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PROJECT REPORT

on

"METERED WATER SYSTEM FOR AN APARTMENT"

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CERTIFICATE

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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DECLARATION

We, **KUMAR SATYAM (1CR16EC066),HARSH VARDHAN (1CR16EC045), AJAY BHANDARI (1CR16EC204**) bonafied students of CMR institute of Technology,Bangalore,hereby declare that the report entitled "**Metered water System For an Apartment"** has been carried out by us under the guidance of **Dr.Ananth Kumar M.S, Assistant Professor**, CMRIT ,Bengaluru,in partial fulfillment of the requirements for the requirementsfor the award of the degree of bachelors of engineering in **Electronics and Communication**, of the **Visvesvaraya Technological University,Belgam** during the academic year 2019-20.The work done in this dissertation report is original and it has not been submitted for any other degree in any university.

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ABSTRACT

Satisfying the increasing demand for water supply has been major challenge for many countries around the world .Water is one of major requirements for human survival ,conservation and management of the water resources must be given most importance. Water Supply management systems in Apartments need strict monitoring of consumption of water of each household and control the usage of it .In this project we develop a system to control the water usage in apartment.Each household can be configured with a threshold supply limit after which the supply is cut off. There by efficient usage od water without wastage is ensured.

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Chapter 1 PREAMBLE

1.1 Introduction

More people now live in cities than in rural areas around the world. Due to the rapid urbanization, cities are growing and the density of cities are increasing, which creates new demands on services and infrastructure. At the same time, with the rising awareness of the importance of sustainability, there is an overarching goal to enable a transition towards a more sustainable city. The digital revolution with its new technologies such as the Internet of Things (IoT) and how these technologies could be incorporated in services and infrastructure have emerged into the term of smart cities. Smart cities have enormous potential and it is recognized that smart cities could meet these new challenges posed by an increasing complexity [9]. Already a couple of years ago, smart cities were pointed out as a future emerging market which is expected to drive the digital economyforward.

IoT technology enables collection of massive amounts of high frequency data from smart sensors and could be used to monitor and measure usage and performance of different technical systems. The recent explosion of IoT enables new technical capabilities such as finer granular real time monitoring. A relevant application of this technology would be in the water sector, where the technology could be used throughout the water supply infrastructure. The interest of IoT in the water sector is growing rapidly, which can be seen by the number of scientific papers that have been written and published on the topic during the last two years.

The theoretical objectives of introducing IoT technology in the water supply system is to enable for both water utilities, operational managers and consumers to proactively manage their water usage and hence, achieve higher levels of sustainability. An implementation of smart sensors would feed the dedicated information platform with huge amounts of data. However, the technology development in the water sector are generally set behind compared to other sectors, as for example the energy sector, and full-scale implementations within the research field of urban water are still very rare. Further on, incitements of investigating the possibilities of utilizing smart sensors have not been homogeneously distributed and have primarily been seen where the impacts of growing population demand, water scarcity and challenges posed by climate change have been more noticeable.

1.2 ProblemStatement

In India, improving existing technologies in order to conserve water or utilize water more efficiently have not been of priority, since water often is both oversupplied and under priced. However, groundwater levels have decreased in several parts of the country and there is a increasing need to control the usage of water. The project considers the problem of metering the water supply and controls the supply by settingthresholds.

1.3 ExistingSystem

Current residential pipelines are monitored by means of an analogue water meter and there is no way to control the supply by setting thresholds in analogue meter. Also readings from analogue meter are notprecise.

1.4 ProposedSystem

We propose a sensor based supply monitoring and controlling the supply using electrical controlled valves.

Fig 1.4 Proposed System

Meter with electrical value control is fixed near the discharge. When the water flows, it is detected using Hall effect sensor and from it the volume of water supplied is measured. The measured value is sent to a server where threshold checking is made. If the threshold is crossed , server instructs the stop the valve.

1.5 Brief outline of theproject

The works carried out at each project phase are outlined below:-

Learning & Analysis Phase

This phase includes:

- Gatheringknowledgeaboutexistingcommunicatingtechniques.
- Wellunderstandingoftheprojectdesignreviewfromtheclient.
- Learningtools,technologies&programmingLanguageforcodingpurpose.

Design & Implementation

This phase Includes:

- Designingtheoverallfunctionalviewi.e.systemarchitectureoftheproject.
- Describing the language, platform used in the projectimplementation.
- Identification and design of the modules forimplementing.
- Implementing the applications for accessing and controlling the different types of services.

Testing Phase

This phase includes:

- Writing the test cases for testing the implementedmodules.
- Executing the test cases manually, comparing and evaluating the actual result with the expectedresult.

Chapter 2

LITERATURE SURVEY

Residential, commercial, and industrial sectors receive and pay for utilities such as natural gas, electricity, or water through the use of a utility company. These resources are carefully managed to ensure sustainability and customer's use is recorded for billing as well as demand predictionpurposes.

Customers who have a utility meter installed are billed according to their use and this process for water meters traditionally involved an employee from the utility company visiting the premises to manually record the meter's reading [1]. This process is time consuming, inaccurate and susceptible to corruption and theft [1, 2]. To solve these problems utility companies are focusing their attention on technologies which will enable automatic meter reading (AMR). Through use of new technologies, utility meters become smart sensor nodes that are part of a sensor network that communicates with a centralized control and data location.

AMR will not only allow utility companies to collect measurements automatically but also pave the way for remote control and configuration of meters by adding a networked and intelligent electronic controller. A rising trend is to either replace or retrofit water meters to enable AMR. The movement towards AMR is part of the smart grid movement as well as the bigger smart city movement where technology is being developed and used to improve every aspect of human life with goals such as automation, reducing power consumption, and lowering costs[3].

The smart grid movement mainly focuses on adding communication infrastructure to the existing power system infrastructure to increase efficiency of the whole power system [4]. While the smart grid focuses on the provision of electricity the water sector shares many of thesamechallengessuchascybersecurity,scalability,andinterfacingwithlegacysystems.

The use of AMR generates a vast continuous stream of data which must be correctly handled before the benefits of applying analytical tools to this data flow will be achieved [5]. A scalable communication architecture is also required to handle the large amount of nodes in a smart utility network. Utility companies can use a carefully developed system architecture for all of their supplied utilities to create integrated utilities sharing management, database, and communicationsystems.

Creating smart utility networks requires more than just smart meters but rather the creation of an Advanced Metering Infrastructure (AMI) to provide monitoring and control capabilities from the source all the way to the consumer. Current utility networks were built as a centralized system with the intelligence aspects of the system at central locations with little intelligence found in the geographically spread out distribution elements [4]. Futurenetworks will however make use of two-way communication between intelligent components to increase reliability and efficiency[4].

By enabling automatic meter reading through the use of smart utility meters, utility companies receive several benefits. AMR allows utility companies to implement automated billing systems, monitor supply and demand in real-time, provide remote control over meters, detect theft, and remotely detect faults [2, 6]. An AMR system can also be expanded to measure not only water quantity but also water quality [7]. When water shortages arise utility companies often respond with activating water restrictions such as forbidding the watering of gardens outside provided time periods. Without any real-time data of consumer's water consumption, it can be difficult to determine if consumers are breaking these restrictions but AMR can serve as a source of usage data in nearreal-time.

With no or only infrequent manual readings utility companies make estimates based on historical data when calculating a household's use [1]. The use of real-time monitoring allows for monthly bills to not only be accurate but also provide much more information about a household's monthly use patterns [8]. This new source of accurate usage data can also be used to improve customer rewards schemes and will allow consumers to better save money when they limit their use to nonpeak hours. Consumers would therefore also benefit from automatic meterreading.

The use of AMR and AMI has many benefits but negatives also exist. Their implementation will not only require a large financial commitment but also must be supported and desired by consumers. The cost of AMR extends beyond the meters themselves to the upgrading of the central control and data locations to add data storage and processing capabilities. Staff will havetoberetrainedandcampaignstogainthesupportofconsumerswillhavetobecreated.

Consumers have privacy issues with the large amount of data about their everyday habits being recording by their smart meters [9]. One of their main concerns is the detection of their presence in their homes through the use of this data [10]. Privacy preserving schemes are in development for the smart grid to ensure customer privacy [10]. The security of the data as well as the network itself is also a concern as the network could be targeted with cyber threats [11]. Usage habits could be presented to the customer through the use of cloud services but security concern with this approach must also be addressed[12].

A commonly used communication technology in applications such as home automation, remote monitoring, and smart lighting is ZigBee, which is based on the IEEE 802.15.4 specification [3]. Zigbee focuses on the upper layers of the networking stack asIEEE 802.15.4 only defines the lower two layers [13]. In addition to being recommended by the US National Institute for Standards and Technology (NIST) for smart grid networks in the residential domain, ZigBee based meters are also preferred by several smart grid vendors [3]. ZigBee based designs are popular in the smart utility field because of low power consumption and cost-effectiveness [14–16]. There are however drawbacks to using ZigBee such as a proportionalincreaseininterferencewhenthenumberofnodesisincreasedaswellaslow bandwidth capabilities [2]. These drawbacks will only present themselves when researchers in the AMR field create an experimental setup of sufficient size, for example, large networks instead of a small proof of conceptnetwork.

While gas, electricity, and water meters each have unique challenges in measuring their respective resource, the design challenges in building smart meter systems are very similar. For example, in all three cases meter installations are normally done during building construction and upgrading existing meters to create smart meters requires retrofittable designs. Existing meters would have been originally installed without any considerations to the power and networking requirements of a smart metersystem.

Smart water meters can be developed using different technologies, depending on several factors: cost, scalability, and networking requirements and if existing meters are retrofitted or replaced with a new smart water meter design. Before designing a network for a smart water meter system, it is beneficial to first examine the meter itself to gain an understanding of not only the data that has to be sent but also any other designrequirements.

Smart water meters measure the flow of water using mainly two approaches: image processing or through the use of sensors. Image processing of the meter's display allows for the easy retrofit of existing analogue meters [17–19] while sensor based approaches use either magnetic [1, 20] or capacitive sensors[21].

Smart Water Meters Using Magnetic Sensing

A smart water meter system with the design goal of monitoring water consumption in near real-time was successfully developed in [1]. A meter interface node was built which counts pulses generated by a reed switch inside the water meter. Every time a specific amount of water has flown through the meter another pulse isgenerated.

In a retrofittable system flow rate is measured externally to the existing analogue water meter by attaching a custom magnetic sensor [20]. The already installed water meter measures flow by monitoring a rotating magnetic coupling. The coupling's magnetic field is however detectable outside the meter and by using a Tunnelling Magneto resistive (TMR) device an external system can also measure the flow rate without any modifications to the meter's internal components[20].

A smart water meter was built in [22] with magnetic hall sensors sensing a magnet attached to the impeller of a water meter. An algorithm was developed to determine the direction of water flow to determine periods where the controller can be putinto sleep mode.

Smart Water Meters Using Capacitive Sensing

A low-cost noncontact arrow sensor was developed for a water meter [17, 21]. The smart meter consists of mechanical water meter with an electronic circuit embedded in the display capable of detection the location of a pointer's arrow. The electronic circuit uses a signal generator to send a square wave (of a specific frequency) through the metal arrow andthe combination of the metal arrow, the copper foil, and the water between these two conductive objects form a capacitor [21]. By applying capacitive signal sensing techniques via detection pads each connected to a sensing pad (copper foil under a number) the location of the arrow can be determined. The system was tested using 300 test samples taken over a 30-day period and had a success rate exceeding 95%[21].

