

## Automatic Computerized Control of Canal in Irrigation

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**Abstract** - This paper presents the necessitate and value, and also conception of water supply systems which flows in flexibly and can deliver water with flexibility in occurrence rate, and duration beneath the control of the farmer at the specific relevance using a partial rate stipulate or other schedule. "Obstruction"-Total capacity and reserve time is essential to pledge water delivery at the specific frequency and desired rate as well as it introduces the needed expressions. It emphasizes the conversion of the economical steady deliver canal flows flexibly on-farm convention throughout the usage of service area reservoirs located between the secondary and tertiary systems. Partially closed pipelines and level-top canals as automatic distribution systems which tries the farmers the requirement for daytime as well as at night. Probably on-farm deliveries it used to permit optimization of on-farm water management. This enhanced management which be the ultimate source of augmented food production after improving land, and water resources, crops and reached to their maximum level. This is preferable for farmer's and will save their lots of time and increased their work level without any uncertainty.

**Key Words:** Automation, cellular networks, Internet, Irrigation, measurement, water resources, wireless sensor networks (WSNs).

### 1. Introduction

Flexibility in irrigation deliver permits a farmer to manage his water, labor, land and weather possessions as one integrated division within his total farming program. Flexibility is essential to optimizing agricultural operations and maintaining sustainable irrigated agriculture. The assessment to widely utilized exterior irrigation methods of large variable flow rates and daytime only sets, and half or less as much labor expediently and more successfully used, must be considered in the financial side of projects.

Generally in areas where irrigation is essential for yield production. The on-farm problems created via the use of a stiff rotation schedule with the purpose of permits a canal toward drive continuously at a constant flow rate be establish on the way to be acknowledged in planning.

The stiff rotation supply forces wasteful water use such since improper timing, over irrigation as well as excess, prevents effective use of rainfall, requires inconvenient and excessive labor, creates conflicts over water, and inhibits good farm management. It may be associated with subsurface drainage; high water table caused salinity, and reduced production problems.

Skilled on-farm control of irrigation water deliveries permits appreciable reduction contained by drainage and salinity problems caused via excess and nonuniform application. A limited rate arranged-demand schedule be the desired practical schedule. Near obtained flexibility requires flow rate changes of appreciable magnitude.

The engineer frequently considers adequate scheduling at the same time as delivering water on the day the farmer needs it in the midst of a volume as needed but with a fixed rate and duration. The convenience of irrigating as soon as and with the flow rate preferred has assessment to a farmer and he is willing to disburse a higher water charge designed for the improved service. "It is not just the volume of water delivered, although the way it is delivered to formulate it usable," that is important. "The engineer is obliged to learn to think approximating an educated farmer." The farmer on an approved day, and as preferred be able to obtain a variable stream up to the system's design perimeter, use it providing needed to infiltrate to the desired depth, and subsequently shut off the irrigation after he is finished.

Daytime merely irrigation at slightest doubles a continuous flow rate requirement and used for eight hour days will necessitate triple capacity. It will have need of no flow at night in the distribution system but probably it happens. Having the put to one side capacity to permit preference of irrigation frequency by the side of the lower end of a sideways may double sideways capacity requirements yet again. However, simply some of the farmers lying on a particular sideways will desire to irrigate on any given day, so the averaging involve of many users possibly will mean the upper portion of the system requires simply a small increase in capability. The flow condition left in a main canal by means of night becomes

the subsequently day's supply further downstream or it know how to be placed in a re-regulating reservoir system. Operational spillage possibly will be practical wherever the spillage is reused.

To resolve these limits requires storage and scheduling. The a large amount inexpensive location for a large piece of this storage is close up to the point of distribution involving the secondary and tertiary systems so with the intention of the capital-intensive continuous use area.

