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Implementation Fuzzy Logic Water Quality Prediction in IoT-Based Hydroponics Assistant

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Abstract

Hydroponic system the fertilizer or nutrient supply obtains the level of need for good and fresh crops, the fertilizer needs of the plants and the appropriate dosage that the ABmix fertilizer will mix into a nutrient mixed with clean water with the right amount to avoid water pollution or quality water nutrients so as to cause turbidity of water in a container, will be known through pH measuring devices, electrical conductivity to be able to see the acidity in accordance with the plant and use turbidity sensor that is to see the turbidity of water. Turbidity has become a major water quality monitoring parameter to access the health and environmental quality of water sources especially in hydroponics plants. this study aims to predict water quality in Hydroponics Assistant through the application of fuzzy model that is a method to overcome uncertainty in overcoming problems that have many answers. To be able to predict when water change in hydroponics can use sensors with fuzzy logic method.

Keywords: *Fuzzy logic, Hydroponics, Turbidity sensor, water quality*

1. Introduction

The population of Bandung city in 2016 the number of population reached 2,490,622 population 15,713 inhabitants / km2 with the growth rate of 0.37 of his (Bandung city 2016) Increasing population growth so that lands, development in obstacles cause a variety of problems, One is the conversion of agricultural land into housing and industry, consequently, agricultural land in the corner of the city is transiting [1] for people who want to garden issues urban food needs on agricultural land. The most well-known cultivation technique today is hydroponic [1]. Hydroponics is an innovation for developing plants in the supplemental arrangement required for each supplemental component needed for ideal crops [2] one hydroponic technique is a technique in hydroponics, the air will be used continuously and only decrease due to evaporation. by the Sun or by the process of photosynthesis of the plant [3] the NFT system uses a solution to drain in the root region [1] hydroponics consists of production tanks and feed for nutrient solutions, energy availability, pH, dissolved oxygen, temperature, osmotic pressure and conductivity electrics and installation and growth of cucumber [4] with groundwater use, new methods of growing groundless plants, use a solution of minerals in aqueous solvent instead of [2] The nutrient solution is very important to be equated with [1] hydroponic plants most widely used mineral or hydroponic mineral or fertilizer solutions are Stock A and Stock B as the nurtitioning requirement for the [5]

Water quality is needed Hydroponics plant, the water will be used continuously and only decreases due to evaporation by the Sun or by photosynthesis of plants [6] water quality can be limited to specific ion concentrations and phytotoxic substances that are relevant for plant nutrients as well as the presence of organisms and substances that can clog the irrigation system regarding the presence of organisms both in water for the preparation of nutrient solutions and recycling nutrient solutions [2] system water quality monitoring can measure water quality parameters in real time [7], Water quality monitoring is important because the physical-chemical water parameters can have a negative effect on growth [8] for hydroponic plants the quality of water used to meet certain conditions such as pH, turbidity, particle size, chemical elements to obtain maximum results low

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pH levels can also affect the plant so as not to absorb nurtisi. A container is a place where the direct pesticide is used for storing during the handling on the hydroponic container there is a mixture of stock a and stock B with additional clean water into a nutrient solution for the crop, fertilizer should be considered because if the water quality becomes not good because there is no monitoring on pH and EC (conductivity electic) to disrupt the growth of plants and make the quality of water is not normal or even become cloudy because of the moisture in a container it will result in plants to not grow and even die. Turbidity is defined by turbidity or liquid blurriness caused by suspended solids normally invisible to the eye, [9] Practice use Electronic turbidity meter or general turbidity tube conducted to measure turbidity. Both methods have the advantages and disadvantages of [10] to see the water quality there are some problems encountered such as water in the hydroponic tank becomes cloudy because the water must be refilled

Internet of Things (IoT) technology to configure and deploy intelligent sensors [11]. The Internet of Things allows any physical object to communicate over the internet and transfer data to a specific server for further processing [12], an already automated system of agriculture using hydroponic techniques making farmers work easily [13] Internet of Things (IoT) allows any physical object to communicate over the Internet and transfer data to a specific server for processing [14]

In hydroponic plants water quality needs to be considered to keep the needs of the plant to grow properly, but it is not known when the water in the container/tank must be replaced, the internet of things help for farmers with automatic system with turbidity sensor and fuzzy logic method for assess the turbidity of water quality in hydroponics and provide solutions so that they can monitor and know when the water in the container/tank has to be refilled water back. In this particular hydroponic farming automation system, it should be done wholly where the water supply Automation, maintaining the temperature at the required level, maintaining the pH level of nutrients and EC (Electrical conductivity) [13] and maintaining water quality by looking at turbidity levels to be predictable.

