

The Design of IoT Water Control System

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Abstract— Wastage of water is a bad practice for every human being on earth. The features of the water wastage feature can be divided into several types. Examples of the types are wastage at home, domestic wastage and wastage from the industry. In this study, domestic wastage is a priority because the problem was contributed to a reduction of water percentage in the watershed, whether at home or at the water plant. This should be resolved in the right way to avoid it occurring continuously. In this case, one way to take is to build an application called the Water Control System. This application is capable of detecting open pipes due to negligence or certain reasons. The purpose of this study is to give the easier solution to solve the wastage of water problem and provide information about how to solving it. This system will give benefit not only to domestic user or household, but also toward the industry that use a lot of water for their daily requirement. Hope that this study will help a lot by identify the problem and provide for the solution to user.

Index Terms—IoT, raspberry pi, water control system, sensor

I. INTRODUCTION

NOWADAYS, water is very important thing for daily life usage such for bathing, washing, drinking and much more. Water sources are very important to humans because it is to maintain population. Without the proper usage of water, it would be wasted and human beings will be greatly affected and can lead to global water crisis. The impact of continuous wastage of water can result in drought due to uncontrolled wastage. This is because 65% of the human body consists of water.

Unplanned and wasteful use of water is an irresponsible act and attitude. This is because water is very important and very limited source. Only less than 1% of the clean water available on this earth. The constant impact of wastage water will result in wastage of money paying large water bills, causing the amount of water in catchment areas in at the water plants will be decrease rapidly especially during the dry season. In addition, it will also reduce water pressure to be distributed to every residential and adverse effects in the future is the wasteful attitude will be followed by children who someday will be a new generation.

The water control system is proposed based on IoT which use android applications that provide help to household users to control pipes from outside the home area. It is helpful in reducing the amount of energy and money compared to the

manual method. By using this application, a way to close the open water pipes at home will be easy and can also find out how often this problem occurs by looking at the history of the application. The purpose of the design is to serve several objectives as below:

- To monitoring and to control water outflow using android application from everywhere and anytime.
- To prevent wastage of water at home when water is not used in proper way.
- To notify user when the device detect an open water pipe.

A. Raspberry Pi

The Raspberry Pi is low cost computer that is small in size, and uses a standard keyboard and mouse. It is capable to do everything because it is suitable for all ages and enabled user to explore about computing. The raspberry pi created in February 2012 by the Raspberry Pi Foundation. This device have multi-function purpose and capabilities where user just need to think any innovation or new idea and implementing it on raspberry pi.

First and foremost, the operating system (OS) is required to boot the raspberry pi. In this project, raspbian have been chosen because raspbian is the best OS for the Pi 3 according to the research information. The raspberry pi consist of the micro USB power, HDMI, micro SD slot, Ethernet and display port, CPU and GPIO pins. USB power supply is used to supply the raspberry board and with the help of SD card it can store mass storage to boot the raspbian. Next, HDMI is used to display the user interface for the Linux OS. The function of Ethernet port is to connect the raspberry pi to the network area. Then, the GPIO of the raspberry can receive input from water detection sensor and sent the output data to mobile application through a network. Depending upon the users command the water pipe will be switched off after the command have been made [2].

B. Water Sensor

Water sensor is an electronic device designed to detect the presence of water and also provide a warning in time to enable the prevention of water leaks. A basic design of water sensor is made up from small cable or flat copper that having series of parallel wires exposed traces. The water sensor have a weak

pull-up resistor of 1MΩ. The resistor will pull the value of sensor to the high until the drop of water shorts the sensor trace to the grounded trace. In this system, water sensor will be install at the pipe nozzle. When the sensor detect the water presence, it will give the output high to the raspberry.

C. PIR Sensor

Passive infrared sensor (PIR sensor) is an electronic sensor that used to measure the radiation of light from an object in a field range. In this project, PIR sensor is used to sense the movement of people or existing of them near the water pipe. PIR consist of pyroelectric energy that produce energy when expose to heat, if human or animal body in the field range of the sensor it will take the movement because they emit heat energy in the form of infrared radiation. The term passive word means that the sensor not using any energy for detecting purpose, it just work detecting the energy given of by the other object. The module also consist a special design cover names fresnel lens which focus the infrared signal onto pyroelectric sensor.

II. METHOD

The methodology that have been used in this project is agile because it can anticipates change and allows for much flexibility than traditional methods. Besides, agile is easy to manage and client can make change without huge amendments to the budget or schedule. Another approach used in this project is database life cycle which overall have five stages consist of requirement, logical design, physical design, implementation and monitoring, modification & maintenance.

The first stage is requirement analysis which is most important stage in the database life cycle [1]. This stages involves assessing the informational and all data to be store in database and the function so one can need via those database to satisfy consumer necessities. Next stages is the logical design, during this stage a conceptual model is created based on the needs assessment performed in stage one. An entity-relationship diagram typically show the tables, field and primary keys of the database and table that are related (linked) to one another. The tables sketched in the ER diagram are then normalizes. The normalization process resolves any problem associated with the database design to make data could be accessed quickly and efficiently.

The third stage is physical design that only have on purpose which to make maximize database efficiency. That means it will finding ways to raise up the performance of the RDBMS. Manipulating database design element can raise up the two slowest operation in an RDBMS which retrieving data from and writing data to a database. The fourth stages is implementing stage. During the implementing stage, the programming phase will be done after fulfilling with the logical and physical design stage. The last stage is the monitoring, where all the stage have successfully implemented with the properly functioning and it is secure from unauthorized access.

