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An Efficient IoT E-Environment System to Monitor and Control Air, Water, Sound Pollutions of Educational Institutions to Maintain Hygienics Principles on Behalf of Covid-19 Pandemic Situation

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An Efficient IoT e-Environment System to Monitor and Control Air, Water, Sound Pollution of Educational Institutions to Maintain Hygienics Principles on behalf of Covid-19 Pandemic Situation.

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***Abstract*— The Covid-19 Pandemic (C19P) situation of the entire world now affects all fields in terms of Excellencies and let to suffer drastically from normal functioning. The whole world is now concentrating on the protection from the C19 virus in the form of vaccination (C19V) and social distancing (SD). There is a kind enough need arises to maintain the hygiene environment during and after the post C19P situations, and this IoT e-Environment Pollution Monitoring and Controlling System (IEE-PMCS) with 3 parameters (air, water, sound) resolves and addresses the issues in the hygiene maintenance of various environments as common. In the IEE-PMCS proposed work, the 3 measuring parameters and their real-time and current values are percept with the appropriate sensors of IoT elements and the data are collected and stored on a cloud and are verified with the predefined threshold values of pollution measures with included tolerance values of permissible values to indicate if there is any cause of the pollution on the real-time perceptions. The verification and decision making of the system is reliable on the new algorithms proposed in this work. This work is based on system modeling and providing an efficient architecture to the maximum extent of the intended purpose, with a detailed description of the flow of operations and with the algorithmic level.**

***Keywords*—** IoT Monitoring system, IoT Controlling system, C19P-e-Environment Management, Hygiene Maintenance, Handling Pre and Post C19P Situation.

I. INTRODUCTION

The pollution of the living environment on the earth is the major issue faced by human society. The essential needs such as water and air pollution cause major critical threatening factors to lead the survival of the living beings on earth i.e. not only for the human society. Along with the sound, pollution gives a restless lifestyle to the living beings, even which is generated artificially. In such factors like water, air and sound are considered in this work to provided control over the abnormalities to bring in to the normal for peace of mind and lead a healthy life and efficient production in an educational environment.

In this C19P time, people are suffering so many problems in all aspects of life. Especially in human life, health problems are a big issue which we are facing in this pandemic. This C19P change the lifestyle as well as the work style of people. Whether before C19P people neglect common issues like water, air and sound pollution. But in this period peoples are thinking about these issues. The main reason is because of immunity boost through these air and water. Once people did not get fresh air and purified water then they lose immunity to fight the C19P situation, and sound pollution creates the biggest role of disturbing and distracting Humans mind from their targets.

Especially, the Educational Institutions and education world facing the biggest problem in this C19P situation. 95% of educational institutions are closed and they are working online (Internet mode-audio or video conferencing). Educational Institutional Managers are having the human resources responsibilities of their subordinates and having hesitation to open their institution because of the C19P situation. The student community also facing similar issues on health-conscious and their parents are not ready to send their children by considering the hygiene practice. The Educational institution environment's air, water and sound, which are the student communities' immunity boaster while they survive in the institutional premises', create the biggest role in fighting against the C19P situation. Through this paper, we aim to create a mechanism which provides air, water and sound pollution free educational institutional campuses through which educational institution owner, as well as educational workers, faculties, students and their parents, get confidence to send their children's to the institution to attained manual class through people can return their normal life.

This paper is based on IoT and cloud computing technology. The IoT based devices are used to perform so many tasks like Observing, hearing sound, sense through touching and taste and smell. By using these all qualities of IoT device, we are trying to make a module through IoT device and cloud computing technology which can perform their task on air, water and sound. And the people who want to know the campus environment situation through the IEE-PMCS module they should have to download the App through App store and register it through OTP and once user registered they can utilize the IEE-PMCS module by getting continues updated reading about educational institution's air, water and sound pollution. Further, this paper is sectioned as the similar works of literature available in the field as literature review, the IEE-PMCS as a proposed system, future enhancements and conclusion.

II. Literature Review:

Jizhang Wang et. al. discussed the agricultural IoT system development based on the greenhouse environment and focused on the communication channel of the system by introducing an agent to achieve the expected outcomes, which is a supportive concept of the proposed system of this work [1]. The role of IoT systems in monitoring and controlling activities are considered in the work presented by Antonio IydaPaganelli et. al., and narrated an early warning architecture for the distant monitoring on the C19P patients in the hospital [2]. An IoT wearable sensor-based system developed by Nizar Al Bassam et. al., and discussed the monitoring with the available technologies such as GPS, android mobile, etc. can provide a remote digital platform for monitoring and take corrective actions with such monitoring. This monitoring and controlling system framing are the major work of our proposed system [3]. MohdJavaidand Ibrahim Haleem Khan described the IoT system framing for the healthcare domain and provided effective outcomes on the challenges nowadays faced by the C19P situations. The computational intelligence with data communication network based real-time monitoring and controlling system on managing health monitoring domain can be achieved with positiveness, becomes the key role induction for out proposed work to carry with such monitoring and controlling/reporting on the pollutions of the air and water [4]. Seda Savascı Sen et. al. projected their work on networked eHealth equipment based IoT system, achieved exactly functioning surveillance system with improved statistical data for the C19P situations [5].