A Field-Programmable Gate Array (FPGA) was used to implement a signal generator, perform signal processing, and send data via an RF module to a server[21].

Smart Water Meters Using Image Processing

Image processing is a popular method in smart water meters and is particularly useful if a retrofittable design is desired, as an external camera module can be used to capture a water meter's display for processing. This approach requires no modification of the existing meter's internal structure. An example of an analogue water meter's display is shown in Figure 2. The display consists of multiple pointer (or arrow) dials as well as a digital dial. An image processing-based approach would have to be developed with specific water meter models in mind as the displays willdiffer.

Chapter 3

SYSTEM REQUIREMENT SPECIFICATION

Programming necessity Specification is a central report, which shapes the establishment of the product improvement handle. It records the necessities of a framework as well as has a depiction of its significant element. A SRS is fundamentally an association's understanding (in composing) of a client or potential customer's framework necessities and conditions at a specific point in time (for the most part) before any genuine plan or advancement work. It's a two-way protection arrangement that guarantees that both the customer and the association comprehend alternate's necessities from that viewpoint at a given point in time. The SRS additionally works as a plan for finishing a venture with as meager cost development as could be expected under the circumstances. The SRS is frequently alluded to as the "parent" archive since all ensuing venture administration records, for example, outline details, articulations of work, programming design determinations, testing and approval arrangements, and documentation arrangements, are identified with it. Note that a SRS contains utilitarian and nonfunctional prerequisites just; it doesn't offer plan recommendations, conceivable answers for innovation or business issues, or whatever other data other than what the improvement group comprehends the client's framework necessities tobe.

3.1 FunctionalRequirement

Utilitarian Requirement characterizes an element of a product framework and how the framework must act when given particular data sources or conditions. These may incorporate estimations, information control and handling and other particular usefulness. In this framework taking after are the utilitarian prerequisites:-

Following are the functional requirements of theproject

1. Each house hold must be set with threshold water supplylimit.
2. The water consumption of each home must bemonitored
3. When the water consumption of home exceeds the configured threshold, supply must becut-off.

4. The daily water consumption of home can betracked.

3.2 Non-functionalRequirement

Non useful necessities are the prerequisites which are not specifically worried with the particular capacity conveyed by the framework. They determine the criteria that can be utilized to judge the operation of a framework as opposed to particular practices. They may identify with emanant framework properties, for example, dependability, reaction time and store inhabitancy. Non useful prerequisites emerge through the client needs, due to spending imperatives, hierarchical strategies, the requirement for interoperability with other programming and equipment frameworks or due to outside variables, forexample,

Portability: Since the software is developed in java it can be executed on any platform for which the JVM is available with minor or no modifications.

Scalability: The system can work for any kind of map.

Ease of Use: The front end is designed in such a way that it provides an interface which allows the user to interact in an easymanner.

Modularity: The complete product is broken up into many modules and well-defined interfaces are developed to explore the benefit of flexibility of the product.

Debug: Generate the logs for eachfunction.

3.3 ResourceRequirement

NetBeans IDE 7.2 : NetBeans is a multi-dialect programming improvement condition containing an incorporated advancement condition (IDE) and an extensible module framework. It is composed fundamentally in Java and can be utilized to create applications in Java and, by methods for the different modules, in different dialects also, including C, C++, COBOL, Python, Perl, PHP, and others. NetBeans utilizes modules keeping in mind the end goal to give the majority of its usefulness on top of (and including) the runtime framework, rather than some different applications where usefulness is commonly hardcoded. The

NetBeans SDK incorporates the NetBeans java improvement instruments (JDT), offering an IDE with an implicit incremental Java compiler and a full model of the Java source documents. This takes into account progressed refactoring strategies and code examination. The IDE likewise makes utilization of a workspace, for this situation an arrangement of metadata over a level record space permitting outer document changes the length of the comparing workspace "asset" is invigorated a short timelater.

Swing: The Java Foundation Classes (JFC) comprises of five noteworthy parts: AWT, Swing, and Accessibility, Java 2D, and Drag and Drop. Java 2D has turned into a necessary piece of AWT, Swing is based on top of AWT, and Accessibility support is incorporated with Swing. The five sections of JFC are surely not fundamentally unrelated, and Swing is required to consolidation all the more profoundly with AWT in future adaptations of Java. Swing is an arrangement of classes that gives more intense and adaptable parts than are conceivable with the AWT. Notwithstanding the well-known parts, Swing supplies selected sheets, scroll sheets, trees, and tables. It gives a solitary API equipped for supporting various look-and feels so that designers and end-clients are not bolted into a solitary stage's look-and-feel. The Swing library makes substantial utilization of the MVC programming configuration design, which reasonably decouples the information being seen from the UI controls through which it isseen.

Swing possesses several traits such as—

1. Platformindependence

2. Extensibility

3. Component-oriented

4. Customizable

5. Configurable

6. Look andfeel.

Stage freedom both regarding its demeanour and its usage, extensibility which takes into consideration the "stopping" of different custom executions of determined system interfaces

Users can give their own particular custom usage of these segments to abrogate the default executions. Part introduction permits reacting to a notable arrangement of charges particular to the segment. In particular, Swing segments are Java Beans segments, consistent with the Java Beans Component Architecture details. Through adaptable element clients will automatically tweak a standard Swing segment by doling out particular fringes, hues, foundations, opacities, and so forth, configurable that enables Swing to react at runtime to key changes in its settings. At long last look and feel enables one to practice the look and feel of gadgets, by adjusting the default by means of runtime parameters getting from a current one, by making one sans preparation, or, starting with J2SE 5.0, by utilizing the Look and Feel which is designed with a XML propertyrecord.

Microcontroller:

• Computer on a single integratedchip:

– Processor (CPU)
– Memory (RAM / ROM /Flash)
– I/O ports (USB, I2C, SPI,ADC)

• Common microcontrollerfamilies:

– Intel: 4004, 8008, etc.
– Atmel: AT and AVR
– Microchip:PIC
– ARM: (multiplemanufacturers)

• Usedin:

– Cellphones,
– Toys
– Householdappliances
– Cars

– Cameras

Arduino:

• Open-source hardwareplatform

• Open source developmentenvironment

– Easy-to learn language and libraries (based on wiringlanguage)

– Integrated development environment (based on processing programmingenvironment)

– Available for Windows / Mac /Linux

Arduino IDE:

