SMART WATER MANAGEMENT SYSTEM USING IOT

WATER LEAKAGE DETECTION

SYSTEM ANALYSIS:

The data used for the project was collected from a housing complex having 16 households. The height of the water tank as well as the requirement of the household plays an important role in determining the working of the whole process of start ing and stopping the motor. The water tanks installed were Syntax 1,000 L tanks having 109.98 cm radius and 122.43 cm height. There was no inflow of water in the tanks at the time of monitoring. The tank system is as shown infollowing figure1.1.

Fig:1.1

WORKING OF ULTRASONIC SENSOR

The Arduino kit including the UV sensor was installed on the top of one of the two tanks, to monitor the water level after every 10 seconds. This ultrasonic sensor sends UV rays to measure the distance of water level from the top of the

tank using SONAR. The sensor sends the ultrasonic waves to water level, which is reflected by the water surface and comes back to the ultrasonic sensor. Sensor uses this time of wave propagation to calculate the distance between the sensor and the water level. Time taken by the pulse is actually to and fro for travel of the ultrasonic signals, while only half of this is needed. Therefore, the time is time /2.

DISTANCE CALCULATION

Distance ¼ speed*time/2
Speed of sound at sea level ¼ 343 m/s or 34,300 cm/s
Thus the distance measured ¼ 17150* time (unit cm) Boyle et al.
With the help of that distance, the water level and hence the volume of water consumed can be calculated since the height and radius of the tank are fixed.

WORKING WIFI MODULE

The Wi-Fi module can connect to internet via hotspot by using its SSID and Password. It has been programmed to implement logic statements as per requirements of the pro ject. The ultrasonic sensor reads the distance of water surface and returns it to the module. The module, when con nected to internet, uploads this value to the database. The water level to be monitored for each tank is collected by the ultrasonic sensor and simultaneously the data collected is shifted to the server via ESP12-e

DATA ANALYTICS

Feature space and response variables We have considered the following parameters in defining the feature space for the SVM algorithm: (a) Volume of water consumed (cu cm), (b) Number of users, (c) Temperature (C) and (d) Precipitation (mm).

The response variables for SVM consist of: (a) Average Water Consumption per user per day and (b) Prediction of Water Consumption per user per day. The algorithm for leakage detection considered the following parameters: (a) Input variables are Water Level Initial, Water Level Final and In Use. (b) Response Variables include Leakage detected (yes/No) and Leakage Rate (cubic cm/sec). SVM based classification SVM has been used for analysis purposes, since it is highly accurate and the preferred method for data sets with small size [Ray]. SVM is also less prone to over fitting than other methods and facilitates compact model for classification. Kernel Function, radial basis function (RBF) is used since the data is not linearly separable [Ng] and is the most commonly used kernel in support vector machines. Finally, the optimal hyper-plane is found, which makes maximum empty spaces at two sides of coordinate.

