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IoT based retail automation of fuel station and alert system

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IoT based retail automation of fuel station and alert system

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Abstract In this new era everyday life is filled with technology from the start up till to bed. In olden days people mostly worked within circle or walkable distance but now the technology developing day by day to reduce the work as well as time taken by work to complete.Thestuff's in our daily process, somehow we left some lot of work due to lack of time. In today's life most probably utmost 50% of products all came with automation and making theconsumers/users to access those products from anywhere by using their mobile or gadgets. In this paper, it deals with automation of fuel station retail outlet; this system will give the sales and stock report to the owner for every hour. The main problem is customer complaints about less quantityof fuel is issued or filled for money given and customers get diverted theirs attention by operators and refill the fuel without they resetting the nozzle. Nowadays to overcome these problems they replaced some electronic and computerised fuel dispensers but there is no way to identify inside the rotary valve adjustments by fitter.

1. Introduction

The internet of things is the fastest growing platform nowadays for connecting all hardware modules like (sensors, electronics, devices etc.) together and embedded those with software making our own creative devices applications. With the help of this technology we create the web application that make view of values of temperature, density, moisture and light level of lamp status and also download the report of sales.This thesis makes us to the fuel retail outlet owners to make a service easier and to take a look at current status of stock easily with in his place. This application the users agency owners check the past sales record, stock of the fuel and sales of that day. When the users log into theapplication with the company provided credentials to access their portal. Once they logged in they can access or check the current stock, temperature of the liquid/fuel. Then at service level and makes reduce of the fuel theft from the customer. We improved a security for the fuel calibration unit in pump. For accessing the e-calibration unit we need a special permission from the regional officer by making a phone call. We make a step forward to increase its security level by accessing the e-calibration unit request an OTP to access. Once the OTP request is generated by giving the pump

service engineer registered mobile no and then OTP is generated and send a copy to the pump service engineer registered e-mail.

2. Literature Study

In [1], Priyaranjan Mishra *et al.* works had been carried out in many papers regarding the fuel station and embedded system, we has been selected as a reference for our proposed system.The power shutdown is major problem nowadays in India, it could be 2 hrs in normal days and during summer it increase 2 to 4 hrs. In urban area it may be 4 to 8 hrs a day. In the fuel station this is major problem so they used diesel generators (DG) to compensate it for a short period but it may increase using DG will be a non-profit for them. And this makes huge impact in sales as well as profit for them, to avoid like this interruption solar panels are used for backup purpose. This makes huge investment at beginning stage and compares with DG after years this make huge amount to owners at last. They used dc grid based for fuel station to reduce cost wastage and implementation based on Sid.

In [2], Shiu Kit Tso *et al.*discuss the future revolution has fuel as diesel, petrol in this lane gas is used as fuel for transportation and then this refilling of fuel to the vehicles on highways is made automatic by this paper.in this paper the automatic vehicles will definitely need an automatic fuel refilling mechanism. So the automatic refilling in fuel station will be handled by robots by this paper so that it reduces money, personnel and increase security and safety.

In [3],Sedhumadhavan.S*et al.* Implemented the automation of home and accessing the door lock from the gadgets like mobile phone, tablets etc. The door in third floor is unlocked and if the person in the ground floor in this scenario he wants to go to third floor and lock the door.to avoid the waste of energy and time this system gives a way.by the mobile the user will unlock and lock the door from his place itself using Wi-Fi connection. The application will send the requests to lock and unlock the door through Wi-Fi and controls the servo meter.

In [4],Yu Zhang*et al.*describes about the continuous analyse of temperature through nrf9e5 to reduce the power consumption .the temperature sensor ds18b20 is used to monitor the temperature values and nrf9e5 is used for wireless transmission of temperature values. The front end is nrf9e5 is used and for backend the computer is used.

In [5], the OTP is main theme for this thesis, the OTP one time password is used for authentication purpose nowadays and this gives the method generating otp.in most of the organization like banking, account login the static password are used till now due to this the hackers may steal the passwords easily. This paper shows the dynamic way password use by OTP and describes about the generating technique of OTP with linear functions which gives high level security to the user.