Elements of Arduino IDE

• Text editor

– syntax and keywordcoloring

– automatic indentation

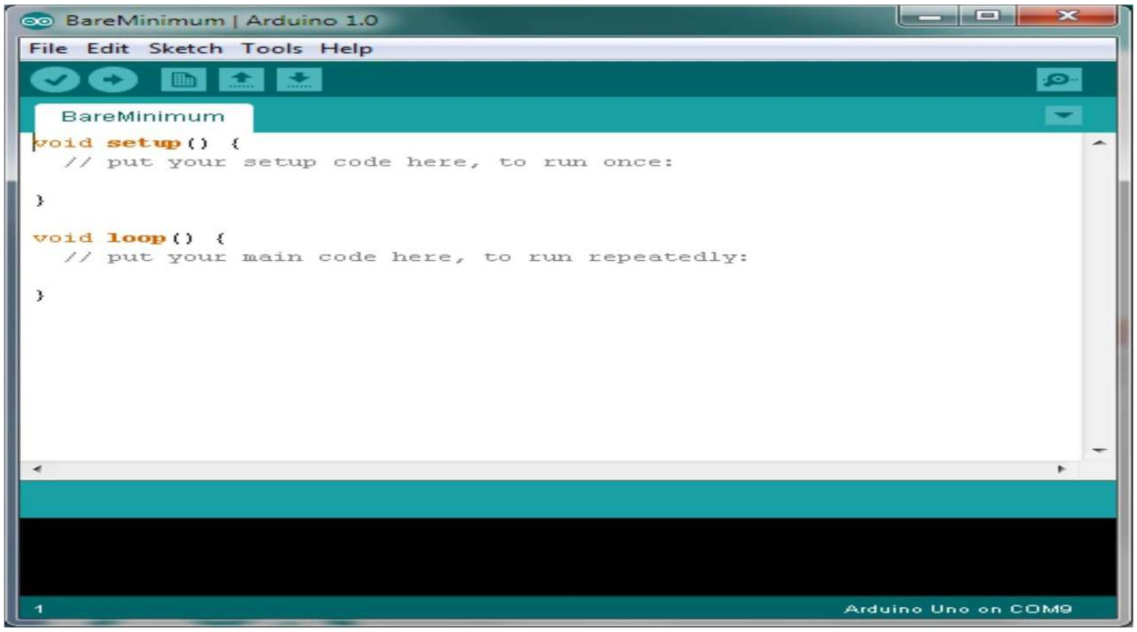
– programmingshortcuts

• Compiler

• HardwareInterface

– Uploadingprograms

– Communicating with Arduino viaUSB



```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Fig 3.3 Arduino IDE

3.4 HardwareRequirements

We need two platforms Embedded platform and Server Platform.

Embedded platform requirements

Controller	: Arduino microcontroller
Battery	: 5Vbattery
Devices	: Water flow Sensor, Electrical solenoidvalve.

Server platform requirements

We need 1 machine with following minimal needs

CPU	: Intel 2GHZ
Memory	:2GB
Disk	: 40GB

Network : Internet interface / Serial cableinterface.

3.5 Software (Tools &Technologies)Requirements

The software requirements of Embedded platform is below

Coding :C

Platform : Arduino2.1

Dev Tool : Arduino Development Kit

OS :Windows

Software requirements of the server platform is below:

Coding : JAVA,J2EE

Platform : JDK1.7,

OS :Windows

DevTool : NetBeans IDE7.2.

Chapter 4

SYSTEM ANALYSIS

Examination is the way toward finding the best answer for the issue. Framework examination is the procedure by which we find out about the current issues, characterize items and prerequisites and assesses the arrangements. It is the state of mind about the association and the issue it includes, an arrangement of advances that aides in tackling these issues. Plausibility contemplate assumes a key part in framework investigation which gives the objective for plan andadvancement.

4.1 FeasibilityStudy

Contingent upon the consequences of the underlying examination the overview is presently extended to a more point by point practicality ponder. "FEASIBILTY STUDY" is a trial of framework proposition as per its workability, effect of the association, capacity to address issues and compelling utilization of the assets. Eight steps involved in the feasibility analysis are:

✓Form a project team and appoint a projectleader.

✓Enumerate potential proposedsystem.

✓Define and identify characteristics of proposedsystem.

✓Determine and evaluate performance and cost effective of each proposedsystem.

✓Weight system performance and costdata.

✓Select the best proposedsystem.

✓Prepareandreportfinalprojectdirectivetomanagement.

Three key considerations involved in the feasibility analysis are

✓ECONOMICALFEASIBILITY

✓TECHNICALFEASIBILITY

✓SOCIALFEASIBILITY

4.1.1 EconomicalFeasibility

This review is done to check the monetary effect that the framework will have on the association. The measure of store that the organization can fill the innovative work of the framework is restricted. The consumptions must be legitimized. Consequently, the created framework too inside the financial plan and this was accomplished in light of the fact that the majority of the advances utilized are unreservedly accessible. Just the tweaked items must be acquired. Following are the detail Hardware specification for smart bin.

Device	Cost INR
Water flow Sensor	150
Arduino microcontroller UNO with cable	450
Electrical solenoid valve	250
Adapter	100

4.1.2 TechnicalFeasibility

This review is done to check the specialized plausibility, that is, the specialized prerequisites of the framework. Any framework created must not have an appeal on the accessible specialized assets. This will prompt levels of popularity on the accessible specialized assets. This will prompt levels of popularity being set on the customer. The created framework must have an unobtrusive necessity, as just insignificant or invalid changes are required for executing this framework.

4.1.3 SocialFeasibility

The part of study is to check the level of acknowledgment of the framework by the client. This incorporates the way toward preparing the client to utilize the framework effectively. The client must not feel debilitated by the framework, rather should acknowledge it as a need. The level of acknowledgment by the clients exclusively relies on upon the strategies that are utilized to instruct the client about the framework and to make him acquainted with it. His level of certainty must be raised with the goal that he is additionally ready to make some productive feedback, which is invited, as he is the last client ofthe framework.

Summary

The principle point of this part is to see if the framework is sufficiently possible or not. Thus various types of investigation, for example, execution examination, specialized examination, temperate examination and so forth is performed.

Chapter 5

SYSTEM DESIGN

Configuration is an inventive procedure; a great plan is the way to viable framework. The framework "Plan" is characterized as "The way toward applying different procedures and standards with the end goal of characterizing a procedure or a framework in adequate detail to allow its physical acknowledgment". Different plan elements are taken after to build up the framework. The plan determination depicts the elements of the framework, the parts or components of the framework and their appearance toend-clients.

5.1 Fundamental designconcept

An arrangement of basic plan ideas has developed in the course of recent decades. In spite of the fact that the level of enthusiasm for every idea has differed throughout the years, each has stood the trial of time. Each gives the product creator an establishment from which more modern outline techniques can be connected. The major plan ideas give the vital structure to "taking care of business". The crucial outline ideas, for example, deliberation, refinement, measured quality, programming design, control chain of importance, auxiliary dividing, information structure, programming strategy and data stowing away are connected in this venture to hitting the nail on the head according to theparticular.

5.1.1 Inputdesign

The information Design is the way toward changing over the client arranged contributions to the PC based configuration. The objective of planning info information is to make the mechanization as simple and free from blunders as could reasonably be expected. Giving a decent information configuration to the application simple information and determination elements are received. The information plan necessities, for example, ease of use, reliable configuration and intelligent discourse for giving the correct message and help for the client at opportune time are likewise considered for the improvement of the venture. Input configuration is a piece of general framework plan which requires exceptionally cautious consideration. Regularly the gathering of info information is the most costly piece of the framework, which should be course through number of modules .It is the point where the client prepared to send the information to the goal machine alongside known IP address; if the IP address is obscure then it might inclined toblunder.

5.1.2 Output design

A quality yield is one, which meets the necessities of the end client and present the data obviously. In any framework consequences of preparing are imparted to the clients and to different frameworks through yields. It is most critical and direct source data to the client. Proficient and astute yield enhances the frameworks association with source and goal machine. Yields from PCs are required basically to get same parcel that the client has send rather than tainted bundle and caricature parcels. They are additionally used to give to perpetual duplicate of these outcomes for laterinterview.

5.1.3 The MVC Design Method

Swing really makes utilization of an improved variation of the MVC configuration called the model-designate. This outline consolidates the view and the controller question into a solitary component that attracts the part to the screen and handles GUI occasions known as the UI appoint. Correspondence between the model and the UI designate turns into a two-way road. Each Swing part contains a model and a UI assign. The model is in charge of keeping up data about the part's state. The UI delegate is in charge of keeping up data about how to draw the part on the screen. The UI designate (in conjunction with AWT) responds to different occasions that engender through thesegment.

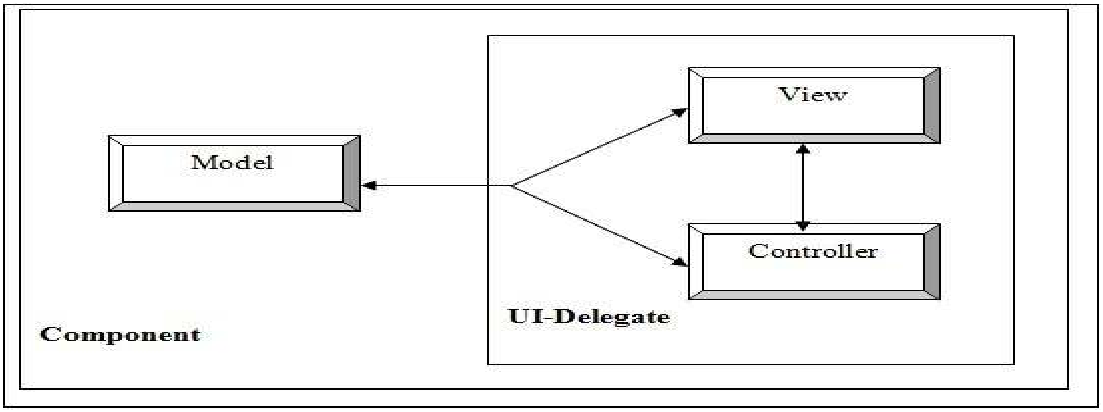


Fig 5.1.3- Combination of View & Controller into a UI delegateobject

The design method that has been followed to design the architecture of the system is MVC design pattern. Swing uses the model-view-controller (MVC) architecture as the fundamental design behind each of its components. Essentially, MVC breaks GUI component into three elements. Each of these elements plays a crucial role in how the component behaves. The MVC design pattern separates a software component into three distinct pieces: a model, a view, and acontroller.

Model

The *model* is the piece that represents the state and low-level behavior of the component. It manages the state and conducts all transformations on that state. The model has no specific knowledge of either its controllers or its views. It encompasses the state data for each component. There are different models for different types of components. For example, the model of a scrollbar component might contain information about its current position of its adjustable “thumb”, its minimum and maximum values, and the thumb’s width. A menu on the other hand, may simply contain a list of the menu items the user can select from. The system itself maintains links between model and views and notifies the views when the model changesstate.

View

The *view refers to how you see the component in the screen. It* is the piece that manages the visual display of the state represented by the model. Almost all window frames will have a title bar spanning the top of the window. However, the title bar may have a close box on the left side or on the right side. These are the examples of different types of views for the same window object. A model can have more than one view, but that is typically not the case in the Swingset.

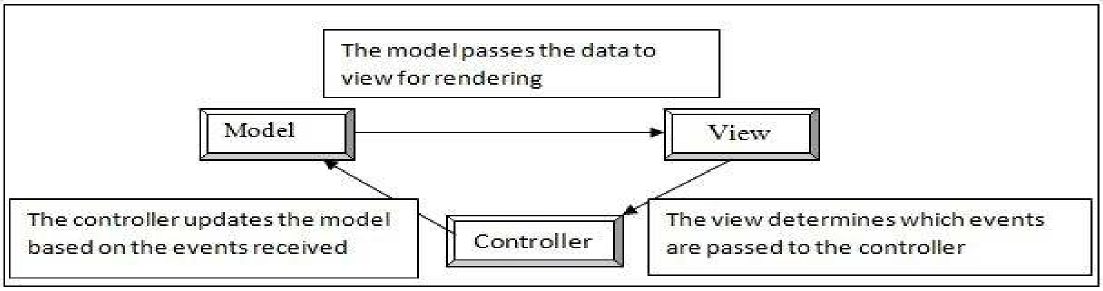

The model passes the data to view for rendering
Model
View
The controller updates the model based on the events received
Controller
The view determines which events are passed to the controller

Fig 5.1.3- Communication through the MVC architecture

Controller

The *controller* is the piece that manages user interaction with the model. It provides the mechanism by which changes are made to the state of the model. It is the portion of the user interface that dictates how the component interacts withevents.