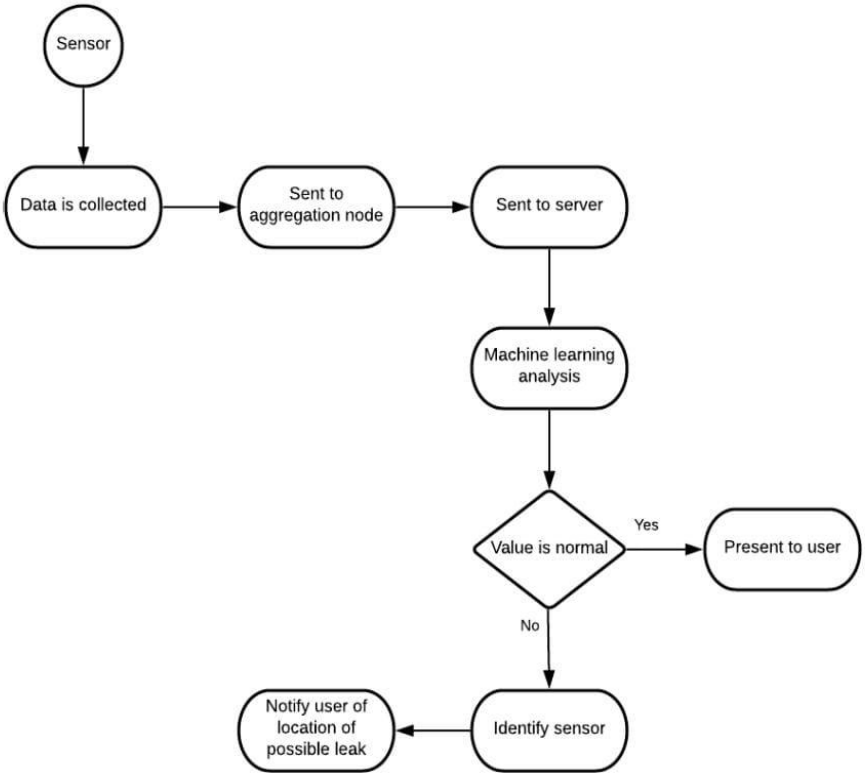

Fig1.2.system logic

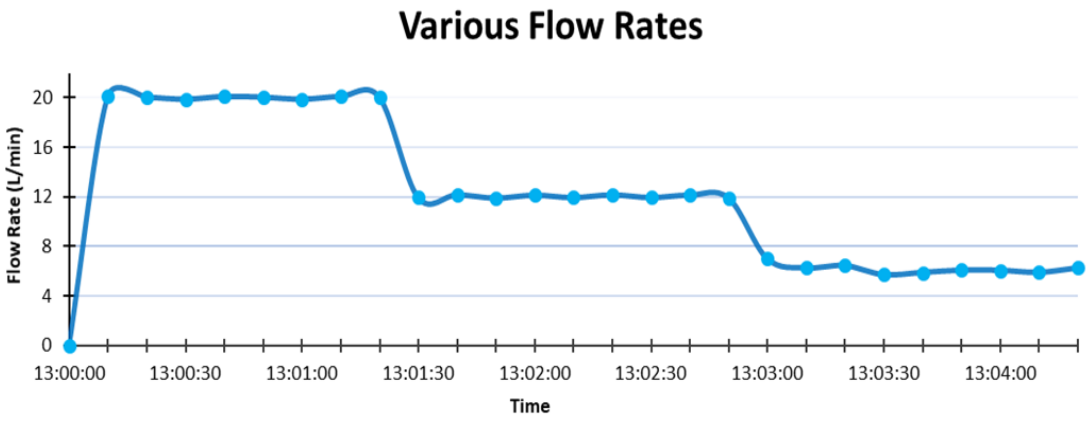

Fig1.3Graph of water flow rate at various conditions.

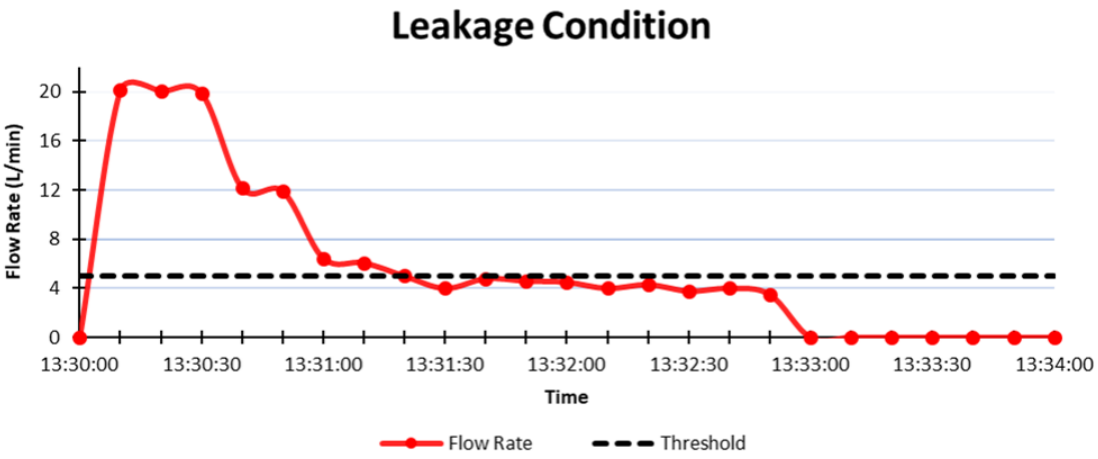

Fig 1.4. Graph of the leakage condition