

Error Check Algorithm in the Wireless Transmission of Digital Data by Water Level Measurement

Hiesik Kim, Daeyeon Seol, Youngil Kim, and Chul Nam

Dept. of Electrical & Computer Eng'ng. University of Seoul, Korea

Tel : +82-2-2210-2427 E-mail : drhskim@uos.ac.kr

Dept. of Electrical & Computer Eng'ng. Graduate School University of Seoul, Korea

Tel : +82-2-2210-2569 E-mail : systemseol@sidae.uos.ac.kr,

young4u@sidae.uos.ac.kr, error016@daum.net

Abstract: By wireless transmission data, there is high possibility to get distortion and lose by noise and barrier on wireless. If the data check damaged and lost at receiver, can't make it clear and can't judge whether this data is right or not. Therefore, by wireless transmission data need the data error check algorithm in order to decrease the data's distortion and lose and to monitoring the transmission data as real time. This study consists of RF station for wireless transmission, Water Level Meter station for water level measurement and Error check algorithm for error check of transmission data. This study is also that investigation and search for error check algorithm in order to wireless digital data transmission in condition of the least data's damage and lose. Designed transmitter and receiver with one - chip micro process to protect to swell the volume of circuit. Had designed RF transmitter - receiver station simply by means of ATMEL one - chip micro process in the systems. Used 10mW of the best RF power and 448MHz-449MHz on frequency band which can get permission to use by Frequency Law made by Korean government

Keywords: Real Time Monitoring, Digital Data, Error Check Algorithm, Wireless Transmission

1. INTRODUCTION

By wireless transmission data, there is high possibility to get distortion and lose by noise and barrier on wireless. If we check the data damaged and lost at receiver, we can't make it clear and we can't judge whether this data is right or not. Therefore, by wireless transmission data need the data error check algorithm in order to decrease the data's distortion and lose and to monitoring the transmission data as real time.

Wireless Digital Data Communication is characterized as the fact that two electronic devices exchange their data, which is formed in the binary codes '0' and '1'.

Local area communication refers to the case that communication devices are equipped in the same place or placed within the same limited place, while the case that two communication devices are located far away from each other is classified as Long distance communication.

A communication equipment is supposed to become a part of the communication system combined with hardware and software in the condition that Wireless Digital Data Communication can be properly used. It's very significant to select sufficient transmission ways or Protocol to put the level of delivery, accuracy, and timeliness to satisfactory degree for the sake of making Wireless Digital Data Communication effective.

There are some methods to check data error. One of the methods is ENQ/ACK method. The operation principal of this method is that it make not to receive the incorrectly transmitted data between two devices. Poll/select method is we designed that one became primary station and another became secondary stations Sliding window method is we can transmit variable data at one time.

The operation of stop-and-wait method is Transmission – receiver waits for confirmatory response after transmitting data.

The study have embodied Error check algorithm using

Stop-and-wait method. By using water level meter to measure the water level it recognizes the sended level as current value and it converts the current value to the voltage value at SM210 Indicator. And then we quantize the converted voltage value to. Transmitted signal like this is checked by error check algorithm and can be monitoring to correct water level measured value in real time.

2. COMPONENT

2.1 System Composition

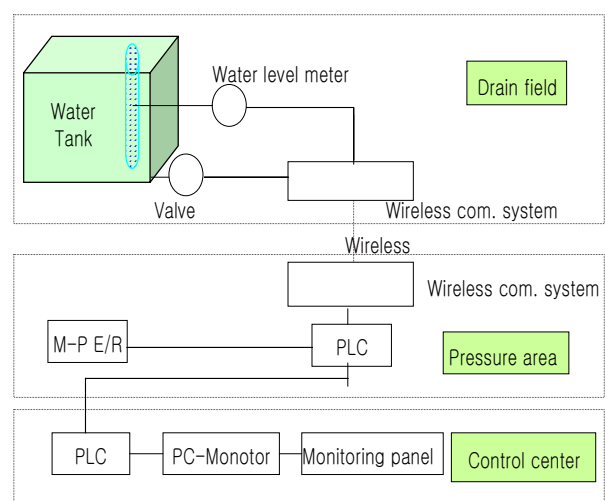


Fig. 1 Measurement simulation diagram

This system is operated for digital data transmission between a drain field and a pressure area, which is the

management system of only wireless-used digital data transmission that was transformed from wire digital data transmission. [1]

In order to measure water level value, first, data is transmitted through a wireless transmission line from a communication system in a drain field to one in a pressure area by using Water level Meter.

