Arduino Based Air Temperature, Humidity And Air Quality Monitoring System

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Abstract
This study is conducted to create a better platform for Taguig City University Library where students can access it in just a few clicks using their mobile phones, desktop, or any smart devices. Innovation is inevitable, as the world progress to advancements school services like libraries should also innovate to provide accessible and better learning experiences to students. Library Cloud Storage of Published Thesis and Research Paper with Laravel Security in Taguig City University is created to provide Taguig City University its own online library that will benefit not just the students but also the library staff and faculty members.The ANOVA F-TEST was used in this study to see if there was a significant difference between the three groups of respondents' perceptions of the system's efficiency and effectiveness. The generated result of ANOVA computation to get the significant difference at 0.05 level of significance of the assessment of the three groups of respondents for the criteria set by ISO 25010 namely functional suitability, compatibility, usability, security, and maintainability of the system. The computed value is F and the F crit is the tabulated value. The F value is less than the F critical value that leads to the acceptance of the null hypothesis that is "There is no significant difference between the assessment of the three groups", which means that the three groups of respondents have almost the same assessment on the feature of the system.

I.   INTRODUCTION

Air is a fundamental component of Earth and contains a complex mix of elements that aid in the survival of human existence. Air among other things contains oxygen which is an isolated element in the atmosphere. Human beings can survive for days without nourishment. We can survive for several days without water, but we cannot survive for more than a few minutes without air. This is why air is the most essential component of life. One of the most significant contributors to health problems is poor air quality.

Informing people about the status of environmental air in their area is a great action and very important for us to respond immediately to the existing health conditions and also has very educational value. This study aims to monitor the air temperature, humidity, and air quality around Lower Bicutan, Taguig City by using an Arduino based air quality and air temperature sensor to gather data inside of the city and monitor using Visual Basic application and submit collected data to the database every one hour of gathering. This study aims to disseminate information about the air temperature, humidity, and air quality in Lower Bicutan, Taguig City that can raise awareness about the neglected dangers of air pollution in terms of guidelines and warnings that the device will give.

Arduino-based application is very important for developers, especially for those creating a system for environmental monitoring. Environmental air nowadays needs to

monitor if acceptable to us. Monitoring systems provide a piece of information what is the status of air temperature, humidity, and air quality if it is acceptable or not. In this study, we proposed an air quality, humidity, and air temperature monitoring system based on the Arduino platform. This environmental air quality, humidity, and air temperature monitoring system is intended to give a cost-effective, simple, and reliable way to continually and in real-time monitor air quality.

II. LITERATURE REVIEW

The same study of the researchers stated that air quality is affected by pollution from vehicles and industrial areas like urbanized places. Air pollution may affect human health. A growing population is one of the main reasons why urban areas have the most polluted air. Air quality increases pollution through mobile sources like trucks, cars, and buses. During rush hour, roads in urbanized places get polluted because of more vehicles passing all roads, especially every afternoon Espinoza et al. (2018). According to Weather-Atlas (n.d.), the midyear also raises air temperature and humidity, resulting in an increased heat index or the actual feeling of heat in our bodies.

III. RESEARCH METHODOLOGY

Method of Research

The researchers used a descriptive type of research. It utilizes the data from the survey score for the pre-test and post-test to gather necessary data needed for the research. Survey research through online was also used by the media, other businesses, and even governments to collect reliable data. The researchers used a survey to test the level of acceptance of the respondents which are the residents in Barangay Lower Bicutan, Taguig City. The survey contained following ISO standard (ISO/IEC 25010) (1) Functional Suitability (2) Performance Efficiency (3) Usability (4) Reliability (5) Maintainability of the developed system.

Data Gathering Procedure

The researchers obtained all of the findings from the proponent using survey questionnaires, informal interviews, data records and papers, books, journals, and internet surfing for the information required in the study's development.

The system was evaluated by the respondents from the residents of Barangay Lower Bicutan, Taguig City. The evaluation procedures are as follows:

1. Each respondent was given a set of survey questionnaires.

2. Each respondent had a chance to use the system to test and evaluate its performance.

3. The system was evaluated carefully by the respondents with regards to the questionnaire given to them.

4. The results were tabulated and computed using the Mean formula to conclude if the developed system was acceptable to the respondents.

Statistical Treatment of Data

The Weighted Arithmetic Mean of the responses is the statistical method used to assess the system's acceptability. Microsoft Excel was used to tabulate these responses. The average of the responses per criteria, as well as the overall evaluation Mean, were

computed. Figure 13 depicts the rating scale used to generate the descriptive evaluation of the Mean.

IV. FINDING AND DISCUSSION

The study aimed to evaluate all collected data based on the ISO/IEC 25010.