The view can't render the scrollbar effectively without acquiring data from the model first. For this situation the scrollbar won't know where to draw its "thumb" unless it can get its present position and width with respect to the base and most extreme. Moreover, the view decides whether the part is the beneficiary of client occasions, for example, mouse clicks. The view passes these occasions on to the controller, which chooses how to deal with them best. In view of the controller's choice the qualities in the model may should be adjusted. In the event that the client drags the scrollbar thumb, the controller will respond by increasing the thumb's position in the model. By then the entire cycle canrehash.

The JFC UI segment can be separated into a model, view, and controller. The view and controller are joined into one piece, a typical adjustment of the essential MVC design. They frame the UI for the segment.

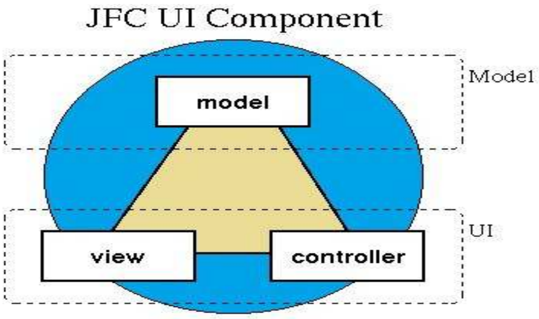


Figure 5.1.4- JFC user interface component

5.2 System developmentmethodology

Framework advancement technique is a procedure through which an item will get finished or an item gets freed from any issue. Programming improvement process is depicted as various stages, systems and steps that gives the entire programming. It takes after arrangement of steps which is utilized for item advance. The advancement technique followed in this venture is waterfalldisplay.

5.2.1 Modelphases

The waterfall model is a sequentialsoftware development process, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Requirement initiation, Analysis, Design, Implementation, Testing andmaintenance.

Requirement Analysis: This phase is concerned about collection of requirements of the system. This process involves generating document and requirementreview.

System Design: Keeping the requirements in mind the system specifications are translated in to a software representation. In this phase the designer emphasizes on: -algorithm**,** data structure**,** software architectureetc.

Coding: In this phase programmer starts his coding in order to give a full sketch of product. In other words, system specifications are only converted in to machine readable compute code.

Implementation: The implementation phase involves the actual coding or programming of the software. The output of this phase is typically the library, executables, user manuals and additional software documentation

Testing: In this phase all programs (models) are integrated and tested to ensure that the complete system meets the software requirements. The testing is concerned with verification andvalidation.

Maintenance: The maintenance phase is the longest phase in which the software is updated to fulfill the changing customer need, adapt to accommodate change in the external environment, correct errors and oversights previously undetected in the testing phase, enhance the efficiency of thesoftware.

5.2.2 Reason for choosing waterfall model as development method

- Clear projectobjectives.
- Stable projectrequirements.
- Progress of system ismeasurable.

- Strict sign-offrequirements.
- Helps you to beperfect.
- Logic of software development is clearlyunderstood.
- Production of a formalspecification
- Better resourceallocation.
- Improves quality. The emphasis on requirements and design before writing a single line of code ensures minimal wastage of time and effort and reduces the risk of scheduleslippage.
- Less human resources required as once one phase is finished those people can start working on to the nextphase.

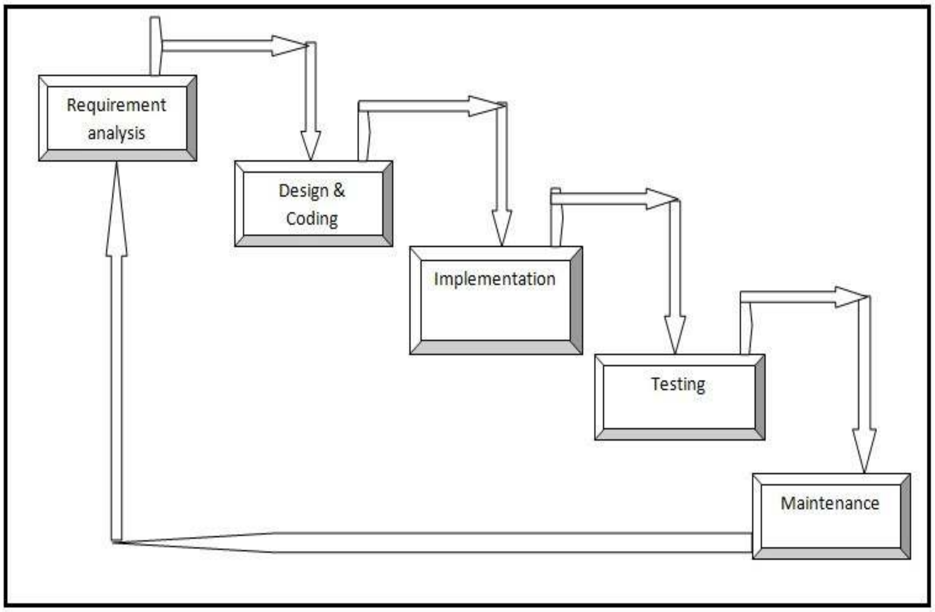


Fig 5.2.2: - Waterfall model

5.3 SystemArchitecture

Framework engineering is the applied outline that characterizes the structure and conduct of a framework. A design portrayal is a formal depiction of a framework, composed in a way that backings thinking about the auxiliary properties of the framework. It characterizes the framework parts or building pieces and gives an arrangement from which items can be secured,andframeworksbuiltup,thatwillcooperatetoactualizethegeneralframework.

The System architecture is shown below.

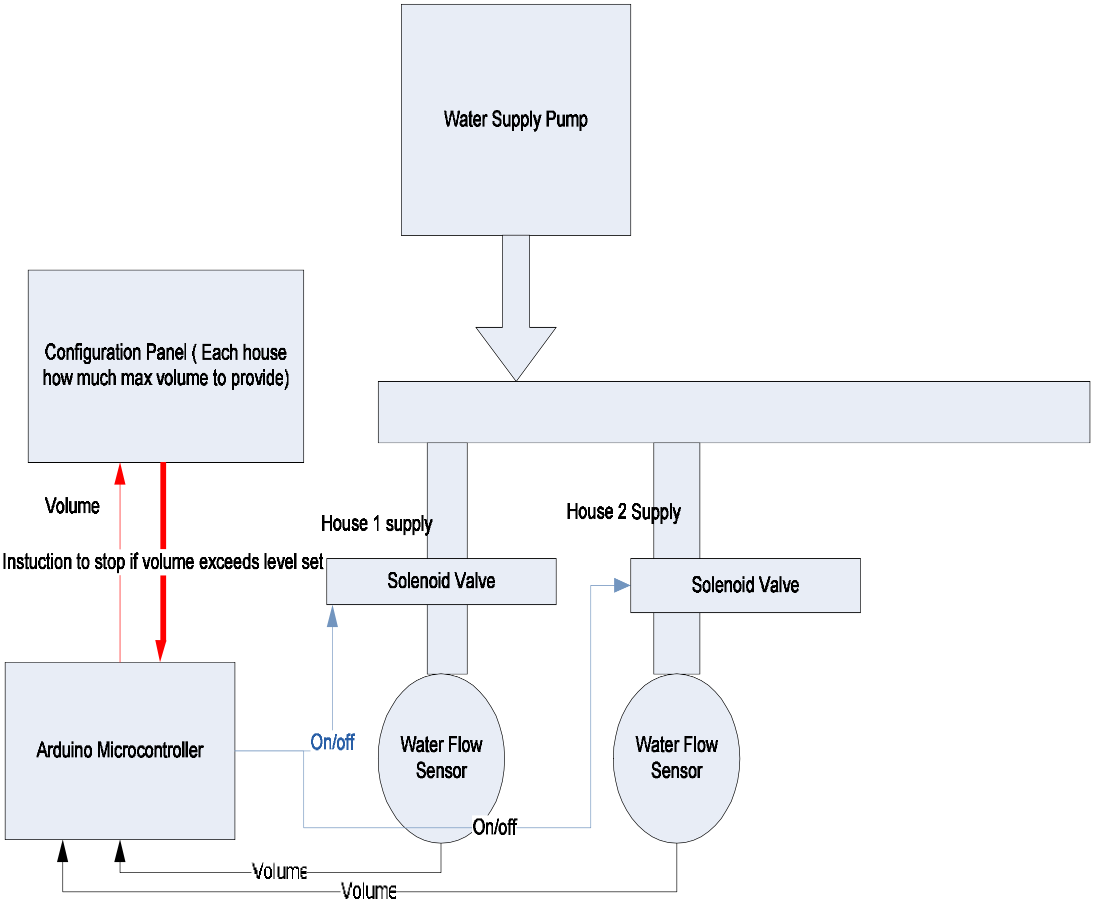


Fig 5.3 System Architecture

5.4 Classes Designed for thesystem

A class diagram in the Unified Modelling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, and the relationships between theclasses.

The class diagram is shown below.

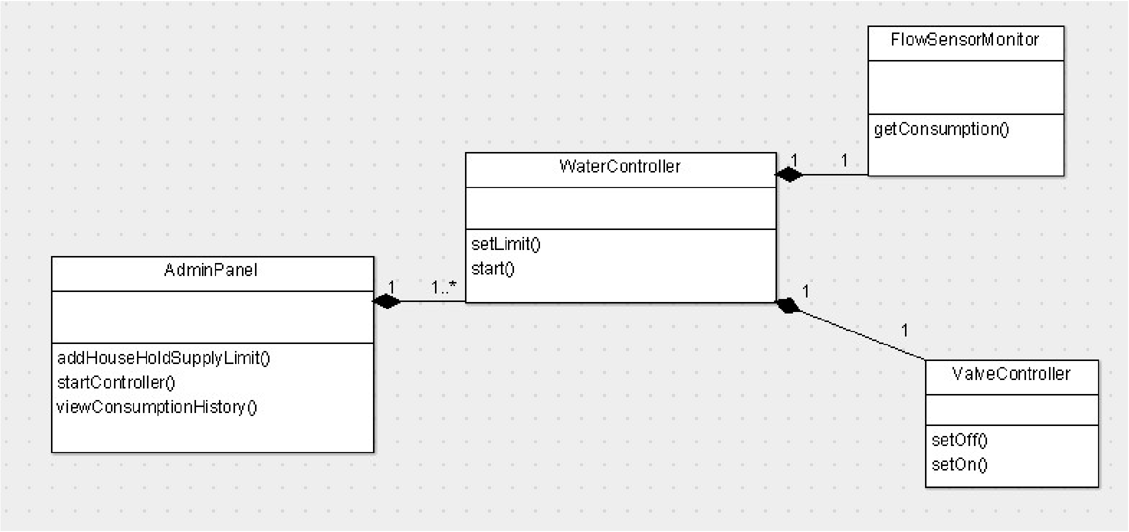


Fig 5.4 Class Diagram

5.5 Use case Diagram of thesystem

A use case diagram is a type of behavioral diagram created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those usecases.

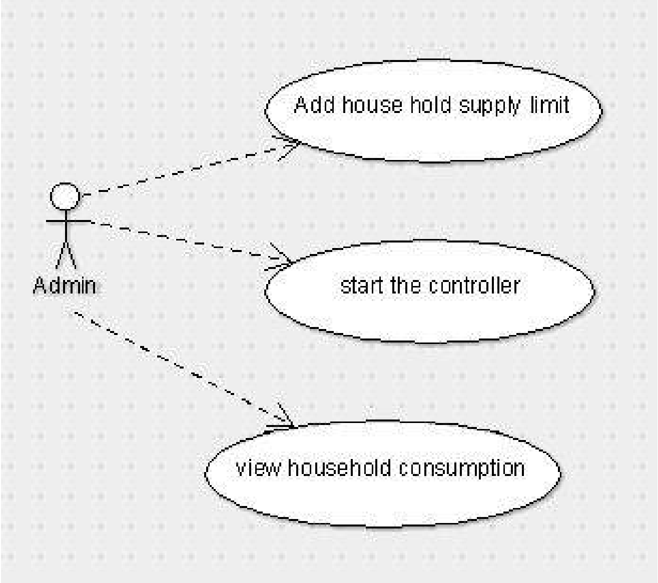


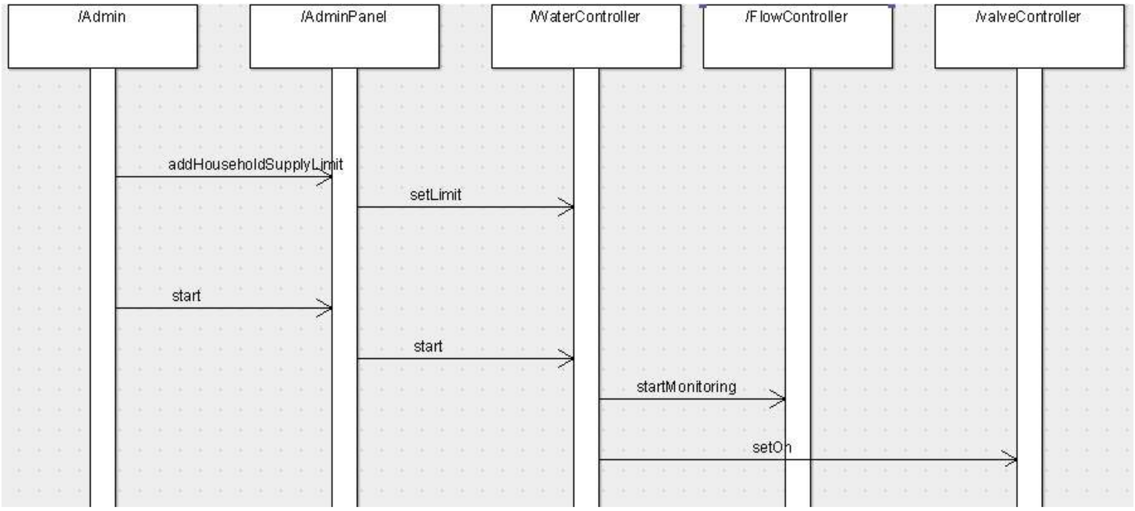
Fig 5.5 Use Case Diagram

5.6 Sequence diagram of systemoperation

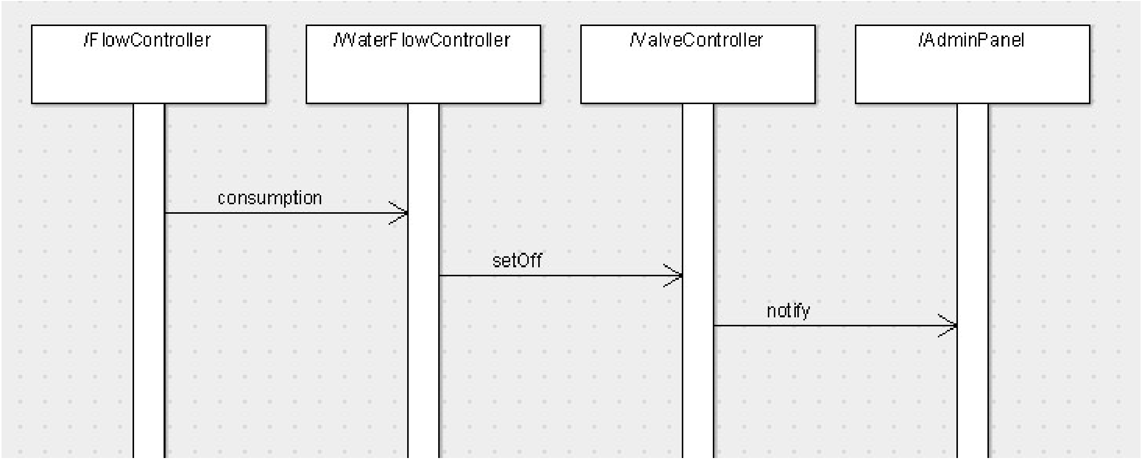
A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message SequenceChart.

The sequence diagrams shown below

Startingflow



Controlflow

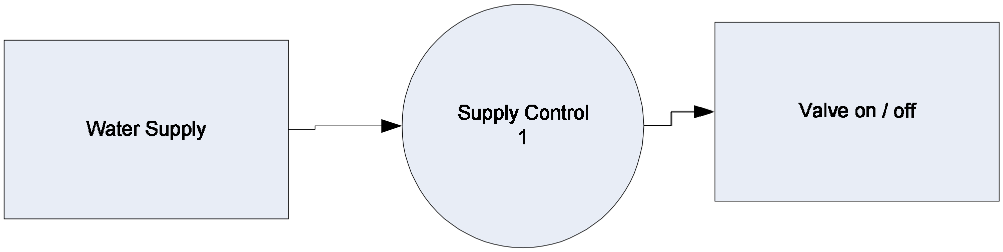


5.7 Data Flow Diagram of thesystem

An information stream chart (DFD) is a graphical portrayal of the "stream" of information through a data framework. DFDs can likewise be utilized for the representation of information preparing (organized outline). On a DFD, information things spill out of an outside information source or an inner information store to an interior information store or an outer information sink, through an insideprocedure.

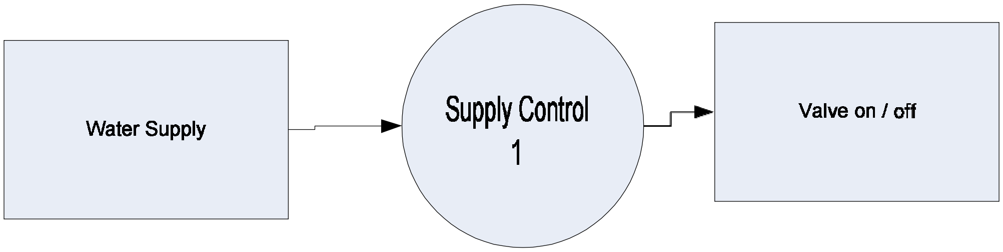
Level 0 Data flow diagram

A setting level or level 0 information stream chart demonstrates the association between the framework and outside specialists which go about as information sources and information sinks. On the setting outline (otherwise called the Level 0 DFD) the framework's cooperations with the outside world are demonstrated simply as far as information streams over the framework limit. The setting outline demonstrates the whole framework as a solitary procedure, and gives no signs as to its innerassociation.



Level 1 Data flow diagram

The Level 1 DFD demonstrates how the framework is partitioned into sub-frameworks (forms), each of which manages at least one of the information streams to or from an outer operator, and which together give the majority of the usefulness of the framework in general. It additionally distinguishes interior information stores that must be available all together for the framework to carry out its employment, and demonstrates the stream of information between the different parts of theframework.



5.8 Flow Chart of the System

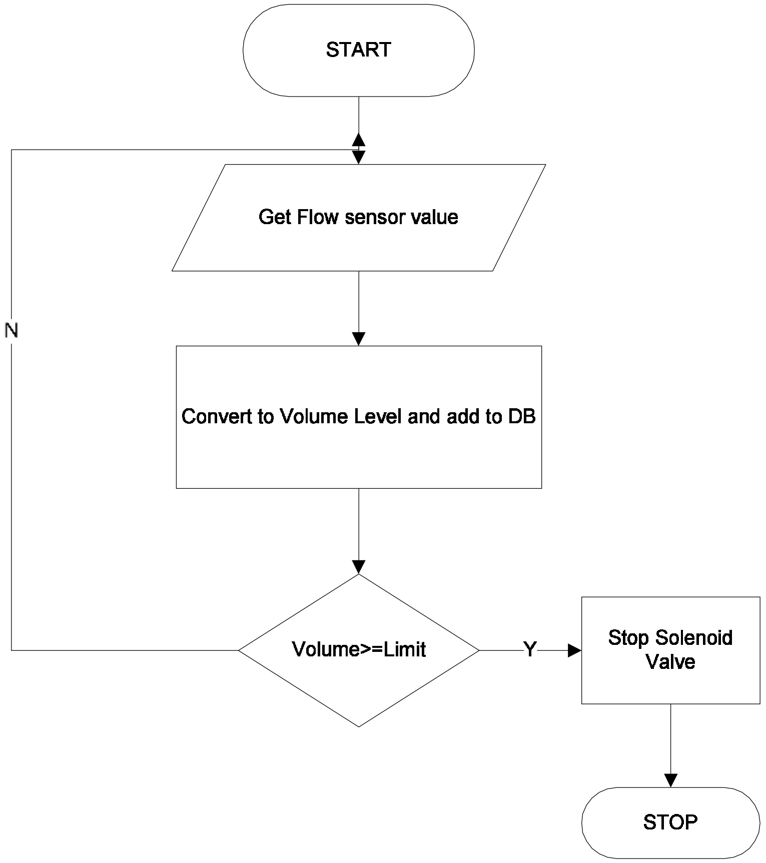


Figure 5.8: flowchart of the system

Summary

This chapter mainly concentrates on system architecture, class diagram, sequence diagram, and data flow diagram etc.

Chapter 6

IMPLEMENTATION

Implementation is the stage of the project where the theoretical design is turned into a working system. At this stage the main workload and the major impact on the existing system shifts to the user department. If the implementation is not carefully planned and controlled, it can cause chaos and confusion.

The implementation stage requires the following tasks.

- Carefulplanning.
- Investigation of system andconstraints.
- Design of methods to achieve thechangeover.
- Evaluation of the changeovermethod.
- Correct decisions regarding selection of theplatform
- Appropriate selection of the language for applicationdevelopment

.

6.1 Language used forimplementation

Execution stage ought to splendidly outline configuration report in an appropriate programming dialect keeping in mind the end goal to accomplish the important last and right item. Frequently the item contains defects and gets destroyed because of wrong programming dialect decided forusage.

In this venture, for execution reason Java is picked as the programming dialect. Few purposes behind which Java is chosen as a programming dialect can be laid out as takes after:-

Platform Independence: Java compilers don't create local protest code for a specific stage yet rather 'byte code' directions for the Java Virtual Machine (JVM). Making Java code take a shot at a specific stage is then just an issue of composing a byte code translator to recreate a JVM. What this all methods is that the same arranged byte code will run unmodified on any stage that backingsJava.

Objects Orientation: Java is a pure object-oriented language. This means that everything in a Java program is an object and everything isdescended from a root object class.

Rich Standard Library: One of Java's most attractive features is its standard library. The Javaenvironmentincludeshundredsofclassesandmethodsinsixmajorfunctionalareas:-

- ✓ Language Support classes for advanced language features such as strings, arrays, threads, and exceptionhandling.
- ✓ Utility classes like a random number generator, date and time functions, and container classes.
- ✓ Input/output classes to read and write data of many types to and from a variety of sources.
- ✓ Networking classes to allow inter-computer communications over a local network or theInternet.
- ✓ Abstract Window Toolkit for creating platform-independent GUIapplications.
- ✓ Applet is a class that lets you create Java programs that can be downloaded and run on a clientbrowser.

Applet Interface: In addition to being able to create stand-alone applications, Java developers can create programs that can download from a web page and run on a client browser.

Familiar C++-like Syntax: One of the factors enabling the rapid adoption of Java is the similarity of the Java syntax to that of the popular C++ programming language.

Garbage Collection: Java does not require programmers to explicitly free dynamically allocated memory. This makes Java programs easier to write and less prone to memory errors.

Swing support: Swing was developed to provide a more sophisticated set of GUI componentsthan the earlier Abstract Window Toolkit. Swing provides a native look and feelthat emulates the look and feel of several platforms, and also supports a pluggable look andfeelthatallowsapplicationstohavealookandfeelunrelatedtotheunderlyingplatform.

6.2 Platform used forimplementation

A stage is a critical component in programming advancement. A stage may be essentially characterized as "a place to dispatch programming". In this venture, for usage reason Windows XP stage is utilized and purposes behind picking this stage are Integrated Networking support, More steady and secure than past variant, Contain remote desktop association and re-establish alternative, Enhanced gadget driver verifier, Dramatically lessened reboot situations, Improved code insurance, Side-by-side DLL bolster, Windows File Protection, Pre-emptive multitasking engineering, Scalable memory and processor bolster, Encrypting File System (EFS) with multi-client bolster, IP Security (IPsec), Kerberos bolster, Smart card bolster, Internet Explorer Add-on Manager, Windows Firewall, Windows Security Centre, Fresh visualoutline.

6.3 Pseudo Codeused

Arduino Side Code for water monitoring and control