Next, perceived water level is sensed by current unit, which is changed into a voltage value in SM210 indicator.

2.2 Digital Data Error Check Algorithm

This is to make R&D (Research and Development) on Error Check Algorithm for wireless digital data transmission, in order to minimize loss of data on wireless. This consists of three components which are a water-level measuring instrument, RF for wireless transmission, and Error Check Algorithm.[2]

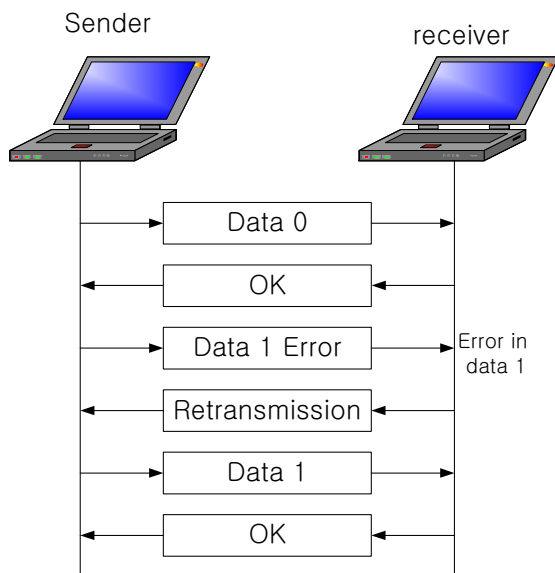


Fig. 2 Error Check Algorithm

So as to measure the height and low of water level, a perceived water level is sensed by using Water Level Meter as current unit, which is converted into voltage value. The data is transmitted by putting the diverted voltage value into 8bit quantization.

Error Check Algorithm requires re-transmission of data in the case that data is damaged or data is lost.

A transmitter maintains the copies of lately-transmitted data until a reaction to that data is received.

It can retransmit data by keeping up the copies of it by the time that damaged data or data in loss is received. Data and a requiring signal of transmission are given the figures '0' and '1' in turn, so as to recognize data. The fact that a receiver has taken data '1' and then is waiting for data '0' is checked and responded by transmission requirement signal 1.

Such numbering (or number-marking) can make the sense of data in the event that transmission is duplicated. That's very vital to the case that a checked reply is lost. The re-transmission signal of data goes back if there's an error found in data.

The re-transmission signal of number-not-marked data

makes a receiver retransmit data which was sent last.

Error Check Algorithm is required to wait until a confirmatory reply for the last transmitted data is received before the receiver sends the next data. A transmitter sends back data which was transmitted after the last confirmed response, irrelevant of the number of data, if it receives the re-transmission signal of data.

The transmitter regards the last data as damaged data during the process of transmission and then sends it back again if the checked reply that the transmitter is waiting for doesn't reach within the allotted time. The receiver is equipped with a timer so that if the confirmation and response that the receiver is waiting for is not received within the allotted time, the last data is counted as the lost one during the process of transmission so it's sent back again. In the case that the transmitter finds data including an error, the receiver sends back the re-transmission signal and the transmitter brings the last data to re-transmission.

2.3 Data anti-collision technique used wireless module

The most ideal Anti-collision method used either less interference or no interference after made multiple data channel.

One of the several signal transmission method of detector is designed Polling loop method or made multiple channel, but multiple channel is actuality impossibility because multiple used limited resources.

Polling loop method embody at the one channel in single media but the life battery give a mortal in the wireless detector. The reason is possible mutual transmission and receive between detector and control panel, detector responds to the Poll of Control panel. Therefore detector always designed to the operation type but it is a deathblow to the life time of battery[3]

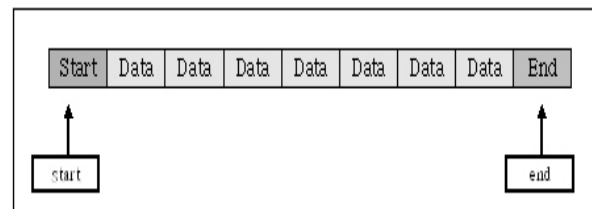


Fig. 3 Signal transmission method for general wireless sensor

If among detectors send signal at the time, Signal of almost all of the detectors will be a loss. Therefore used sends separated data frame for the anti-collision.