The fundamental nature of the perception of a flexible water supply is to make available the farmer by means of management control of the frequency, rate and duration of irrigation water delivery. He be capable of then effectively manage the intact farm program as a unit exclusive of restraints created by the typical water supply system. It is important to appreciate with the purpose of this management capability is the potential source of the eventual augmentation of food production subsequent to the land and water resources and improvement comprise reached their edge. It permits a superior farmer to be converted into an excellent farmer.

### 1.1 Problem Statement

All beyond techniques have a quantity of problem similar to security issues, low transmission rate, etc. Designed for overcome this problem, this system is used. In this model, Automatic Irrigation System based on RF module. RF module is used only for passing the signal. All nodes is connected determination be centralize node along with this node is used ARM.

And remaining two nodes is used microcontroller which is low power device. One more thing will be added i.e. node to node communication for better results and more area will be cover.

The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants and sense he condition and transfer the information to centralize node and other nodes. When nodes are receiving the information then system will be start automatically.

## 2. Architecture and modeling

### Working:

In the unusual condition where farm outtakes are from flexible project laterals which are level-top canals or sloping canals with flexibility obtained by operational spillage over constant level gates or long-crested weirs,

farm turnout to level-top or sloping field head ditches can "float" on the project supply lateral canal at a constant level regardless of outtake rates. For the return flow systems to a level-top head ditch, the return may be made to any place and the supply flow will be slowly reduced to match. The return to a sloping head ditch must be made between the project turnout and the farm control gate as for the pipeline supply procedure. The operation of the head ditch is as described above and the return flow surge must be considered.

Summarizing, flexible supply systems facilitate the installation of runoff return flow systems where required or desired. The elimination of low side storage reservoirs and the use of small cycling return flow pumps is possible. Such systems facilitate the use of proper sized initial streams, reduce labor and the needed precision of flow sets, and economically eliminate runoff allowing moving water surface irrigation methods to have high application efficiencies.

The following design procedure illustrates the concepts of flexibility based on an operation plan utilizing a limited rate arranged-demand schedule though it may be less effectively used with other schedules. Use of a limited rate arranged-demand schedule requires the farmer to apply in advance to arrange for a day upon which he is permitted the use of the system. An assured minimum and a maximum rate limit are set in the design procedure by the pipeline or turnout capacity. The farmer's actual rate is seldom the maximum rate. The requirement of scheduling arranged days prevents overloading. A reasonable congestion limit provides assurance of availability under most conditions. Implicit in this design procedure is that usually the farm will be irrigated only during the daytime. This condition is a very high priority among the educated experienced farmers using a flexible supply system. During the arranged day, the irrigator can take water as he wishes as to rate and duration demand up to the system limiting rate, and at night if so arranged if the system supply volume is adequate.

In the design procedure a base map is needed at a workable scale showing topography, ownership or subdivision boundaries, and a soil survey map a GIS one is helpful. A tentative irrigation layout of distributors, laterals, branches and main is superimposed. Under some conditions, it may be reasonable to modify field boundaries to facilitate irrigation methods. For example, prior to designing the irrigation layout, the top and bottom property lines can be relocated if necessary to make them parallel or to approximate a contour so reasonable cross slope irrigation grades will not leave odd shaped pieces of land. In addition, long, narrow repeatedly subdivided

fields by inheritance can be consolidated into shorter wider units with farmer concurrence.

The unit farm area value is selected with consideration of present and future actual farm boundaries. It is usually a bit larger than a majority of nearly all of the farms or fields presently used. If an actual ownership is much larger, two days and possibly two outlets can be arranged and considered when reviewing the congestion. Two small areas needing small streams, after consultation with the owners, could be allocated half days or half streams if soils and methods permitted. There is considerable leeway and judgment at this point in selecting the pipeline distribution areas and in laying out the distributor and lateral pipelines related to the actual farm boundaries. Pipelines provide much more freedom as to location than do ditches. They can go across fields and up and down. Structures should be placed at field edges.

