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A Paradigm for Research In Physical Sciences

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ABSTRACT: What we call research is argued by authorities as "not fact-finding", and such authorities further their argument that "when you don't know and you carry out investigation in order to know it is not research but fact finding". That research, is (only) a study designed to fill a gap in human knowledge (Awokeni, 2001)wherever this argument goes the fact remain that in management sciences whenever a problem exists and needed to be solved, a search and/or further search has to be conducted to gather knowledge in order to solve such problems. But since management problems are social problems, social research is essential and this entails studying a collection me objects individuals and events. Most times this collection of individuals for study are large that studying them would not make sense hence use of samples drawn from the collection.

Keywords: Automatic Control, Programmable Logic Controller, Wireless Control, Xbee, Level Control

I. INTRODUCTION

Wireless Technology has been always the goal for automation industry and control systems worldwide because of many remote industrial control applications. Wireless control networking concept had difficulties to pave its pathway into replacing the conventional control networks. In many terms, the wireless control network would have been the optimum solution that is able to reduce the cost substantially by simply replacing the running cables, wires and required infrastructure. Today, the wireless control network is undergoing extensive studies and piloting to address the issues in order to mitigate the risk and clear the path for it. For the past decades, many industries have been working extensively to overcome the issues which become obstacles towards the development of such an important and essential field. Overall, the industrial control system standards in most cases require a level of robustness in terms of reliability and availability as a challenge for the wireless control. For that reason, manufacturers are working thoroughly to improve and to develop the needed technology. In addition, meeting the standards and deploy the concept of wireless control network have been investigated more widely in the automation industries. Most of the experiments that have been done using the xbee as a wireless control media for a wireless control network focused on two concepts. Realization of the xbee behavior with simple plant structure considering the analog output control signals has not been applied. Usually, these systems did not get controlled by a PLC as an industrial controller and micro-controllers are used instead. Also, most of the processes were simple and didn't fully load the xbee modules which might be a bottleneck in some applications. An experiment performed by SRM University [1] presented bees as wireless control modules using the PLC as control platform. The level was controlled through an ON/OFF solenoid valve, they used the digital input/output pins to control the level by either fully open the valve or completely closed. The process was one tank which might not give an enough insight on an application where interactions in the process might contribute to the performance differently. Other work presented in [2] uses the xbee as a wireless control network, it is actually using the PWM signal as an analog output for simple application such as the control of a servo motor [5]. We noticed that the servo motor is receiving the PWM to control the motor directly but that would not show the xbee capability to control devices that don't receive PWM as an analog form of signal which requires an extra interface hardware to be designed.

II. MATERIAL AND METHODS

In this study, Terra MODIS AOD 3km data (Atmosphere level 2 Aerosol Product in HDF format, Collection 6) collected in 2011 were ordered and downloaded from the Unites States Geological Survey (USGS) web site. HDF data processing procedures include the reprojection of MODIS AOD data to a universal traverse Mercator (UTM) projection and conversion of file format to Geo TIFF. Hourly PM2.5 data for each PM2.5 station in North Carolina was downloaded from the U.S EPA AirNow web site. AirNow is a U.S EPA program that provides public with easy access to national air quality information online. There were seventeen AirNow stations providing hourly PM2.5 measurements in NC in 2011(Figure 1). The latitude and longitude of each AirNow PM2.5 station was used to create a shape file containing all hourly PM2.5 monitoring stations in North

Carolina. To match overpass time of Terra satellite (10:30-12:30 pm local time), the average of PM2.5 concentration measured at 11 am and 12 pm for each day was selected for the correlation testing.

III. ROLE OF SAMPLE IN RESEARCH

Use of sample affords a researcher the ease and possibility of handling or managing the variables of interest in the study statistically so as to arrive at a definite and comprehensible conclusion with which he can make inference or generalization about the population. A great distortion would be introduced if all the variables of interest are studied in terms of the relationships existing between them, for large population (Cooper and Emory, 1995) this is because the manipulation of tools of statistics and mathematics may be incomprehensible by humans. Again "sampling possesses the possibility of better interviewing (testing). More thorough investigation of missing, wrong or suspicious information, better supervision and better processing than is possible with complete coverage (Cooper and Emory, 1995).

IV. EXPERIMENTAL RESULTS

Fig 16 shows the overall system built at the ECE department of California State University Northridge. The xbee devices are classified to the base and the remote modules. The base module is where the xbee is receiving the data from the remote one and is wired directly to the PLC system. The remote xbee is the transmitter where all remote devices and instruments are wired to it directly. It is very important to develop a procedure that serves the objectives defined for this project. Therefore, the following procedure is developed where the wireless control performance of the tanks level control can be tested. The following steps are required to be applied in order to generate the plotted results of the experiment depicted in Figs 18, 19 and 20.

V. CONCLUSION

This paper proposed an optimized wireless automatic control technology using a programmable logic controller a long with a wireless communication network. The remote control platform was designed and implemented using xbee wireless control modules for level control of a cascaded tanks system by programmable logic controllers. A prototype system is designed and built. The power consumption and cost is minimized for the proposed implemented technology. The process control is successfully tested and evaluated to demonstrate the reliable, robust and accuracy of the proposed method. This remote control process verifies the use of wireless control network in industrial type environment. The proposed set up helps realize and impose a drastic improvement in the automation and control industry. Conducting a full and thorough feasibility study at least for such a small scale process helps advance and accelerate the implementation of wireless control system in wider and broader ranges. This model is a

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