Table no. 1 Evaluation of the respondents on the Proposed Arduino Based Air Temperature, Humidity And Air Quality Monitoring System

Characteristics	Overall Weighted Mean	Verbal Interpretation
Functional Suitability	3.53	Highly Acceptable
Performance Efficiency	3.47	Acceptable
Usability	3.39	Acceptable
Reliability	3.50	Acceptable
Maintainability	3.53	Highly Acceptable
Total	**3.48**	**Acceptable**

The table showed above represents the overall weighted mean based on ISO/IEC 25010 in terms of (1) Functional Suitability, (2) Performance Efficiency, (3) Usability, (4) Reliability and, (5) Maintainability of the developed system.

The highest overall weighted mean with verbal interpretation of "Highly Acceptable" are both Functional Suitability and Maintainability.

V. CONCLUSION AND FURTHER RESEARCH

Based on the findings, the researcher came up with the following conclusions:

That the purpose of this study was to identify the pollutants in the said barangay and to gain an understanding of peoples' knowledge and awareness of Air Quality and providing the Residents of Barangay Lower Bicutan, Taguig City the awareness for everyone's safety and warnings they need.

1. This study also found that Carbon Monoxide (CO) and PM 2.5 were the two most common pollutants detected by the system especially every morning.

2. With the developed system the Arduino Based Air Temperature, Humidity and Air Quality Monitoring System which will be a very effective Air quality monitoring system this will help a lot of people to be aware and learn the daily air quality status and air pollution around the barangay. Based on the performance of the system we can say that it is easy to use, and based on the findings the Functional suitability, the Performance efficiency, Usability, Reliability and Maintainability of the developed system meet all the systems needed functionalities, response and processing times, details provided in the interface, operational and accessible and can also be effectively and efficiently modified.

3. Notification via email is very important like nowadays. Because they aware about the environmental air in the Barangay Lower Bicutan,Taguig.

4. The respondents strongly agreed that the system is acceptable in terms of performance Efficiency, functional suitability, reliability, security, and maintainability.

5. We have a lot of problem experiencing to the system developed like accessing to the website. The system web needs to use a a vpn(virtual private network) to access web link.

Recommendations

Based on the results of the findings and conclusions, the researcher would like to recommend the following:

1. In system application, Station user need to see the current status of air using dashboard of the system. The VB.net application need to run for 12 hours to save and calculate the data based on the condition of air in the barangay.

2. The Barangay Lower Bicutan residents must subscribe by registering their gmail address to notify them about the current air quality status of the barangay.

3. The researcher suggests to the future developers/researchers to use higher programming language like C# to accommodate and incorporate the high and low level language and for front end design used by the current system.

4. The user must use Chrome Browser for better interface of the system. Some browser like Samsung browser cannot show the data in a proper form like in text color, the gauges and graph.

REFERENCES

1. Espinoza et al. (2018). Project Amihan: Online Air Monitoring System for Selected Areas along McArthur Highway, Valenzuela City https://pdfs.semanticscholar.org/cbf8/088aeeb72482339960688cc01ac0 91bff2d3.pdf
2. Ibrahim, Jafar Ali S., S. Rajasekar, Varsha, M. Karunakaran, K. Kasirajan, Kalyan NS Chakravarthy, V. Kumar, and K. J. Kaur. "Recent advances in performance and effect of Zr doping with ZnO thin film sensor in ammonia vapour sensing." GLOBAL NEST JOURNAL 23, no. 4 (2021): 526-531.
3. Jeyaselvi, M., M. Sathya, S. Suchitra, S. Jafar Ali Ibrahim, and N. S. Kalyan Chakravarthy. "SVM-Based Cloning and Jamming Attack Detection in IoT Sensor Networks." In Advances in Information Communication Technology and Computing, pp. 461-471. Springer, Singapore, 2022.
4. Malik, K. Alhaf, D. Elayaraja, S. Jafar Ali Ibrahim, and NS Kalyan Chakravarthy. "INVESTIGATING THE POTENTIAL CONSEQUENCES OF THE MEMBERSHIP FUNCTIONS IN A FUZZY LOGIC CONTROLLER-BASED OBSTACLE CLIMBING ROBOT." INFORMATION TECHNOLOGY IN INDUSTRY 9, no. 1 (2021): 1294-1299.
5. Elayaraja, D, Ibrahim, S. Jafar Ali. "Design Parametric Optimization Of Wall Following Robot." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12, no. 8 (2021): 2072-2080.
6. Weather-Atlas (n.d). May weather forecast and climate Manila, Philippineshttps://www.weather-atlas.com/en/philippines/manila-weather-may

7. Ibrahim, Mr S. Jafar Ali, K. Singaraj, P. Jebaroopan, and S. A. Sheikfareed. "Android Based Robot for Industrial Application." International Journal of Engineering Research & Technology 3, no. 3 (2014).