Frame repeatedly sends to the rest time among the frames after frame composition is start, stop and 3 data.[4]

Transmission repeats 6 times, rest time of among frames assigns randomly. The basic of rest time established the free running timer in the MCU.

Minimum rest time limited the unit of frame transmission time, maximum rest time established 6 frame transmission time. Therefore rest time randomly give 1~6 frame transmission time.

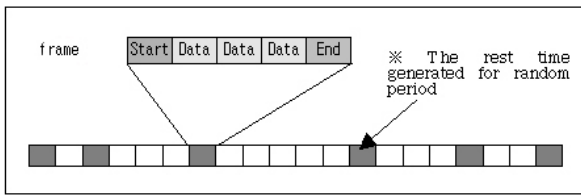


Fig.4 Anti-collision algorism of wireless sensor data communication

The result of signal receive unit test of the wireless sensor that signal loss unit was 10.2% in first test. This is signal loss due to the wireless data collision of the between adjacent sensors.

The second result of the signal receive unit test that signal loss unit was 0.2% for the anti-collision of the between wireless sensors , one signal repeatedly sends 6 time, after between repeated signal randomly adjust time difference.

2.4 RF spec

Table. 1 RF Module

Frequency bandwidth	448.7500MHz ~449.2625MHz
RF Impedance	50 ohm
Channel interval	12.5KHz
Channel number	25
RF power	500mW
Transmission distance	Free space : 3K m, Downtown area : 1Km

3. WIRELESS DIGITAL DATA MONITORING EMBODIMENT

The received wireless digital data can check an error by Error Check Algorithm and the checked error is monitored by LabView program.[5]

The measured wireless digital data is temporarily stored in the memories of a measuring instrument, but only current a water level value is output due to the limitation of an amount of memory. Some stored data is converted and stored in a type of text file with the intention of long-period storage.

The stored data is used in plotting a graph. A graph file and a text file are designed to be checked on the internet by PHP program and Web sever program.

In order to see the water level value measured in real time in a type of text file and graph file, users should renovate and update the received data on a continuous basis.

And data is read and stored on set time. So as to describe the stored data as the graphics, GD library's been used and the compiler operated GCC. The measured water level value can be confirmed through a internet browser wherever users are.

By the usage of simulation disc controlled by LabView program, a period of operation time was shortened and loading was much more quicker that before.

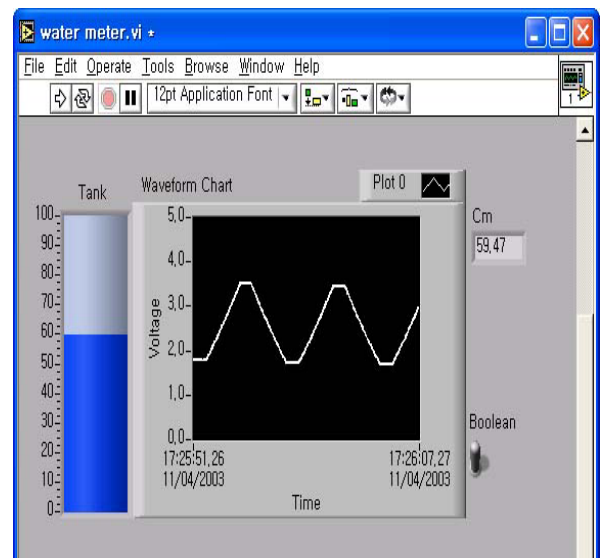


Fig. 5 LabView Simulation

And also a period of input and output time decreased. The measured wireless digital data was stored and output in three forms of maximum value, minimum value, and average value at time intervals of a hour, a day, and a month in order. And then the existing stored wireless digital data can be confirmed through the usage of a reference function.

4. CONCLUSION

In this study, by using highly dominated Wireless Digital Data Error Check Algorithm in a various range of fields, we've monitored the measured data in real time and technically described in order for users to check stored data through the internet.

In this study, also by using wireless Digital Data Error Check Algorithm of the currently used Stop-and-Wait method, the system that can monitor a water level value has been invented.

In this experimentation, we measured and monitored not only a water level value ,but also we'll be able to very diversely make an application of that method on the fields that need an real-time accuracy in measuring factors such as pressure, temperature, and wind direction and on the fields that measure the changes of external environment.

ACKNOWLEDGMENTS

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