Imparting Advanced water management trends Using IBeacon water Science Link Analysis

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Abstract : Its an era of change, we are on the verge of a great technological transformation over which the next generation technology will have a decisive role to play in understanding the semantics of human needs and also draw up suitable means to reach over there with the aid of innovations surrounded by technology[1].We are moving towards automation from the recent past on top of which we want to change the ways in which things comprehensively. Using this as a means it becomes necessary to understand the context of the requirements and uplift the Mankind activity and its relevant process by means of automation and critical thinking.

There are quite a few areas where the computer science is expected to play a comprehensive role on how things are being looked up and adapted in accordance to the situations in the similar way the crisis of water management is still being a haunting task where no automation is being employed over there to increase its feasibility of supplying it as per the need of a domain.

The task of managing water according to its utilization aspect is a mayhem task be it for a domestic purpose it may be for a industrial use, we are aware of the fact that we still depend on the nature i.e. the rain water as the major resource of water utilization barring other sources which may be river sea or any such resource[4].

This proposed paper intents to Raise the standards of water management through a automated approach which when implemented will bring in about a comprehensive difference on how to deal and manage water for different purpose over in all the situations and manage them as per subject to availability.
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Keywords: WaterScience ,water analysis ,water segments,IBeacon,Bluetooth low efficiency,ControlScience,FairShare,Cognitive indexing

1. INTRODUCTION

The process of water management is a very traditional task where in a dedicated yet contestant set of operations are to be performed in order to create a water

management cycle which will then be deployed across the necessary ecosystem and according to which the inflow and out flow of water will be disseminated into the respective environments[5].The very thing unanswered till date with regard to water management process is that how feasible is it in accordance to the situations and what happens when a particular scenario changes will we be still able to apply the same water management cycle across borders if so will the performance of the same will change. To address all the above mentioned issues we need to implement some next generation methodologies to make a significant difference of how to management water from different view point and respective scenario accordingly[8].
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How does a traditional water cycle work?

The water cycle is called the hydrologic cycle. In the hydrologic cycle, water from oceans, lakes, swamps, rivers, plants, and even you, can turn into water vapour[3].
Water vapour condenses into millions of tiny droplets that form
clouds. Clouds lose their water as rain or snow, which is called precipitation. Precipitation is either absorbed into the ground or runs off into rivers. Water that was absorbed into the ground is taken up by plants. Plants lose water from their surfaces as vapour back into the atmosphere[3]. Water that runs off into rivers flows into ponds, lakes, or oceans where it evaporates back into the atmosphere.

From this we are clear of the fact that the traditional approach follows a basic cycle of water production phase to water consumption phase more over the process is a static one in its term that it has a series of events based on nature more over some of the event may be unpredictable and depends heavily over the season[6].

There are a plethora of questions that are to be answered they are:
1.How can we manage the water when it is available in abundance.
2.How can we manage the flow of water when there is no water available.
3.how can we assure a steady flow of water from source to destination when the water is un balanced from the source to the destination.

To address all the above situations we implement a set of technological concepts which not only provides a comprehensive solution to all the above addressed problems but also develops a automated process in water management.

Lets begin with the First Case #01:

How can we manage the flow of water when it is available in abundance.

The very process associated with the above context is the "water is available than how can channelize them according to field of required aspect.

The traditional system followed his highly non feasibly as that won't satisfy the cause of makingavailablethrough the given area round the clock,

Here is what the proposed system Approach will look like.

#01:Semantic source destination synchronization and Automated water management using IBeacon and BLE[Bluetooth Low Energy]Chips.

To better understand the above context we need to get things in very detail,

So what is a Beacon?

iBeacon is Apple's implementation of Bluetooth low-energy (BLE) wireless technology to create a different way of providing location-based information and services to iPhones and other iOS devices[2].

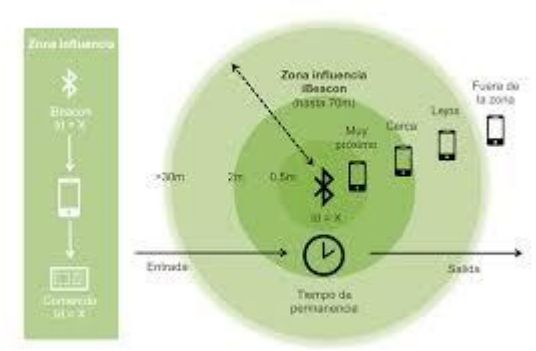

Figure 1

In simple words an Ibeacon is a device which can be connected with a set of low level low frequency devices i.e.BLE[Bluetooth low efficiency],more this 2 devices are connected remotely[8].

The advantage of this fact would be that the beacon has the nature of sensing a number of BLE devices and also accepting requests from to transfer for requests[1].These feature allows to form a high end connectivity with data transfer as well with minimum about of time spend and so is very cost effective.