The size of the unit farm stream is not pertinent at this stage. The procedure is to select the number of streams congestion and days of use needed at various locations which can later be converted to flow rates and pipe sizes. Pipeline distribution areas should be small enough to require only one or two unit farm streams. More than three is undesirable as it creates more flow variation, and difficulty in metering if that is desired. For farmer utilization of upgraded irrigation systems and methods, some simple mathematical processes are convenient for management and also for design. Evapotranspiration of a crop is given in mm/day or in/day, rainfall is mm/day or in/day, soil moisture deficiency in the root zone depth is in mm or in.

Ordered or applied water needs to be convertible into comparable depth units. In the British system a flow rate of 1.0 cfs for 1.0 h applies 1.0 in. on 1.0 acre a cfs h equals an ac in. A comparable metric flow unit applying 1.0 cm on 1.0 ha in 1.0 h is one basic stream, which is 100 m<sup>3</sup>/h or 27.78 lps 0.98 cfs 1.0 basic stream hour equals 1.0 ha cm. This is a very practical sized stream, and easily visualized by an irrigator. Its use rather than "lps" is easier and facilitates upgraded management. It is far easier for a farmer to compute the need and arrange for 1, 1 1/2, or 2 streams rather than to request 28, 37, or 56 lps.

For design purposes, the selected irrigation cycle length interval is related to crop, climate, soil variations and management allowable deficiency MAD Merriam 1966. Moderate variations in the design cycle length with an acceptable effect upon congestion are of little consequence. The magnitude of the irrigation cycle must be representative of the actual conditions under peak use plus a little reserve. Its precise value is not important, but a design value must be selected. It is a key value in considering congestion and it must be a practical whole number. It is similar to rotation cycles which are often 7, 10, or 14 days.

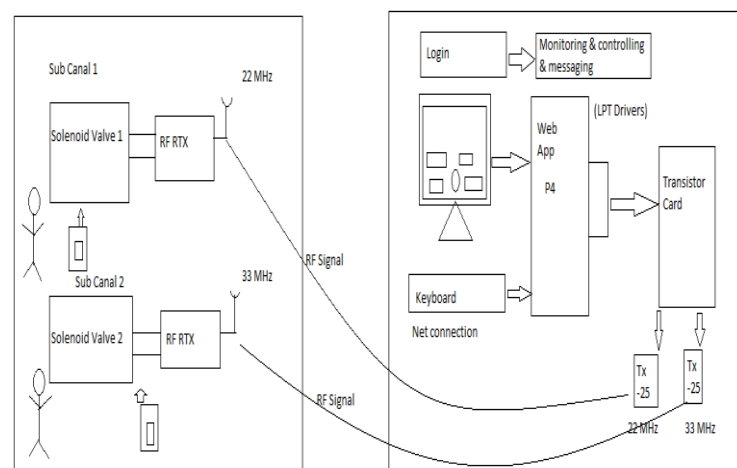


Fig -1: System Architecture.

### A. Wireless Sensor Unit:

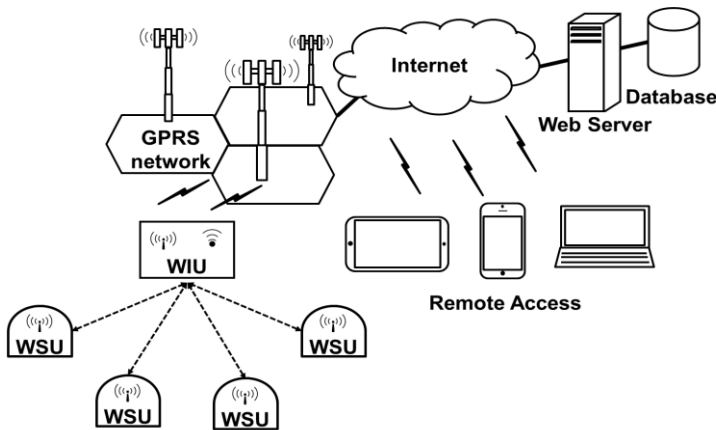
A WSU is comprised of a RF transceiver, sensors, a Microcontroller and power sources. Several WSUs can be deployed in-field to configure a distributed sensor network for the automatic irrigation system. Each unit is based on the microcontroller PIC24FJ64GB004 (Microchip Technologies, Chandler, AZ) that controls the radio modem XBee Pro S2 (Digi International, Eden Prairie, MN) and processes information from the soil-moisture sensor VH400 (Vegetronix, Sandy, UT), and the temperature sensor DS1822 (Maxim Integrated, San Jose, CA).