Vladimir Tanasiev et. al. detailed the IoT technologies' involvement in the single building real control on the HVAC system tracking of electrical, comfort and environmental parameters and prescribed the services on the development of predictive analysis [6]. Emmanuel Abiodun Abioye et. al. experimented with a model on conventional mustard leaf cultivation with an introduction with the IoT based drip irrigation monitoring system with a framework and as controller hardware, Raspberry Pi 3 is used with display dashboard. The cultivation and irrigations parameters are considered in their work and scheduling on the irrigation drip is optimized to experiment and as a result, they achieved the improved quality on IoT platform based monitoring[7]. With the consideration of the world's C19P situation, the individual's safe environment presence as the primary factor, the IoT technologies are incorporated by Diana Yacchirem and Arturo Chura in their work and demonstrated the effectiveness of 91% accuracy to determine the society members present on the environment [8]. Identification of contaminated water in the environment with IoT wireless network equipped system, and the monitoring was carried out by Sathish Pasika and Sai Teja Gandla in their work, which relatively supports this IEE-PMCS work [9]. Jose Alfredo Alvarez Aldana et. al. presented a distributed mobile IoT based monitoring system and introduced a consensus mechanism [10].

The security challenges and issues on IoT systems are systematically discussed in the work presented by Alyaa A. Hamza et. al. [11]. The heterogeneity characteristics of the IoT platform is described by Moussa Aboubakar et. al. and surveyed IoT component-based network performance issues and addressed further network issues on low power IoT networks [12]. Mohammed Sarrab et. al. narrated in their work that the traffic management systems under intelligent transport systems for an urban environment can be integrated with AI and IoT concepts and developed a prototype and tested in the environment, which results in a good performance in the identification of vehicles and fewer errors in road occupancy estimation [13]. Oliver Mörth et. al. projected their work to improve the production performance of any system and described that for monitoring, controlling related activities the IoT is an efficient platform [14]. The forest environment monitoring is adopted by Rajesh Singh et. al. and with available IoT technology presented their work [15]. A common fault diagnosis model with unknown fault identification is treated in the work carried out by Erbao Xu et. al. and presented the complexities in the unknown fault identification and updating in the adaptive fault pattern of the base for the future identification with the help of Particle Swarm Optimization algorithm, Support Vector Data Description and IoT [16].

With the available technologies such as CNN, deep learning, IoT, Bluetooth and an android application a system is modelled as a waste management system by Md. Wahidur Rahman et. al. and this is the example work for our proposed system for further proceeding [17]. Muhammad Toaha Raza Khan et. al. presented IoT based efficient disease control with a standard operating procedure on monitoring and introduced autonomous monitoring in the indoor environments with named data networking IoT [18]. The IoT implementation practical issues are described by Kehinde Lawal et.al. [19], the anomaly detection in machinery equipment are detailed by Chenyang Li et. al. [20], modelling an intrusion detection system using machine learning in IoT described by Sai Kiran et. al. [21], and the environment monitoring by G Jhansi Rani et. al. [22] are the examples of the monitoring operations can be carried out in IoT based system. The sewage detection using IoT is described by Pratim Bhosale et. al. [23], the research challenges in Fog with IoT is described by Sabireen H and Neelenarayanan V [24], the incorporation of 5G technology for the fastest data communication capability in IoT is presented by Madhusanka Liyanage et. al. [26] are the pioneer model of IoT based research. Pantaleone Nespoli et. al. [25] and Jyoti Neeli and Jyoti Neeli [27] detailed the security essentials in the IoT operations and are primarily considered in the IEE-PMCS of the proposed system.

III. Proposed System:

Through this project, our aim to show the status of the Educational institution area's environment, whether the educational institution environment (air, water and sound) is suitable for educational institution's members as well as students which make a wide role of protection from C19P situation. This proposed work we can use for schools and higher educational institutions. Through this proposed work we can aware to schools children's, school teachers, higher educational institution members, their students as well as the peoples who are staying in housing commercial areas about air, water and sound pollution in their area through an App, which can be download from the App Store and run any Android mobile phone with internet connection.