Now lets move down to the wire and see how Ibeacon and BLE can Be used to solve our problem of Water Management when Available in Abundance.

In simple words Every BLE will have a inbuilt sensor embedded into it, this sensor will be buries into the farm soil bed with some amount of prefixed data into it[2].

The BLE will sense on the nature of the soil and determine on when is the water required to be supplied to the farm, to ensure it produces the crop of high end quality. Also on what is the amount of water required to the field ,which is a serious mean through which we can determine that instead of supplying excess water than what is available be supply only the amount of water required[6].

The BLE will trigger an event to inform the Nearest Ibeacon regarding the time and quantity of water required so that the Ibeacon will result in generating a query to reflect this regard.

Algorithm:IBeacon:
//Purpose:To determine the quantity and time when water is required in a field.
//input:The default values into the BLE.
//output:The Actual value reflecting when and how much the water us required.

Step #01:Every Agricultural area will be equipped with BLE Chips.
Step#02:Every Chip is equipped with the functionality to read the data and also store them.
Step#03:The chips are buried under the farm with the minimum and maximum threshold value of soil. Depending on which the water can be supplied.

Step#04:The Chip will determine the time and the amount of water required for the soil.
Step#05:The chip fires the signal to the beacon located at the central hub.
Step#06:The beacon initiates the process of water supply.
Step#07:A beacon can house 20 BLE in a single shot.

Figure 2 Beacon Architecture

This is a simple mean using which we can determine the amount of water requires for a specific purpose say for instance on a farm of crops, Using this it ensures that not only we supply water when required more over we supply the right quantity of water expected this increases the possibility on wastage of water and the same can be supplied for some other applications in a comprehensive manner.

Advantages:

1.The Problem of water management will be completely eliminated.

2.The Crops will be monitored with great deal of care which will result in fast production in less time.
3.A beacon Cost around 30$ and BLE is 10$.

The below series of advantages justifies the fact on the feasibility of this Concept which is cost effective,realistic, trusted and effective on major and minor applications,where the bandwidth of the BLE as well as beacon can be raised as per the application needs.

From the above approach we do eliminate the cause of water management when it is available in abundance where the challenge would be on how to manage the multiple request from the clients and serve them simultaneously.

Lets move to the Approach #02:

Case#02:Now it is assumed that the water is not available at the nearest hub, how to supply them to the farm?

To deep dive over to this context we need to learn some of the terminologies and concepts,

What is water Science?

Water Science explores water scarcity solutions from a holistic system oriented viewpoint[5].
From the sustainable management of natural water resources to the development of the technologies and infrastructure for the production of clean fresh water from natural and waste water[7].
The focus is on innovative and sound theoretical research on different water issues, exploring potential alternative water sources via recycling and reuse of wastewater with a focus on arid and semiarid environments

Figure 3

As per case #02:when no water is available in the nearest hub or water repository.

The first step is to find the nearest source from the farm where water is available.

To extend the Functionality of a Beacon:

A Beacon can Connect with every other beacon with in some degree of radius.

The function of predictive beacon is to predict or to assess which can be the nearest source of water and the corresponding beacon associated with it.

Here is where the Feature of water Analytics comes into picture.

Water Analytics/Water chemistry analysis :are carried out to identify and quantify the chemical components and properties of water samples[6].

The type and sensitivity of the analysis depends on the purpose of the analysis and the anticipated use of the water.

The result of the analysis provides information that can be used to make decisions or to provide re-assurance that conditions are as expected.

The analytical parameters selected are chosen to be appropriate for the decision making process or to establish acceptable normality[7].

As we understand the concept of water science and water analysis it becomes very feasible on we can ensure that we need to provide a
solution where the situation is unavailability of water in the nearest hub and how are we going to pool the water from the other Resorvior available nad supply them to the location pointed out by the BLE representing a particular area of land in this case.

The process flows as :
When a BLE triggers a request to the Nearest IBeacon,the Ibeacon will still continue the request from other BLE as well.

When the IBeacon determines that it has no water source existing over his range it performs a internal search to find a number of Beacon over to his range.

The moment it is able to find any number of Nearest IBeacon it willInitaite the internal request of the Amount of water required by the respective BLE.

The In focus beacon will determine if there exists water which is excess than its BLE request, if yes than it drops back a response stating that it has stock available.

It performs a set of operations required to transfer the data from the source IBeacon to Destination Beacon.

The Destination Beacon will Reroute all the request to its underlying BLE respectively.

Algorithm:Beacon_Link

//purpose:To interconnect a beacon on request of water when no water is available over there.
//input:A set of address with the source beacon.
//output:A set of Beacon response on water availability.