These components are powered by rechargeable AA 2000-mAh Ni-MH CycleEnergy batteries (SONY, Australia). The charge is maintained by a photovoltaic panel MPT4.8-75 (PowerFilm Solar, Ames, IN) to achieve full energy autonomy. The microcontroller, radio modem, Rechargeable batteries and electronic components were encapsulated in a waterproof Polyvinyl chloride (PVC) container. These components were selected to minimize the power consumption for the proposed application.

### B. AUTOMATIC IRRIGATION SYSTEM:

The automatic irrigation system hereby reported, consisted of two components, wireless sensor units (WSUs) and a wireless information unit (WIU), linked by radio transceivers that allowed the transfer of soil moisture and temperature data, implementing a WSN that uses ZigBee technology. The WIU has also a GPRS module to transmit the data to a web server via the public mobile network.

The information can be remotely monitored online through a graphical application through Internet access devices.

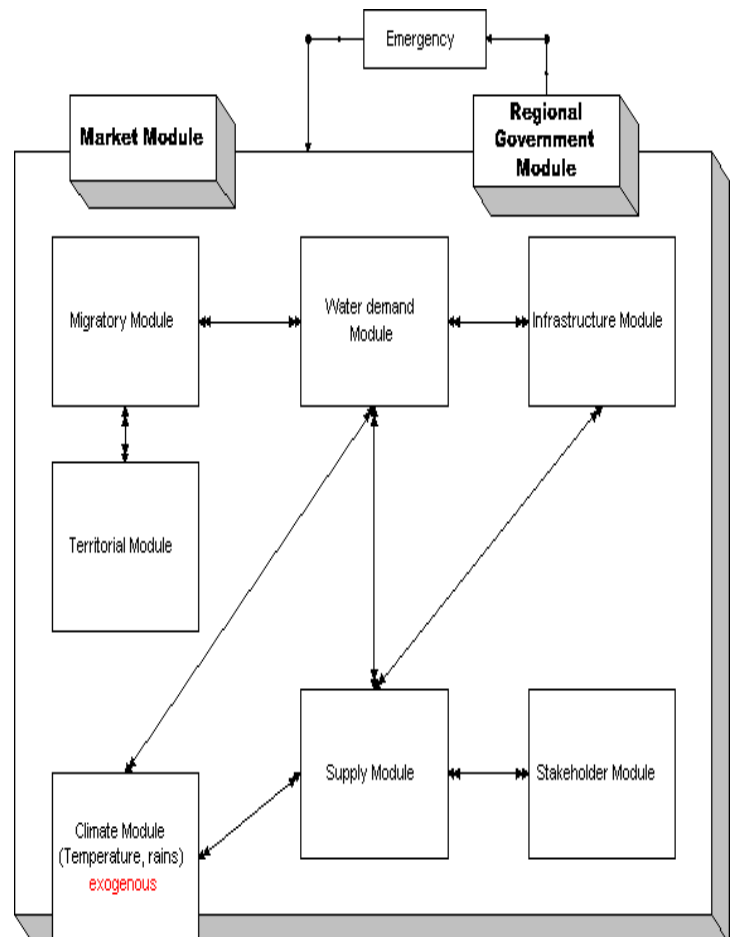


**Fig. 1.** Configuration of the automatic irrigation system. WSUs and a WIU.

**Module:**

1. Enable users to create events that would specify the following information-
  - It searches total number of farms of authorized person’s farm for proper water supply.
  - The time at which water will be started to get flowed to the particular farm which is get assigned.
  - The Final destination.
  - The end time at which water supply will get closed and flowed further.
2. Development of the logic that would enable-
  - Collect all the information from an authorized person.