3. Design Methodology

In this thesis the user can access the current status of the fuel station as well as the stock maintenance through the web application. Through this we can utilize time in efficient manner and man power also and then this proposed system is designed to add a security for the e-calibration unit in the fuel pump. The entrepreneur or company will make reduce of work and paper work by utilizing this application and owner who needs daily data of his fuel station and company needs to track every fuel stations

status in their region or beyond. The main thing if they want to do any pump related repairs without knowledge of regional officer is not possible by this method. Once the retail outlet workers or a pump mechanics wants to enter into calibration mode they are prompt to give their registered mobile no for verification and OTP request is forward to main server if given mechanic credential is valid. After that request OTP to mechanic to enter into the calibration mode.

3.1. System design

The proposed system which includes a windows application as user interface, a cloud database to store and retrieved data's, the product which The architecture and the data flow of the system components are given below.
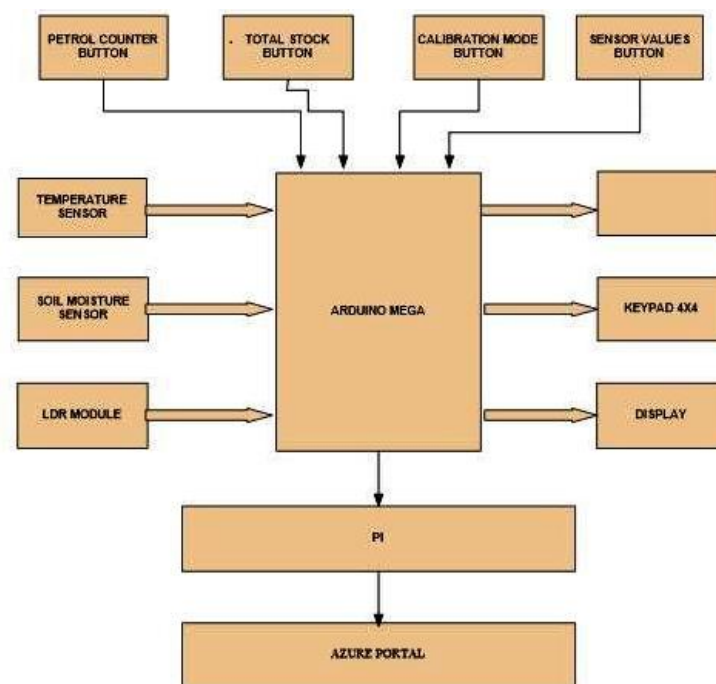

Figure 1. Architecture Diagram

Figure 1 that shows the architecture of the system which describes the components used.
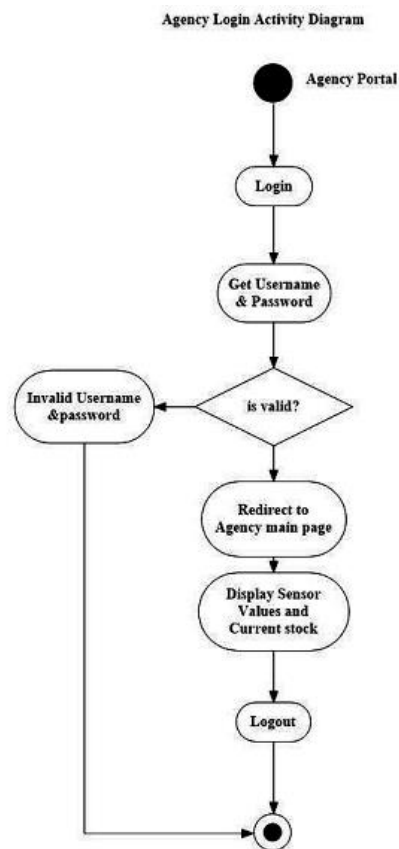
Figure 2. Flow Diagram-Agency Login Mode.

The Figure 2 Where the dealer has tends to login his portal and what are the backend and frontend process and iteration for the login process. The work flow shows the page load, services provided and sensor values.