```
bytesolenoid     = 13;

bytesensorInterrupt = 0; // 0 = digital pin 2
bytesensorPin       =2;

// The hall-effect flow sensor outputs approximately 4.5 pulses per second per
// litre/minute of flow.
floatcalibrationFactor = 7.5;

volatile byte pulseCount;

float flowRate;
unsignedintflowMilliLitres;
unsigned long totalMilliLitres;

unsigned long oldTime;

void setup()
{

  // Initialize a serial connection for reporting values to the host
  Serial.begin(9600);

  // Set up the status LED line as an output
  pinMode(solenoid, OUTPUT);
  digitalWrite(solenoid, HIGH); // We have an active-low LED attached

  pinMode(sensorPin, INPUT);
  digitalWrite(sensorPin,HIGH);

  pulseCount      = 0;
  flowRate          =0.0;
  flowMilliLitres    =0;
  totalMilliLitres = 0;
  oldTime           = 0;

  // The Hall-effect sensor is connected to pin 2 which uses interrupt 0.
  // Configured to trigger on a FALLING state change (transition from HIGH
  // state to LOW state)
  attachInterrupt(sensorInterrupt, pulseCounter, FALLING);
}

/**
 * Main program loop
 */
void loop()
{

   if((millis() - oldTime)>1000)       // Only process counters once persecond
  {
    // Disable the interrupt while calculating flow rate and sending the value to
    // the host
    detachInterrupt(sensorInterrupt);

    // Because this loop may not complete in exactly 1 second intervals we calculate
    // the number of milliseconds that have passed since the last execution anduse
    // that to scale the output. We also apply the calibrationFactor to scale the output
    // based on the number of pulses per second per units of measure (litres/minute in
    // this case) coming from the sensor.
    flowRate = ((1000.0 / (millis() - oldTime)) * pulseCount) / calibrationFactor;

    // Note the time this processing pass was executed. Note that becausewe've
    // disabled interrupts the millis() function won't actually be incrementing right
    // at this point, but it will still return the value it was set to just before
    // interrupts went away.
    oldTime = millis();

    // Divide the flow rate in litres/minute by 60 to determine how many litres have
    // passed through the sensor in this 1 second interval, then multiply by 1000 to
    // convert to millilitres.
    flowMilliLitres = (flowRate / 60) * 1000;

