a ubiquitous usage of wireless systems for smart quality monitoring and communicate data wirelessly*

***FLOWCHART FOR SMART WATER MANAGEMENT:***



ATTRIBUTES FOR SMART WATER MANAGEMENT

PARAMETER

A parameter is contextually declared with the parameter attribute by its specification in a PROCEDURE or ENTRY statement. The parameter should be explicitly declared with appropriate attributes. The PARAMETER attribute can also be specified in the declaration

UNITS

* Not vary with respect to place.
* Not vary with respect to time.
* Be of Convenient size.
* Easy to make a copy.
* Be properly defined.
* Reproduce easily.
* Be easy to measure things. etc.

CATIONS

Characteristics of cations : (i) Cations are positively charged. (ii) Cations are formed when an atom loses electrons from its valence shell to attain octet. (iii) Cations are smaller in size than parent atom. (iv) The charge acquired by a cation is equal to the number of electrons lost by the valence shell

SYMBOLS

A chemical symbol is a one- or two-letter designation of an element. Some examples of chemical symbols are O for oxygen, Zn for zinc, and Fe for iron. The first letter of a symbol is always capitalized. If the symbol contains two letters, the second letter is lower case.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **N01** | **N02** | **N04** |
| COD | ppm | 18 | 21 |  |
| hardness CaC03 | ppm | 397.5 | 353.5 | 3 |
| Si02 | ppm | 2.88 | 3.84 | 4 |
| Organic nitrogen | ppm | 3.27 | 0.54 | 1 |
| Total nitrogen | ppm | 4.96 | 1.17 | 1 |
| Fe | ppm | 0.062 | 0.017 | 0 |
| 804 | ppm | 248.2 | 176.2 | 1 |
| NH3 | ppm | 0.4 | 2.01 | 0 |
| Cl | ppm | 251 | 340.8 | 37 |
| Nitrate | ppm | 6 | 2.98 | 3 |
| Organic Phosphate | ppm | 0.031 | 0.021 | 0 |
| Total Phosphorus | ppm | 0.058 | 0.025 | 1 |
| TSS | ppm | 1426 | 88 | 2 |
| Turbidity | NTU | 18.52 | 43 | 45 |
| pH | ppm | 8.5 | 8.2 | 26 |
| EC | µS em | 1426 | 1620 | 1 |
| Temperature | OC | 14 | 13 | 11 |
| BOD5 | ppm | 3.2 | 3.5 | 08 |
| DO | ppm | 8 | 9.8 | 34 |
| Springs name | 7.3 | 1182 | 3200 3117 | 84 2.14 |
| tfaatook -2 | 7.4 | 1064 | 2900 2790 | 74 1.9 |
| laan-3 | 7.2 | 944 | 2561 2390 | 72 1.9 |
| Al- rohbaan -4 | 7.2 | 986 | 2390 2203 | 73 1.9 |
| Al-hiaiatheea -5 | 7.8 | 1001 | 2320 2237 | 54 1.4 |
| M-rehameah -6 | 7.6 | 1276 | 2690 2412 | 41 1.03 |
| Al-iseaah-7 | 7.6 | 1245 | 2864 2710 | 48 1.2 |
| Al-assaweed -8 | 7.4 | 1387 | 2813 2931 | 56 1.4 |
| Al-ruhhba -9 | 7.3 | 1681 | 2890 2701 | 44 1.1 |
| Rweez -10 | 7.4 | 1512 | 2864 2682 | 46 1.2 |
| Average | 7.4 | 1228 | 2759 2597 | 59 |