The Figure 3This activity process which shows work flow of mobile number verification, OTP generation, email establishment and OTP verification.
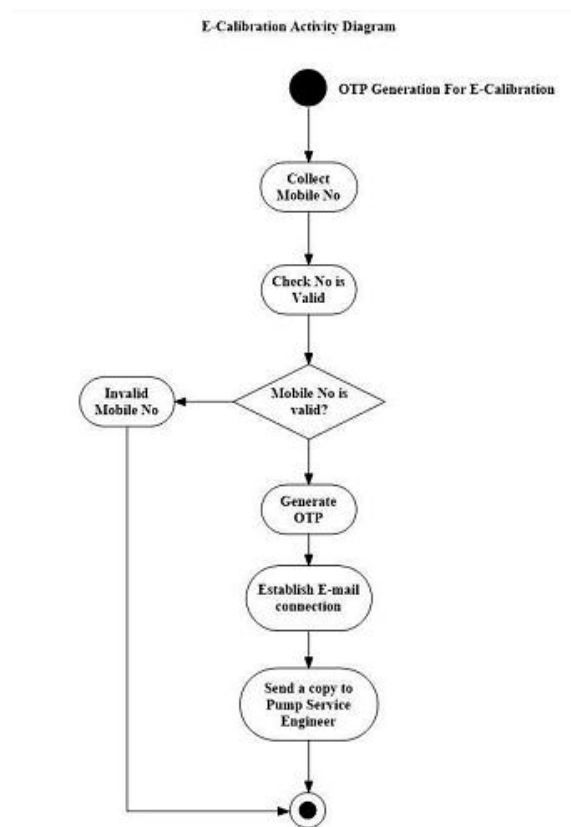
Figure 3. Flow Diagram-E-Calibration Mode

3.2 Prototype Implementation of the Proposed System

A software requirement is like brain for their mechanical devices which has hardware components. Those would be control through the instructions given by software from the programmers. Their use in this scope takes control of login data's, sensor data's, and some commands to take control of some particular devices. The product has been designed based on the user requirements here the product must have to get the sensor data's from the sensor by Arduino and sends those collected data to pi. Then using software language of our need we use python programming language code for a data's to be processed between pi and azure portal. The software prototype of this web application created using Html, C#, .Net and Visual studio. The screenshots of those web application and results attached in this section.
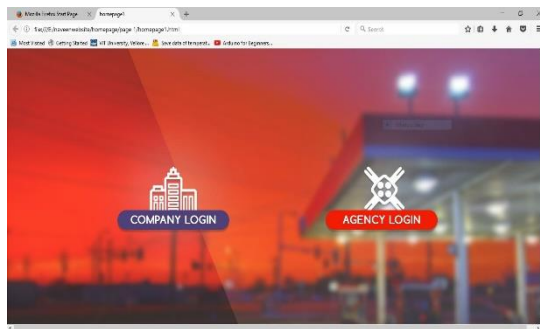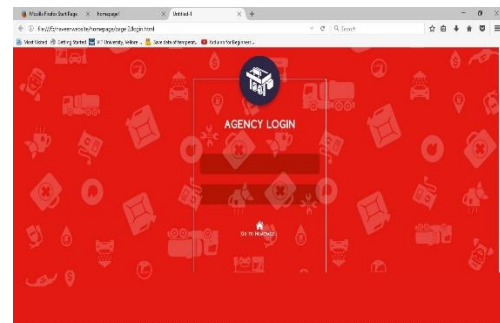
Figure 4. Agency Portal

Figure 5. Agency Login
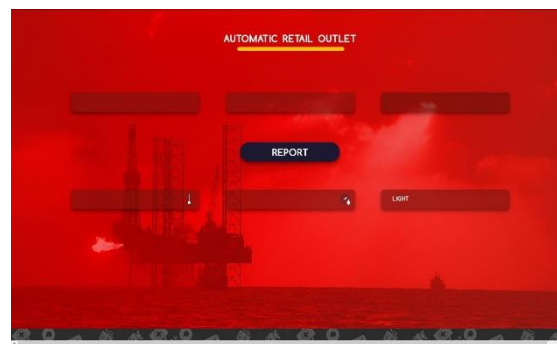
Figure 6. Agency Main Page

3.3 Database Design

We need of database to maintain data's in secure and safe at now we don't have a access to company database. So I created a database as shown below.