    // Add the millilitres passed in this second to the cumulative total
    totalMilliLitres += flowMilliLitres;

    unsignedintfrac;

    // Print the flow rate for this second in litres / minute
    //Serial.print("Flow rate: ");
    //Serial.print(int(flowRate)); // Print the integer part of the variable
    //Serial.print(".");              // Print the decimalpoint
    // Determine the fractional part. The 10 multiplier gives us 1 decimal place.
    frac = (flowRate - int(flowRate)) * 10;
    //Serial.print(frac,DEC);         // Print the fractional part of thevariable
    //Serial.print("L/min");
    // Print the number of litres flowed in this second
    //Serial.print("   Current LiquidFlowing:");             // Outputseparator
    //Serial.print(flowMilliLitres);
    //Serial.print("mL/Sec");

    // Print the cumulative total of litres flowed since starting
    //Serial.print("   Output LiquidQuantity:");             // Outputseparator
    //Serial.print(totalMilliLitres);
    if (totalMilliLitres>0)
    {
    Serial.print("UNIT#2#");
    Serial.println(totalMilliLitres);
    }
    //Serial.println("mL");
    totalMilliLitres=0;

    // Reset the pulse counter so we can start incrementing again
    pulseCount = 0;

    // Enable the interrupt again now that we've finished sending output
    attachInterrupt(sensorInterrupt, pulseCounter, FALLING);
  }

  if (Serial.available() >= 4){
    int left = Serial.read();
    int separator = Serial.read();
    int right = Serial.read();
    int space = Serial.read();
    Serial.flush();