Step#01:When there is no water available the nearest Beacon, determine the source of nearest water as.

Step#02:Every beacon will maintain a table of values on How many Beacons are under its reach and whether excess water available or not for it to transfer.
Step#03:if a beacon is available it fires a request signal on the amount of water it requires, and therefore the water is supplied thereafter.

Step#04:If no Beacon is under reach, the current beacon will perform water analysis i.e. find nearest source of water based on the past data.

Step#05:Say for instance nearest to a beacon there exists a Well with contaminated water.

Step#06:Beacon will detect the well and also Populate a table with the details of the water.

Step#07:The beacon will also define the process to be followed to tune the water as per the farm need.

Step#08:The water can then be utilized for the desired application.

Step#09:The beacon will also suggest on what water variant is best for what type of soil.

Figure 4 Programmable Beacon Chips

Using the above Prescribed Steps a beacon can be allowed to reach out to its peers available with in a specific range.

More over each peer can communicate and transfer the data from the source Beacon to the destination Beacon.

Lets move on the next Case.
Case#03:How to maintain a steady flow and availability of water across all the streams.

There are to prospects here:

a.How to avoid wastage of contaminated water.
b.How to maintain sync between water inflow and water outflow

the challenge would be on how to determine the period during which a water remains fresh and on when does it get contaminated.

To device a solution for both the issues let us consider the following.

Approach#03:Enhanced water sequence management Using Water Aging and Data Link Analysis.

To better understand we need to define

what is Water Aging?

Water aging is the life cycle of a water after it is made available for use,it provides a 360 view of all its stages as on how and when it may be used for what purpose[4].

Lets take up a case study of water for domestic use:
Say we have water in our respective homes, what is the duration of the water?

For instance after 8 odd days if the water is not used, then its contaminated.

If it is contaminated then we might want to discharge it by wasting them under drainage or for non required purpose.

In rural areas about 70% of water is wasted, just because it is contaminated.

The problem is we have no idea on exactly when the water is getting contaminated so that we can use them at the earliest.

More over the contaminated water if used in agricultural farm will reduce the fertility of the soil as well as the quality of the crops will not be a quality one.

To over come this issues:
We can use ProgrammableIbeacon with Cognition semantics:

Algorithm:IN_OUTFLOW

//Purpose: determine the water age and maintain inflow and outflow sync.
//Input: Water data available

//Output: A list of entries reflecting the duration of a water quality
Step#01: Beacon can be aligned with a digital display board.

Step#02:Every water container can be attached with a BLE chip.

Step#03:The BLE Chip will sense the water age, by comparing with the predefined dataset against its threshold value.

Step#04:Depending upon water age a control information will be generated and sent to the beacon.

Step#05:The Beacon Will Populate a table of values which will be displayed on the display board.

Step#06:Using this any user can get the detail up toto what time the water will be fresh to use.

Step#07:The beacon will also generate the predictive data on what is an exact amount of water required for that application for next 30 days or so.

Step#08:The early assignment of water allocation can be done to ensure proper sync is maintained between inflow and outflow of water.

Figure 5 Digital Board Connect to BLE.

The Above Methodology ensures that the ease in supply of water and the life time of the water is maintained comprehensively in ancomprehensive manner, where in all the necessary constraint has been undertaken as a part of the problem statement.

Conclusion

The Intent of this paper was to illustrate the means of Application of Ibeacon and Water Science with Cognition which aims to eliminate the problem of water management from all the respective grounds where in much of the optimizations needs to b carried out onthe context of Performance and also to increase the throughput.

REFERENCES

[1]"Bluetooth Smart," https://www.bluetooth.com/what-is-bluetooth-technology/bluetooth-technology-basics/low-energy
[2] C. Gomez, J. Oller, and J. Paradells, "Overview and evaluation of bluetooth low energy: an emerging low-power wireless technology," Sensors, vol. 12, no. 9, pp. 11734–11753, 2012. View at Publisher · View at Google Scholar · View at Scopus
[3] Apple, "iBeacon for developers," https://developer.apple.com/ibeacon/
[4] Google, "Eddystone-open beacon format," https://developers.google.com/beacons/
[5]P. Martin, B.-J. Ho, N. Grupen, S. Muñoz, and M. Srivastava, "An ibeacon primer for indoor localization: demo abstract," in Proceedings of the ACM Conference on Embedded Systems for Energy-Efficient Buildings (BuildSys '14), 2014.
[6]Z. Chen, Q. Zhu, H. Jiang, and Y. C. Soh, "Indoor localization using smartphone sensors and iBeacons," in Proceedings of the IEEE 10th Conference on Industrial Electronics and Applications (ICIEA '15), pp. 1723–1728, IEEE, Auckland, New Zealand, June 2015. View at Publisher · View at Google Scholar