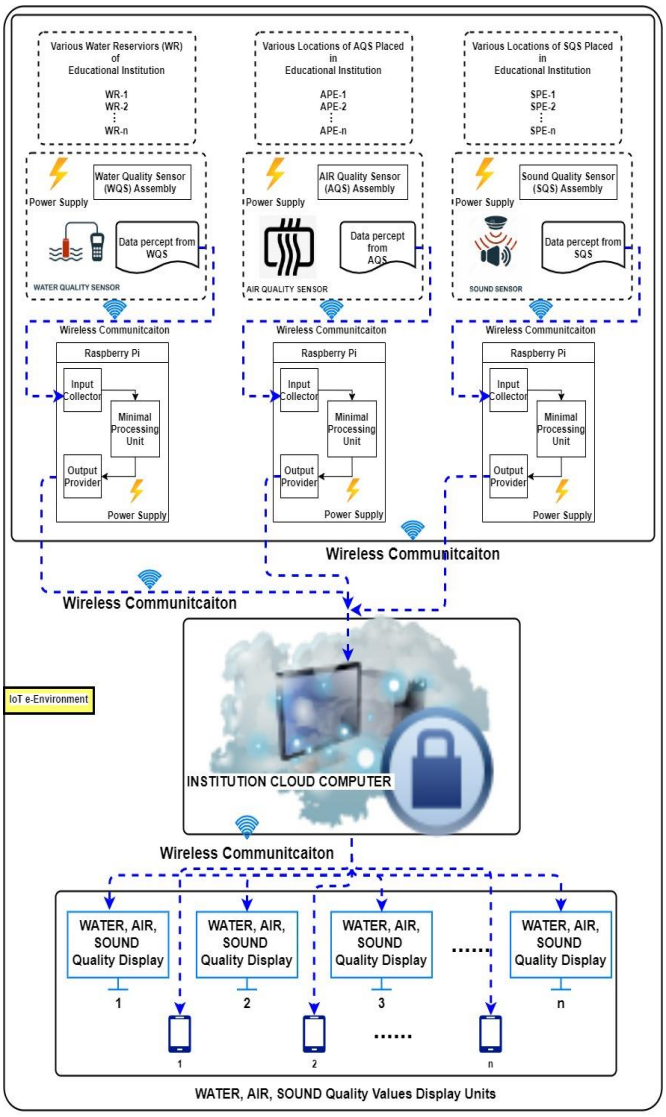

Fig: The Basic module of the IEE-PMCS

The WQS is the first subsystem of this IEE-PMCS module. In this module, we are going to represent the work style of the WQS Assembly module. In this, we are going to use Arduino UNO which is an open-source electronic device that can be easy-to-use hardware and software. The Arduino UNO perform for sense and other physical activities more than a PC (Personal Computer). Arduino UNO based on an open-source physical simple micro-controller board that takes input from a variety of switches and sensors and give the output depends upon the programmer's programming. The reading of the air, water and sound pollution, user can get on their phone through App which user downloads from App store. The basic devices which we use in this module are given below.

Fig: Devices and drives as sensors used in the IEE-PMCS module.

Apart from Arduino UNO, we use ESP8266 circuit which performs for Wi-Fi(Internet Service) and Cloud(data storage), pH sensor to test the water quality by fixing pH sensor at water resources, MQ7 sensor which is used to detect carbon mono-oxide level in the air which will be fixed in different suitable locations, MQ135 which is used to detect different types of gases like NH3(Ammonia), NOx(Nitrous oxide**),** alcohol, benzene, smoke and CO2 in air which will be fixed in different suitable locations and LM393 sound sensor which used to detect sound detection and sound pollution which will be fixed in different suitable locations get connected with power supply. The overall connection of the IoT based Environment Report System and its interconnection with Subsystems' is given below.

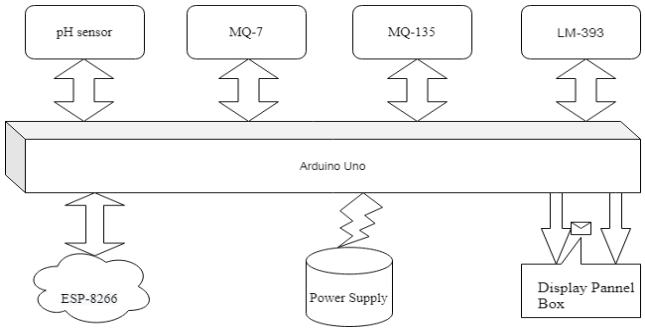

Fig: Basic Block Diagram of IEE-PMCS

IV. Future Enhancements:

This module is used to display the current situation of the Educational Institution's environment condition (air, water and sound) whether in this current situation environment is good and immune boost to students and educational institution members to fight with C19P situation. In future, we can apply this type of module or a much more updated module to present educational institution environment (air, water and sound) situation as well as Industrial area (air, water and sound) situation and commercial housing colony area (air, water and sound) situation and many more.

V. Conclusion:

This module is used to protect the educational institution environment about their using water, air and sound which disturb educational institution students mind growth in this pre and post c19p situation. This module is to encourage people to take action about air, water and sound pollution in the c19p situation and encourage students to attained academic classes in the educational institution.

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