    if (left==99)
    {

        digitalWrite(solenoid,LOW); //set pin low

    }

  }
}

/*
Insterrupt Service Routine
 */
voidpulseCounter()
{
  // Increment the pulse counter
  pulseCount++;
}
```

6.3 Circuit ConnectionDiagram

The connection setup for single home

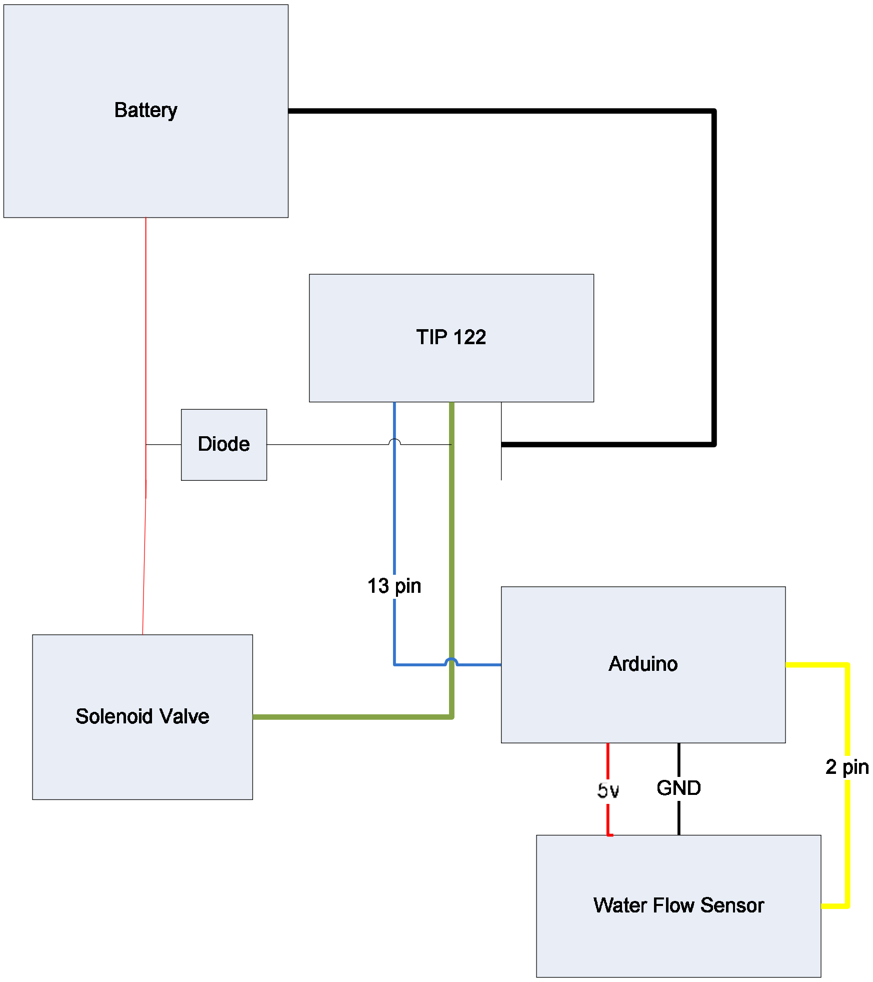


Figure 6.1: Connection setup for single home

The connection setup for 2 home is below

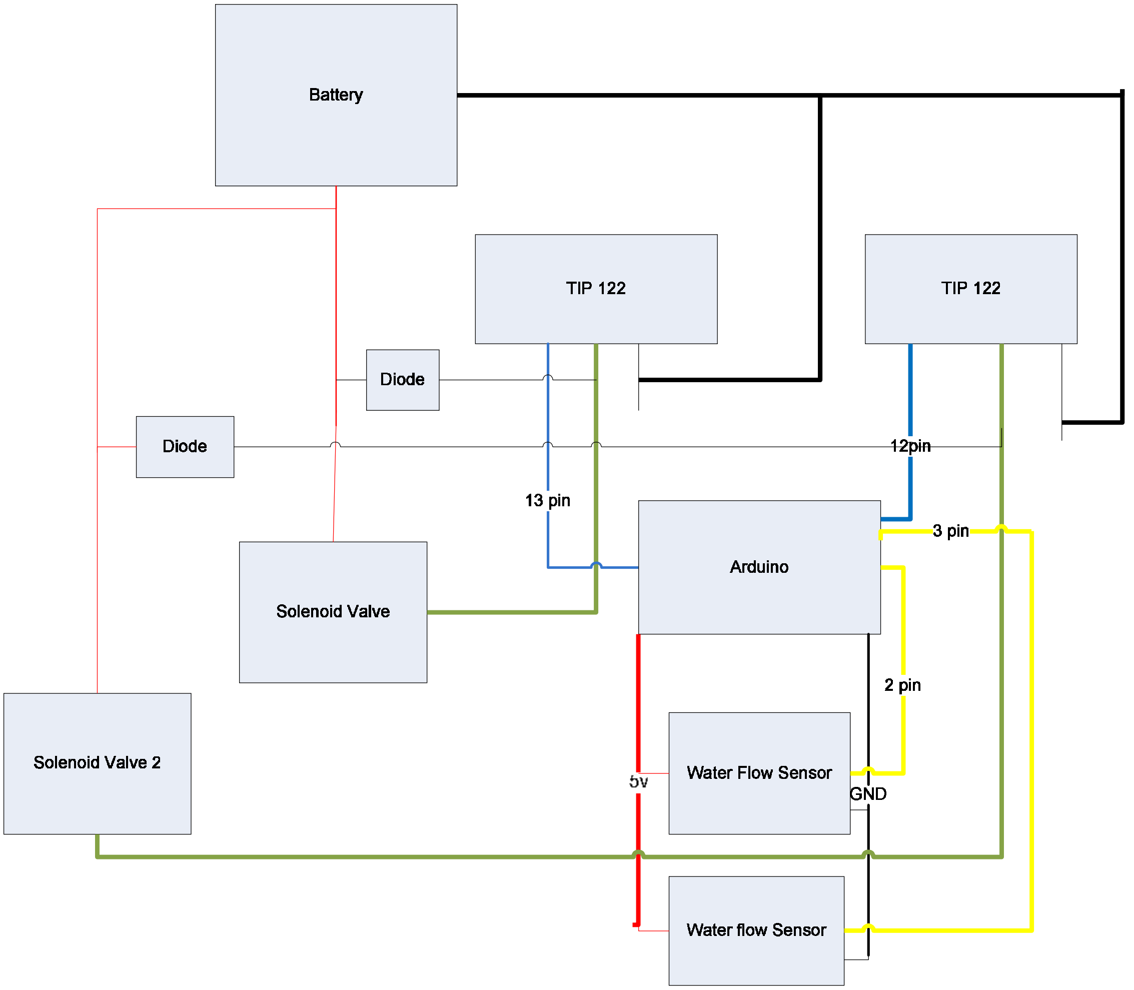


Figure 6.2: - connection setup for 2 home

Chapter 7

TESTING

- Framework testing is really a progression of various tests whose basic role is to completely practice the PC based framework. Albeit each test has an alternate reason, all work to confirm that all the framework components have been appropriately incorporated and perform designated capacities. The testing procedure is really done to ensure that the item precisely does likewise what should do. Testing is the last confirmation and approval movement inside the association itself. In the testing stage taking after objectives are attempted to accomplish:-
- To affirm the quality of theproject.
- To find and eliminate any residual errors from previousstages.
- To validate the software as a solution to the originalproblem.
- To provide operational reliability of thesystem.

During testing the major activities are concentrated on the examination and modification of the sourcecode.

7.1 Unit Testing

Here every module that includes the general framework is tried separately. Unit testingcentres confirmation endeavours even in the littlest unit of programming plan in every module. This is otherwise called "Module Testing". The modules of the framework are tried independently. This testing is completed in the programming style itself. Unit testing practices particular ways in a module's control structure to guarantee finish scope and greatest blunder recognition. This test concentrates on every module exclusively, guaranteeing that it capacities legitimately as a unit. Subsequently, the naming is Unit Testing. In this progression every module is found to work acceptably as respect to the normal yield from the module. This testing is done to check for the individual piece codes for their working. It is done as such that when we do practical testing then the units which are a piece of these functionalities ought to have been tried forworking.

Class	Function	Tests done	Expected Output	Remarks
AdminPanel	addHouseholdSupplyLimit startController viewConsumptionHistory	Check if limit is set and water flow metering is started	Water metering started.	Success
WaterController	setLimit start	Limit is set for supply	Limit is set for supply	Success
FlowSensorMonitor	getConsumpton	Get the volume cosumed	Volume consumed is got	Success
ValveController	setoff setOn	Check is valve is set on and off	Set on and off	Success

7.1 unit testingtable

7.2 Integration

After successful completion of unit testing or module testing, individual functions are integrated into classes. Again integration of different classes takes into place and finally integration of front-end with back-end occurs.

- **Integration of functions intoclasses**

  Toward the begin of coding stage just the capacities required in various parts of the program are created. Each of the capacities is coded and tried freely. After check of accuracy of the diverse capacities, they are coordinated into their separate classes.

- **Integration of differentclasses**

  Here the different classes are tested independently for their functionality. After verification of correctness of outputs after testing each class, they are integrated together and testedagain.

- **Integration of front-end withback-end**

The front-end of the project is developed in Java Swing environment. The user interface is designed to facilitate the user to input various commands to the system and view the system's normal and faulty behaviour and its outputs. The back-end code is then integrated with the GUI andtested.

7.3 IntegrationTesting

Information can be lost crosswise over interface. One module can adversy affect another. Sub capacities when consolidated, ought not decrease the coveted real capacity. Mix testing is a deliberate method for building the program structure. It addresses the issues related with the double issues of check and program development. The principle objective in this testing procedure is to take unit tried modules and manufacture a program structure that has been directed by plan.

After the product has been coordinated, an arrangement of high request tests are directed. Every one of the modules are consolidated and tried all in all. Here revision is troublesome, on the grounds that the disconnection of mistakes is convoluted by the huge breadth of the whole program.

7.3.1 Top down Integration

This strategy is an incremental way to deal with the development of program structure. Modules are coordinated by moving descending, start with the primary program module. Modules that subordinates to the principle program module are consolidated into the structure in either a profundity first or broadness firstway.

7.3.2. Bottom-up Integration

This strategy starts the development and testing with the modules at the most minimal level in the program structure. Since the modules are incorporated from base to up, preparing required for modules subordinate to a given level is constantly accessible. Along these lines for this situation the requirement for stubs is wiped out. The accompanying coordination testing table demonstrates the capacities that were joined into various classes and the class all in all tried for its usefulness. This is vital to check for blunder free association between different classes, and upkeep of informationhonesty.

7.4 Output Testing

After performing the validation testing, the next step is output testing of the proposed system, since no system could be useful if it does not produce the required output in the specified format. Therefore the output testing involves first of all asking the users about the format required by them and then to test the output generated or displayed by the system under consideration. The output format is considered in 2 ways:–

(1) On screen (2) Printedformat

7.4.1 Systemverification

System verification defines the functionality to be tested, how the testing is carried out, its input and output given and to test and test remarks.

Test Case 1:

Setting the Limit and checking if control is done

Input: set the limit on the panel and open water tap

Description: The consumption crossing the supply limit is stopped

ExpectedOutput:Consumptionvaluesfromsensorcollectedandstoredindatabaseandif consumption exceeds supply, the valve isclosed

Actual Output: valve is closed.

Remarks : Success

7.5 User AcceptanceTesting

- Client Acceptance of a framework is the key component to the achievement of any framework. Execution of an acknowledgment test is really the client's show. Client inspirationandinformationarebasicfortheeffectiveexecutionoftheframework.
- The framework under thought is tried for client acknowledgment by continually in contact with the forthcoming framework clients at time of creating and rolling out improvementswhereverrequiredastotheaccompanyingpoint:InputScreendesign
- Output ScreendesignMenu drivensystem

7.5.1 White boxtesting

White box testing (clear box testing, glass box testing, and straightforward box testing or auxiliary testing) utilizes an inner point of view of the framework to configuration test cases in light of inside structure. It requires programming aptitudes to recognize all ways through the product. The analyzer picks experiment contributions to exercise ways through the code and decides the suitable yields. While white box testing is material at the unit, combination and framework levels of the product testing process, it is normally connected to the unit. While it regularly tests ways inside a unit, it can likewise test ways between units amid combination, and between subsystems amid a framework leveltest.