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| --- | --- | --- | --- | --- |
|  | **To convert ppm ‘as the ion’ to ppm ‘as CaC03’ mulit** | | | |
| 0 | **Cations** | symbol | values | T |
| 16.5 | Aluminum | Al3\* | 5.55 | pH |
| .13 | Ammonium | NH4\* | 2.78 | EC |
| 1.26 | Barium | Ba2\* | 0.73 | SS |
| .12 | Cadmium | Cd2\* | 1.78 | MA l |
| .03 | Calcium | Ca2\* | 2.5 | Cl |
| 12.8 | Chromium | Cr3\* | 2.89 | NH3-N |
| .34 | Copper | Cu2\* | 1.57 | N03-N |
| 7.01 | Ferric (Iron) | Fe3\* | 2.69 | DO |
| .14 | Ferrous (Iron) | Fe2\* | 1.79 | Pv |
| .14 | Hydrogen | H\* | 50 | BODs |
| .67 | Lead | Pb2\* | 0.48 | T |
| 66 | Magnesium | Mg2\* | 4.1 | pH |
| 6 | Nickel | Ni2\* | 3.16 | EC |
| 8.1 | Potassium | K\* | 1.28 | SS |
| 730 | Silver | Ag\* | 0.93 | MA l |
| 10 | Sodium | Na\* | 2.18 | Cl |
| 4.4 | Zinc | Zn2\* | 1.53 | NH3-N |
| 8.6 | Copper | Cu2\* | 11.26 | N03-N |
| 457 19.8 | 173 14.2 | 188 9.4 | 952 26. | 660 13.7 |
| 348 15.1 | 91 7.4 | 276 13.8 | 868 24. | 548 11.4 |
| 382 16.6 | 76 6.3 | 252 12.6 | 588 16. | 560 11.7 |
| 203 8.8 | 57 4.7 | 301 15 | 462 13 | 785 16.3 |
| 278 12.1 | 46 3.8 | 326 16.3 | 462 13 | 830 17.3 |
| 263 11.4 | 196 16.2 | 188 9.4 | 380 10. | 1188 24.7 |
| 335 14.6 | 213 17.5 | 152 7.4 | 546 15. | 1226 25.5 |
| 266 | 251 20.6 | 143 7.1 | 714 20. | 970 20.2 |
| 271 11.9 | 342 28.2 | 112 5.6 | 350 | 1765 36.8 |
| 266 | 319 26.2 | 131 6.6 | 392 | 1539 32.1 |
| 307 | 176 | 207 | 571 | 1007 |

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| -0.734 | 0.539 | -0.238 | 0.075 | 0.018 | 0.0 |
| -0.088 | 0.061 | -0.246 | 0.472 | 0.032 | -0. |
| -0.821 | 0.312 | -0.067 | 0.079 | -0.203 | -0. |
| 0.644 | 0.575 | -0.264 | -0.003 | 0.149 | 0.2 |
| -0.463 | -0.380 | 0.357 | 0.083 | 0.682 | 0.0 |
| -0.183 | 0.372 | 0.646 | -0.349 | -0.028 | 0.3 |
| 0.097 | 0.565 | 0.641 | -0.037 | 0.007 | -0. |
| 0.029 | -0.378 | -0.163 | -0.775 | -0.096 | 0.0 |
| 0.659 | -0.623 | 0.113 | 0.067 | -0.017 | -0. |
| 0.524 | 0.675 | 0.061 | -0.120 | 0.096 | -0. |
| 0.467 | -0.176 | 0.539 | 0.421 | -0.295 | 0.2 |
| -0.734 | 0.539 | -0.238 | 0.075 | 0.018 | 0.0 |
| -0.088 | 0.061 | -0.246 | 0.472 | 0.032 | -0. |
| -0.821 | 0.312 | -0.067 | 0.079 | -0.203 | -0. |
| 0.644 | 0.575 | -0.264 | -0.003 | 0.149 | 0.2 |
| -0.463 | -0.380 | 0.357 | 0.083 | 0.682 | 0.0 |
| -0.183 | 0.372 | 0.646 | -0.349 | -0.028 | 0.3 |
| 0.097 | 0.565 | 0.641 | -0.037 | 0.007 | -0. |
| 0.029 | -0.378 | -0.163 | -0.775 | -0.096 | 0.0 |
| 116 1.9 | 25 | 0.641 | -0.037 | 0.007 | -0. |
| 45 1.5 | 26 | -0.163 | -0.775 | -0.096 | 0.0 |
| 116 1.9 | 26 | 0.113 | 0.067 | -0.017 | -0. |
| 116 1.9 | 25.5 | 0.061 | -0.120 | 0.096 | -0. |
| 140 2.3 | 26 | 0.539 | 0.421 | -0.295 | 0.2 |
| 110 1.8 | 26.5 | -0.238 | 0.075 | 0.018 | 0.0 |
| 122 1.99 | 27 | -0.246 | 0.472 | 0.032 | -0. |
| 116 1.9 | 26 | -0.067 | 0.079 | -0.203 | -0. |
| 109 1.8 | 26 | -0.264 | -0.003 | 0.149 | 0.2 |
| 116 | 25.6 | 0.357 | 0.083 | 0.682 | 0.0 |
| 109 | 25 | 0.646 | -0.349 | -0.028 | 0.3 |