- Take decision based on the context on the location.
  - Send “response” to all the selected recipients and handle the accepted or rejected messages received from the recipients or which is get stored in the database of the main office.
3. Generate all the databases saved into the main office from where the water supply is get started and must get informed to a particular authorized person.



**Fig-2:** Activity Diagram.

## 2.1 Mathematical Model

System S = { Automatic Computerized Control Of Canal In  
Irrigation }

System S = {S1, I, d, O}

S1 = {GPRS, WSN}

I = {V, SD}

d = function

O = output

I1 = V =>> Variables

I2 = SD =>>Source & Destination Array

[1] I1 = {Area, Emergency Type}

D1 = I1 =>> O1

O1 = {ST1, ST2, ST3, .....,STn}

ST = Canals

[2] I2 = {Source; Destination}

D2 = Cal

Cal = {Source; Destination}

R = {R1, R2, R3, ....., Rn}

R1 = {Source, node1, node2, ....., node n}

Source = Distance [Source] + nodes

S = Distance Between [Source, node i]

i = 1

D = {D1, D2, D3... Dn}

[R = Routes, D = Distance]

Min. Time = Min (D1, D2, D3... Dn)

O2 = {Min. Time}

Show (Min. Time)

## 2.2 Algorithm

### Divide and conquer

Divide and Conquer is an algorithm design paradigm based on multibranch recursion. A divide and conquer algorithm works by recursively breaking down a problem into two or more sub-problems of the same type, until this becomes simple enough to be solved directly.

- Divide problem into sub-problems.
- Conquer by solving sub-problems recursively. If the sub-problems are small enough, solve them in brute force fashion.
- Combine the solutions of sub-problems into a solution of the original problem.

## 3. Future scope

Irrigation is today's necessity to save the water within which potential by means of WSN and micro controller, actuators is very high. An assessment of several solutions and efforts have been presented within automatic irrigation grassland. The foremost concerns are development support organization with WSN infrastructure is complicated. Proposed system gives automation to irrigation for agriculture field decision support system act with network infrastructure.

The web based Automatic Wireless Drip Irrigation provides a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently. Using this system, one can save water, manpower as well as energy in order to improve productivity and ultimately the profit.

This system can also supply fertilizer and the other agricultural chemicals like calcium, sodium, ammonium, zinc to the field with adding new sensors and valves. Also it is possible to register farmer to download drip control timings from agricultural universities website control own drip irrigation system according to university and weather condition of that particular geographical area.

### 3.1 Advantages

- Simple to design and install
- Increase productivity and reduces water consumption in agriculture field.
- Less manpower is required
- Reduce soil erosion and nutrient leaching.
- Use of web application provide remote controlling to farm for water resource management.
- It helps to maximize profit.

## 4. CONCLUSIONS

Flexibility on-farm managing of an irrigation water supply is indispensable on behalf of the farm manager to obtain most advantageous use of water, crops, land, weather, as well as labor resources. Irrigation must be synchronized with additional aspects of the farming operation. Constraints on the farmer in charge of flexibility of frequency, duration and rate ought to be economically minimized. Daytime as well as night

irrigation is fully crucial. A partially flexible system is of inadequate value.

For the mechanical pressurized irrigation methods, rate be selected in addition to remains fixed. Management controls are all the way through variations of frequency as well as duration. For exterior methods, rate must moreover be diverse to be in contact to variable field intake conditions.

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