Though this method of test design can uncover an overwhelming number of test cases, it might not detect unimplemented parts of the specification or missing requirements, but one can be sure that all paths through the test object are executed. Using white box testing we can derive test casesthat:

- Guarantee that all independent paths within a module have been exercised at least once.
- Exercise all logical decisions on their true and falsesides.
- Execute all loops at their boundaries and within their operationalbounds.
- Execute internal data structure to assure theirvalidity

7.5.2 Black boxtesting

- Discovery testing centers around the utilitarian necessities of the product. It is otherwise called useful testing. It is a product testing system whereby the interior workings of the thing being tried are not known by the analyzer. For instance, in a discovery test on programming outline the analyzer just knows the data sources and whatthenormalresultsoughttobeandnothowtheprogramlandsatthoseyields.

- The analyzer does not ever look at the programming code and does not require any further information of the program other than its details. It empowers us to infer sets of information conditions that will completely practice every single useful necessity for a program. Discovery testing is a contrasting option to white box method.Or maybe it is a reciprocal approach that is probably going to reveal an alternate class of blunders in the accompanying classifications:-Incorrect or missing function.

- Interfaceerrors.
- Performanceerrors.
- Initialization and terminationerrors.
- Errors inobjects.

Advantages

- The test is unbiased as the designer and the testerare independent of each other.
- The tester does not need knowledge of any specific programminglanguages.
- The test is done from the point of view of the user, not thedesigner.
- Test cases can be designed as soon as the specifications arecomplete.

7.6 Preparation of Test Data

Planning of test information assumes an imperative part in the framework testing. Subsequent to setting up the test information, the framework under review is tried utilizing that test information. While testing the framework by utilizing test information, mistakes are again revealed and remedied by utilizing above testing steps and amendments are additionally noted for sometimelater.

7.6.1 Using Live TestData

Live test information are those that are really extricated from association records. After a framework is in part developed, software engineers or experts regularly approach clients to propose information for test from their typical exercises. At that point, the frameworks individual uses this information as an approach to somewhat test the framework. In different occasions, developers or investigators remove an arrangement of live information from the documents that they have entered themselves.

It is hard to get live information in adequate adds up to lead broad testing and in spite of the fact that the sensible information that will demonstrate how the framework will perform for the run of the mill handling prerequisite. Expecting that the live information entered are in actuality commonplace; such information for the most part won't test all mixes or arrangements that can enter the framework. This predisposition toward average esteems then does not give a genuine framework test and in actuality overlooks the cases well on the way to bring about frameworkdisappointment.

7.6.2 Using Artificial Test Data

Counterfeit test information are made exclusively for test purposes, since they can be created to test all blends of arrangements and qualities. At the end of the day, the simulated information, which can rapidly be set up by an information producing utility program in the data frameworks division, make conceivable the testing of all login and control ways through theprogram.

The best test programs utilize simulated test information produced by people other than the individuals who composed the projects. Regularly, an autonomous group of analyzers figures a testing arrangement, utilizing the frameworksdeterminations.

7.7 QualityAssurance

- Quality confirmation comprises of the evaluating and announcing elements of administration. The objective of value confirmation is to give administration the information important to be educated about item quality, in this manner picking up knowledge and sure that the item quality is meeting its objectives. This is an "umbrella action" that is connected all through the building procedure. Programming quality affirmationincorporates:-
- Analysis, design, coding and testing methods andtools
- Formal technical reviews that are applied during each softwareengineering
- Multiread testingstrategy
- Control of software documentation and the change made toit.
- A procedure to ensure compliance with software developmentstandards.
- Measurement and reportingmechanisms.

7.7.1 QualityFactors

An important objective of quality assurance is to track the software quality and assess the impact of methodological and procedural changes on improved software quality. The factors that affect the quality can be categorized into two broadgroups:

- ✓ Factors that can be directlymeasured.
- ✓ Factors that can be indirectlymeasured

These factors focus on three important aspects of a software product

- Its operationalcharacteristics
- Its ability to undergochanges
- Its adaptability to a newenvironment.
- Effectiveness or efficiency in performing itsmission
- Duration of its use by itscustomer.

7.7.2 Generic Risks

A risk is an unwanted event that has negative consequences. We can distinguish risks from other project events by looking for three things:

- A loss associated with theevent.
- The likelihood that the event willoccur.
- The degree to which we can change theoutcome

The generic risks such as the product size risk, business impact risks, customer related risks, process risks, technology risks, development environment risks, security risks etc. This project is developed by considering all these important issues.

7.7.3 Security Technologies &Policies

The software quality assurance is comprised of a variety of tasks associated with seven majoractivities:-

- Application of technicalmethods.
- Conduct of formal technicalreviews
- Softwaretesting
- Enforcement ofstandards

- Control ofchange
- Measurement
- Record keeping andreporting

Summary

This section manages a few sorts of testing, for example, unit testing which is a strategy for testing the precise working of a specific module of the source code. It is additionally alluded to as module testing. It additionally gives a short insight about various types of mix testing in which singular programming modules are consolidated and tried as agathering.

Chapter 8

EXPECTED RESULT AND PERFORMANCE ANALYSIS

The following snapshots define the results or outputs that we will get after step by step execution of all the modules of thesystem.

Starting the Smart Meter server

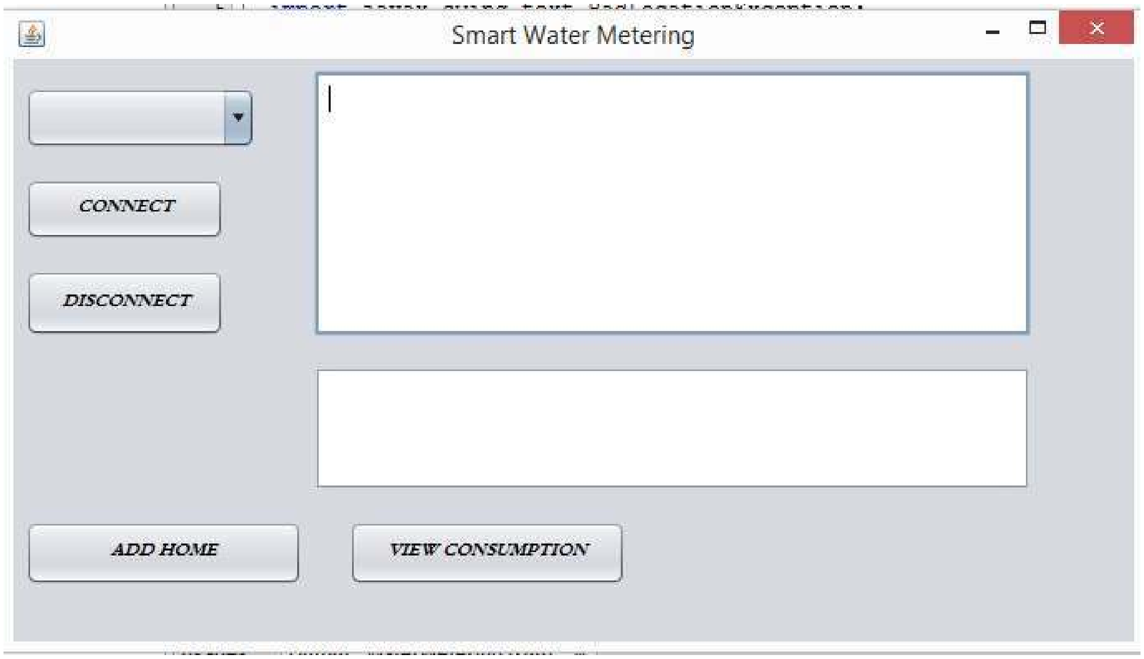
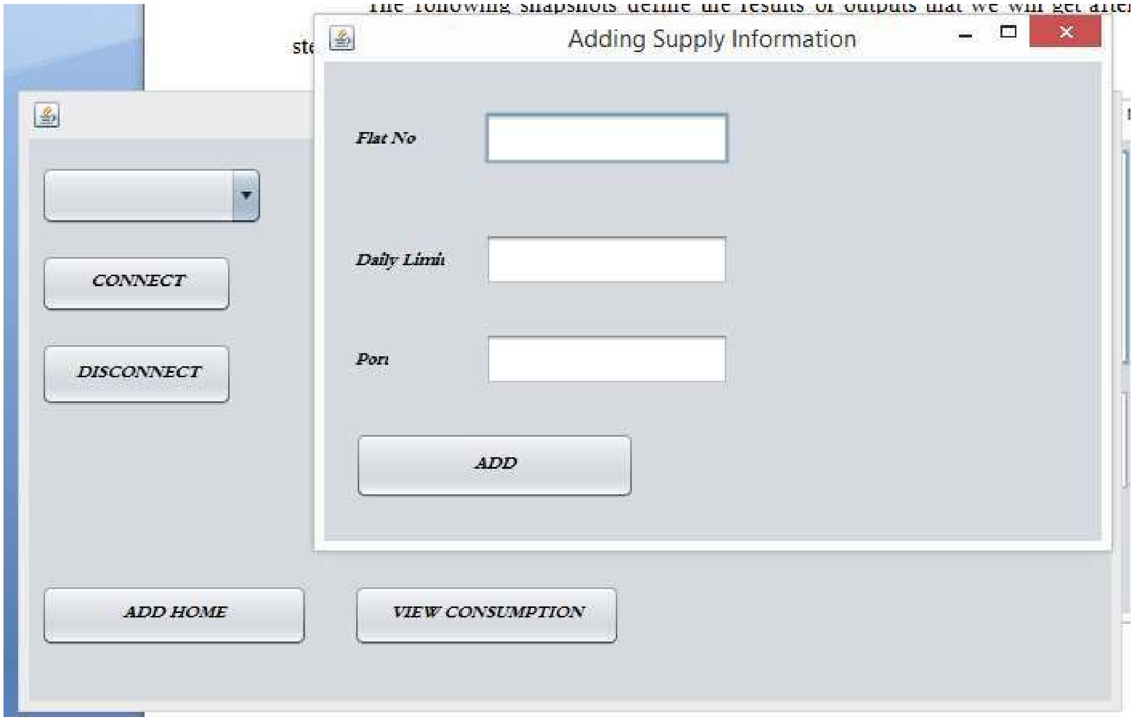
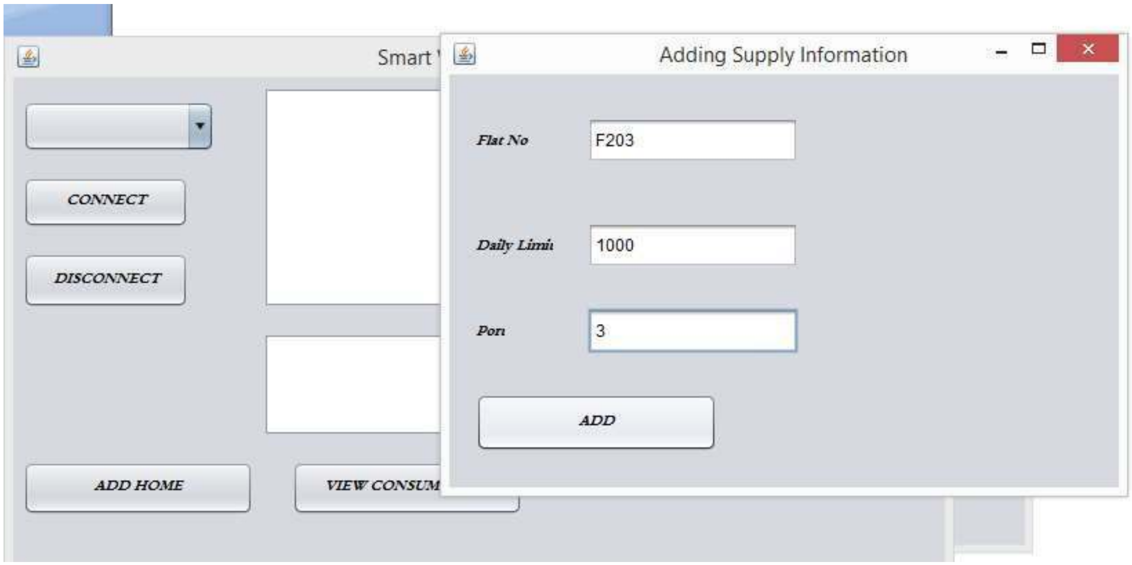


Figure 8.1: control panel for adding home

Adding the supply


The following snapshots define the results or outputs that we will get after
ste
Adding Supply Information
Flat No
Daily Limit
Port
ADD
CONNECT
DISCONNECT
ADD HOME
VIEW CONSUMPTION

Adding the supply



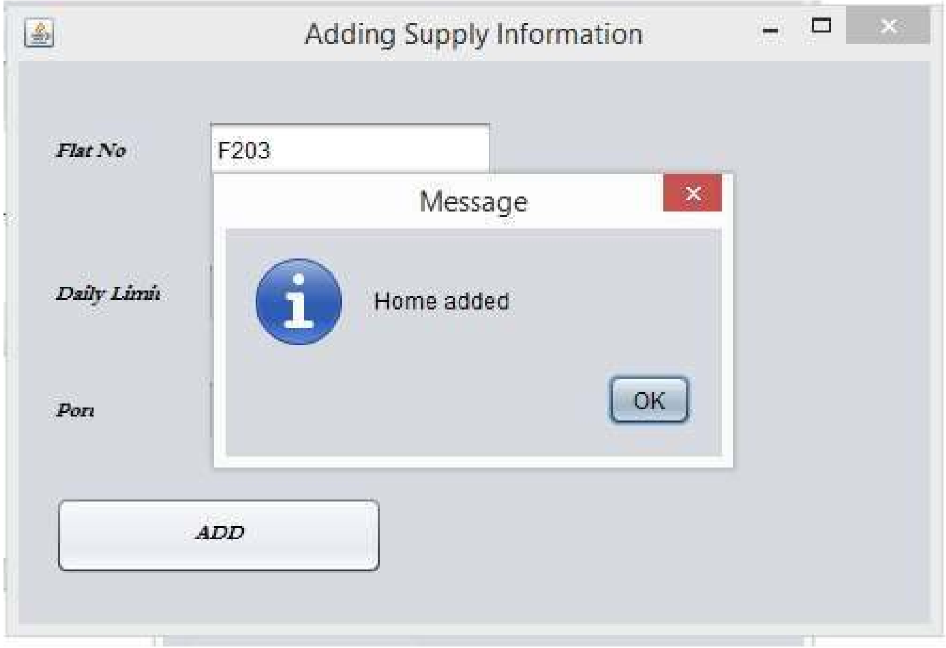
Flat No F203

Daily Limit 1000

Port 3

Figure 8.2: UI for Adding the supply

Home is added



Adding Supply Information

Flat No: F203

Message

Home added

Figure 8.3: Home added confirmation

View the consumption

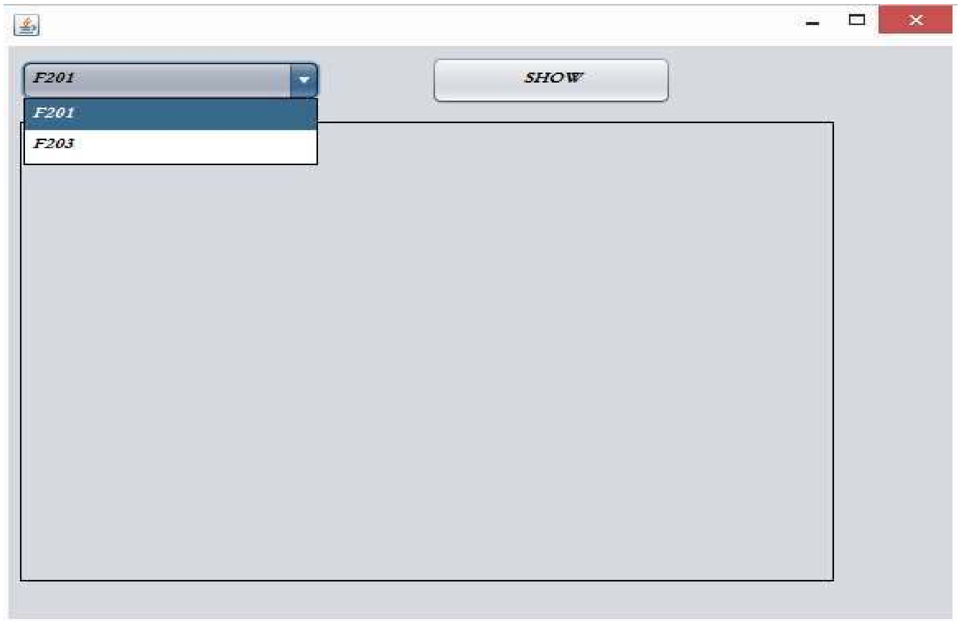


Figure 8.4: UI for viewing the consumption

The consumption is shown as graph

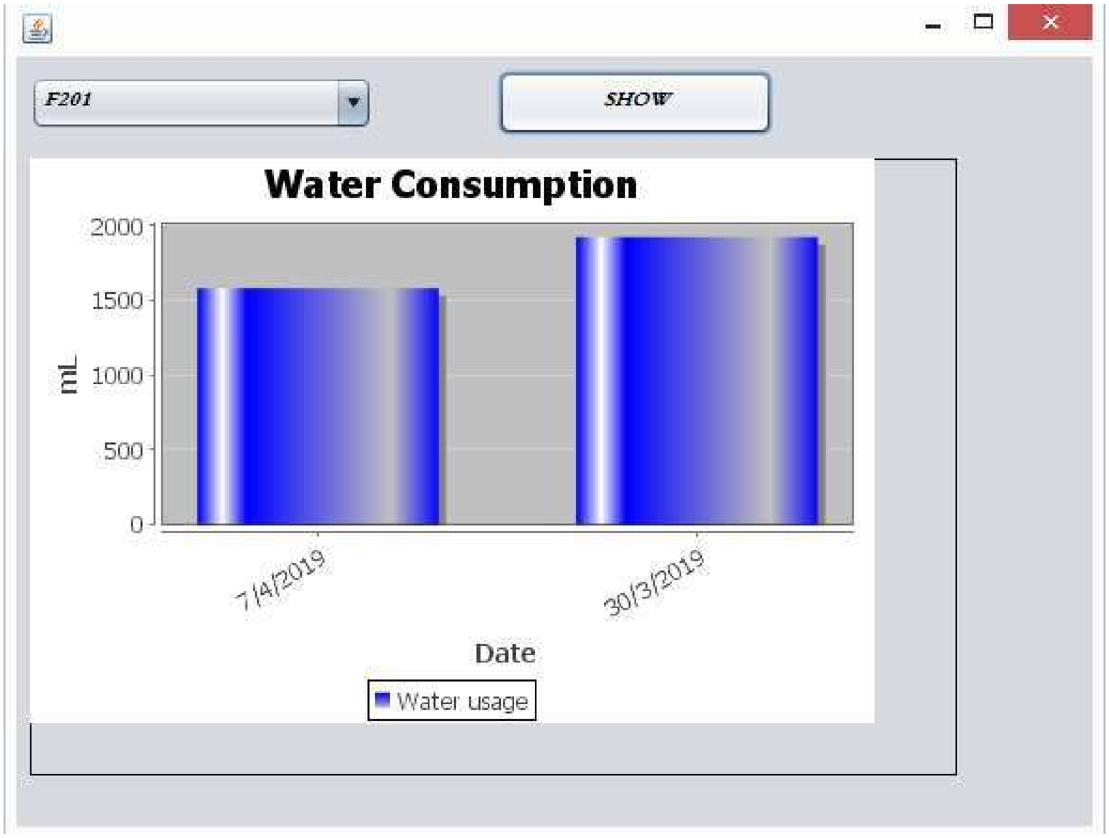


Figure 8.5: Graphical representation of consumption

Chapter 9

CONCLUSION AND FUTURE SCOPE

We have implemented system to control the water flow for households. The system has a admin panel to add home supply and set the daily limit. The supply is monitored using sensor and when the supply exceeds the threshold, the supply is cut off. Due to this system, the water wastage is avoided. As future work we can integrate billing and sending timely notification to pay thebills.

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