Table 1. Login Database

Field Name	Type	Description
Usrnme	varcar(20)	No
Otp	Varchar(20)	No

Table 2. OTP Database

Field Name	Type	Description
Name	varchar(20)	No

Mobile	varchar(20)	No
Email	Varchar(50)	No
Otp	Varchar(20)	No

Table 3. Sensor Value Database

Field Name	Type	Description
Id	Int	Primary key, Clustered :Id
Temp	Varchar(50)	No
Moist	Varchar(50)	No
Ldr	Varchar(50)	No

4. OTP Generation method

One Time Password is great idea to avoid illegal activities of accessing our accounts without our permission and getting our credentials without our knowledge. It's more important advantage is it is a static passwords so they are vulnerable for replay attacks.it generate alphanumeric or numeric string which the user can able to access or to authenticate only one time or session.The pocket-size otp tokens that displays alpha numeric or numeric strings. The user may need to enter his user id to generate otp because some had difficult to memorise those passwords and in some case we are using many accounts that time we cannot create unique passwords for all.so 55% of users in the world they are same password al their accounts, 26% set their passwords as their pet name, nick name, special dates, etc. Later password manager software were came up in market to maintain the passwords of all the accounts in that they can safe theirs password by using one master password. However those software's can also be hacked if they bypass that they can easily get all our stuffs.to restrict this and make user friendly accessing at same time more secure otp was developed. We can receive otp by registered mobile number, propriety tokens, hard copy or through email. In this type of otp generation time is main priority device because the password which generates based on time synchronization.in the device which has clock inbuilt in it that generates password continuously.

4.1 Algorithm

This method use pseudo random numbers for generation of otp and they used lot of difficult formulas and make sure about the repeating will generate an OTP using numbers within 1 to 10, the number

which choose for first time it take i as zero. Where 7 it multiplied by i and divide the answer with 11.then the remainder will be taken as outcome.

```
random i = 7 * i `mod` 11
```

Figure 7. Formula for random number.

```
random  1 ->   7
random  7 ->   5
random  5 ->   2
random  2 ->   3
random  3 ->  10
random 10 ->   4
```

Figure 8. Result of random number

The before process would give an answer between 0 and 10,so it's not beyond 10 because of divide of 11.the answer I'll get is not multiply of 11 because 11 is prime no.If we want answer between 0 and 100 means same formula just divide the answer with 101 this give an answer within 100 only.

```
random i = (j, ans)

    where j   = 7 * i `mod` 101

          ans = (j - 1) `mod` 10 + 1  -- just the ones place, but 0 means 10
```

Figure 9. Formula for random number within 100

```
random  1 -> ( 7,  7)
random  7 -> (49,  9)
random 49 -> (40, 10)
random 40 -> (78,  8)
random 78 -> (41,  1)
random 41 -> (85,  5)
```

Figure 10. Result for random number within 100

5. Results

The Product was designed and checked its working process by collecting their data's and accessing their functions. The working stills and their data's which are stored in database was pictured and enclosed.

Figure 11. Sensor values display.

Figure 12. Calibration mode display.

Figure 13. Requesting OTP

Figure 14. Exterior setup

6. Conclusion

The main theme of this thesis is key way for making smarter by make utilize of well growing IoT platform and information and communication technology ICT to reduce the work and energy as well as security aspects in fuel station. The login credentials which given by the user is validated and forward to agency main page. The agency main web page contains full details of the fuel station like the controls, stock and current readings. Authorized dealer need not worry about status of the fuel station if he is not in station. At security aspects by this we can stop the fuel theft in fuel station by labours or owners. The service engineer should has to request a OTP if he wants to repair any pump by his registered mobile no, so the security level has been increased by this proposed idea.In this technical world, all the gadgets and devices has been converted into IoT enabled devices by get their data's and analyse easily using IoT platform with the help of information and communication technology.by this method of gadgets the time as well as work will be reduce and it will make some more money to save.

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