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| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 161 | 0.023 | -0.174 | 0.220 | 0.208 | -0.048 | 0.113 | 0.067 | -0.017 |
| 091 | 0.131 | -0.349 | -0.184 | -0.030 | 0.009 | 0.061 | -0.120 | 0.096 |
| 98 | 0.316 | 0.041 | -0.060 | -0.041 | -0.026 | 0.539 | 0.421 | -0.295 |
| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 450 | 0.095 | 0.213 | 0.032 | 0.035 | 0.015 | 0.641 | -0.037 | 0.007 |
| 26 | 0.307 | 0.114 | -0.015 | 0.003 | 0.014 | -0.163 | -0.775 | -0.096 |
| 161 | 0.023 | -0.174 | 0.220 | 0.208 | -0.048 | 0.113 | 0.067 | -0.017 |
| 091 | 0.131 | -0.349 | -0.184 | -0.030 | 0.009 | 0.061 | -0.120 | 0.096 |
| 98 | 0.316 | 0.041 | -0.060 | -0.041 | -0.026 | 0.539 | 0.421 | -0.295 |
| 84 | 0.182 | 0.023 | -0.037 | 0.170 | -0.191 | -0.238 | 0.075 | 0.018 |
| 041 | -0.035 | 0.113 | 0.006 | 0.013 | 0.038 | -0.246 | 0.472 | 0.032 |
| 028 | 0.206 | -0.160 | 0.304 | -0.065 | 0.103 | -0.067 | 0.079 | -0.203 |
| 51 | 0.066 | 0.110 | 0.052 | 0.158 | 0.162 | -0.264 | -0.003 | 0.149 |
| 85 | 0.179 | -0.025 | 0.016 | -0.015 | 0.026 | 0.357 | 0.083 | 0.682 |
| 23 | -0.274 | -0.029 | 0.124 | 0.032 | -0.032 | 0.646 | -0.349 | -0.028 |

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| 0.084 | | 7.28 |
| -0.041 | | 5.55 |
| -0.028 | | 2.78 |
| 0.251 | | 0.73 |
| 0.085 | | 1.78 |
| 0.323 | | 2.5 |
| -0.450 | | 2.89 |
| 0.026 | | 1.57 |
| -0.161 | | 2.69 |
| -0.091 | | 1.79 |
| 0.298 | | 50 |
| 0.084 | | 0.48 |
| -0.041 | | 4.1 |
| -0.028 | | 3.16 |
| 0.251 | | 1.28 |
| 0.085 | | 0.93 |
| 0.323 | | 2.18 |
| -0.450 | | 1.53 |
| 0.026 | | 11.26 |
| -0.450 | | 952 26.9 |
| 0.026 | | 868 24.5 |
| -0.161 | | 588 16.5 |
| -0.091 | | 462 13 |
| 0.298 | | 462 13 |
| 0.084 | | 380 10.7 |
| -0.041 | | 546 15.4 |
| -0.028 | | 714 20.1 |
| 0.251 | | 350 |
| 0.085 | | 392 |
| 0.323 | | 571 |

**program( python coding):**

import machine

import time

TRIGGER\_PIN = 23

ECHO\_PIN = 22

LEAK\_LED\_PIN = 19

trigger = machine.Pin(TRIGGER\_PIN, machine.Pin.OUT)

echo = machine.Pin(ECHO\_PIN, machine.Pin.IN)

leak\_led = machine.Pin(LEAK\_LED\_PIN, machine.Pin.OUT)

def measure\_distance():

trigger.value(0)

time.sleep\_us(5)

trigger.value(1)

time.sleep\_us(10)

trigger.value(0)

pulse\_start = pulse\_end = 0

while echo.value() == 0:

pulse\_start = time.ticks\_us()

while echo.value() == 1:

pulse\_end = time.ticks\_us()

pulse\_duration = pulse\_end - pulse\_start

distance = (pulse\_duration \* 0.0343) / 2

return distance

def check\_for\_leak():

distance = measure\_distance()

threshold\_distance = 10 # Adjust this value based on your tank setup

if distance < threshold\_distance:

return True

else:

return False

while True:

if check\_for\_leak():

leak\_led.value(1)

time.sleep(0.5)

leak\_led.value(0)

time.sleep(0.5)

else:

leak\_led.value(0)

time.sleep(1)

output :