The modification will be implement if the user requirement are need to change their informational data in database, and the monitoring will be observed from time to time to ensure that database are greatly perform. The figure below show the flowchart of the proposed design.

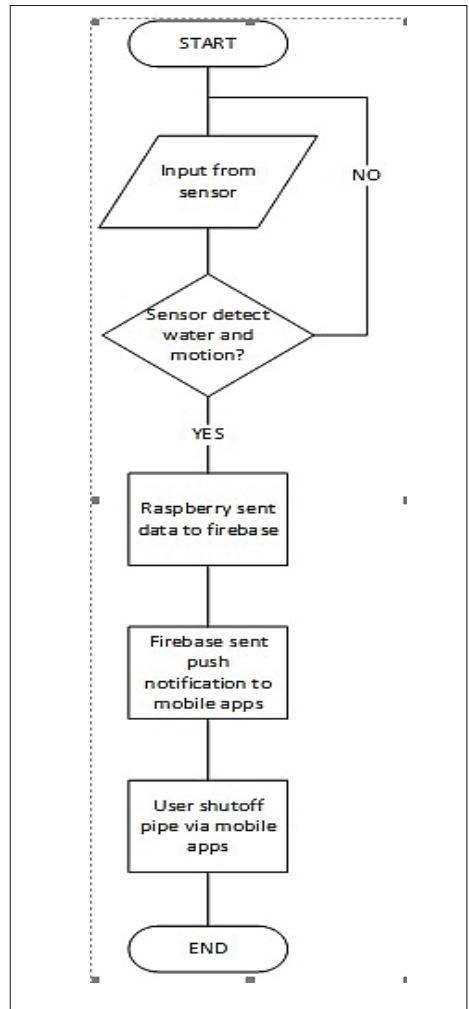


Figure 1. The flowchart for the IoT Water Control System

A. Interface Design

There are three main user interfaces which are login (Figure 2) and register, home page which list all the rooms registered (Figure 3) and history page (Figure 4). User need to register to use the Water Control System using their mobile phone. Initially user need to sign in with email and password to use the application. Home page will allow user to add all the pipes available in the house and display the details of description of each whether the pipe running or not. If the pipe is running, there is a button to switch off the pipe. This page display detail about pipe where it include open pipe time and close time. Then, user will know how much time the pipe have been controlled with this record.

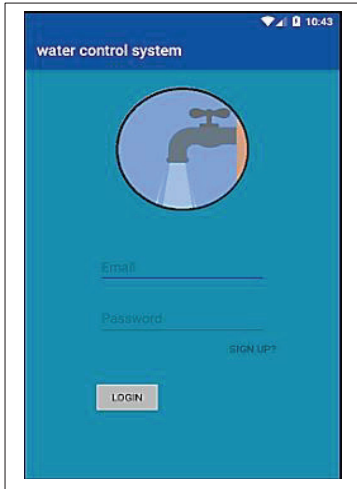


Fig. 2. Login interface

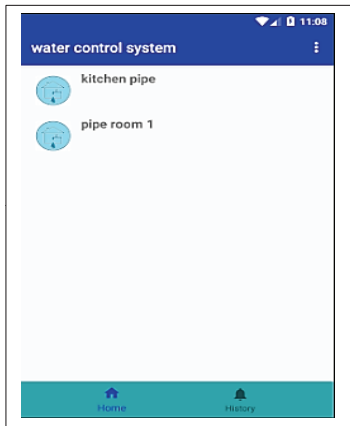


Fig. 3. List of rooms

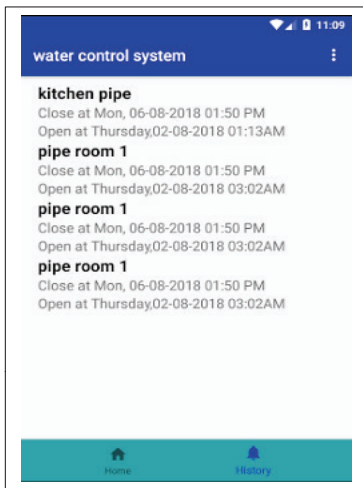


Fig. 4. History report

III. DISCUSSIONS

The proposed framework and interface design has several findings.

- Simple design

The developed system interfaces are easy and simple as it is designed to ease every level of users to make them also easy to understand for whole system flow.

- Enhance daily routine life with IoT technology

IoT innovation is being utilized to build up the framework. This innovation enable user to use automation system like water controlling with little effort cost. Also the low overhead cost bear by the user.

- User friendly

This framework is easy to understand to utilize as this framework is clear. If the client commits an error when utilizing this framework, the framework will inform the client what botth that they have done.

IV. CONCLUSION

For any application or framework that has been produced for a specific reason, there must be both quality and shortcomings. The strength of the proposed design has been identified earlier. The constraints of the design include water control system use an online real time database to store data from sensor. Thus, internet connection is require to access the database. User cannot update and receive any notification from firebase when there is no internet. Water control system tools and equipment need to be installed properly because it can make user vulnerable to danger. As the system require a current and voltage to run and work, user need to take a safety precaution like ensure the component is in safe condition.

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