2. Related Works

Hydroponics is one of the future agricultural systems as it can be cultivated in various places and is of benefit to the community for gardening, a widely used technique for growing ants without soil [15] Hydroponic culture requires large amounts of air and essential nutrients to optimize crop production (Gagnonet al.2010 air quality at good hydroponic level with mixture of mixab fertilizer used for nutrition for plants according to journals that can be water quality of white-footed shrimp ponds, illuminated on LCD and abnormal status or not with LED color obtained in turbidity unit of water range cm 30-45 [7] Air quality is critical for performance improvements by using turbidity sensors and temperatures show the relationship between turbidity with singnal on volt [8] to see the air quality between some airborne problems in hydroponic to turbid because it must be replenished u virgin net to measure turbidity for each set up, used turbidity meter. The turbidity meter is digitally a turbidity signal of samples in Nephelometric Turbidity Unit (NTU) Clear Water 0 NTU 0 NTU 1.07 NTU Turbid Water Level 1 34.96 NTU 35.74 NTU 34.57 NTU [16] Domestic air quality monitoring using Turbidity Sensor (turbidity sensor) release of solids and liquid scattering of solids and liquids. Electronic Lighting Sensor used Light Emitting Diode (LED) as transmitter of light, Dependent Light Resistor (LDR) as receiver, PIC 16F777 as main processor and RS232 module for integrated sensor [9] there is also applicable in laboratory for turbidity detection with Turbidity (NTU) 2.8, 8.5 14.5 and image of turbidity prosessing 2,8,15 [10] Designing and aerial imaging in Indonesia effects of turbidity under air will be studied with the help of optical parameters such as Modulation Transfer Function [6]] development wireless sensor network system, sensor quality, air quality monitoring sensors such as pH sensor, turbidity sensor we have achieved in a simple way optical penyya, consisting of LED and photodiode it opacity with transmittance lamp LED lamp scattered by the particle in water sample as a result of experiment with lake water example [17] Turbidity can also be with pen performance appraisal and experimental performance of turbidity effects on system performance, Solar pool performance is turbidity caused by dirty all the time (eg insects, leaves, dust and angina carrying the fall) with normal and quiet parameters found 28.40 percent for calm cases and 22.27 percent with turbidity

effect [14] knowing air turbidity Insulation Oil must remain in clean condition, as its condition can be a determining factor by looking at oil turbidity [18] Processing of industrial wastewater for its impact on water color packaging waste and turbidity to achieve the condition of color and turbidity by seeing the initial turbidity of 60 NTU to remove the color and turbidity of each. is 76.20 [19] The surface of the OSTE modification scheme for the self-generating array of nanoliter droplets with oil-water inactivity and new [20] regards the influence of the Yellow River water rejuvenation in each index and the person's knowledge experience is rational and reliable fuzzy and AHP [21] irrigation water methods to optimize air use, grain yield, WUE, and restore the super-high yield corn economy in drip irrigation and plastic [22] water reuse thinking that can be used as a reuse scheme on the environmental scale [23]

According to some journals with the fuzzy logic method of group multi-target decision making in the project bidding process through the use of mathematical methods of fuzzy clustering. Bidder 3 was finally selected by most contractors suitable for the construction of this project by determining the score matrix and the vector weight index of the four bidders concerned. that the iterative theory of fuzzy grouping can not only be a classified index in the evaluation, but also do the unit sequence in the bid, which can be explicitly done to reflect the advantages and disadvantages of each bidder, and support the decision of [24]]. In this study the authors developed a new water quality index, the artificial intelligence approach (AI) towards the development of environmental index for the assessment of air quality routine[25]. In the journal based on test results, the accuracy of my fuzzy optimization Functions using genetic algorithms have a higher accuracy value of 90. Parameters used in genetic algorithms [26] The results show that DO is the parameter that most affect the feeding rate 74 while the temperature also does it but in the lower grade 26. The results show that the feed conversion ratio (FCR) is significantly better when the FL strategy is used, saving about 35 [27] how to estimate crossing traffic conditions based on measurement VTT estimates cross-traffic conditions based on average speed and speed of derivatives (acceleration) using fuzzy logic results obtained estimate traffic conditions Intersection with accuracy which is nice even under the penetration of the low tariff [28] to determine (and analyze its effect of) its main environmental variables predict the ecological water quality [29] strong fuzzy logic for intelligent power management was simulated and experimental results showed excellent selection of performance [30] selection of timization based on fuzzy logic, weighted linear combination (WLC) having average risk and capable of involving priority assessment layer of layer criterion using fuzzy method due to uncertainty and determination of importance, the maximum value achieved is 0.86 and the minimum value of rank is 0 (worst alternative) [31] clustering algorithm using fuzzy system inference to improve adaptation capability of TEEN cluster head selection for wireless multimedia sens or network. This protocol converts the cluster head selection method into a fuzzy logic base ensuring the available cluster clusters are selected. Our research evaluates the performance of various fuzzy input functions and alters the transmission method to improve additional energy efficiency [32] proposes a fuzzy logic based runtime bottleneck operator detection approach for improving the scalability of SPEs by providing resources in cloud environments research results show that the fuzzy logic component developed in this case the work can detect bottleneck operators efficiently [33] Objective image quality assessment (IQA) based on Fuzzy Logic to automatically assess the image quality accordingly with human visual perception. The attributes used the evaluation criteria of the research results indicate that the fuzzy logic model has a highly stable behavior with the best deal with human visual perception [34] human knowledge and experiments and methods of error that can lead to failure and time of potential use for employment by the operator and at experience of workers in the oil palm industry [35] created a fuzzy model, in the MATLAB environment, to assist physicians in interpreting the results of urine microscopy analysis considering the number of bacteria, RBC and WBC and sample crosses [36] new fuzzy logic data association algorithm proposed for visual multi-object tracking online. First, in the proposed algorithm, to combine expert experience into data associations for performance enhancements in multi-object tracking, a knowledge-based fuzzy inference system is designed using a set of fuzzy if-then [37]] minimization rules torque for synchronous machines permanent magnet (PMSM), and propose a closed loop fuzzy logic current controller using the harmonic velocity as a feedback signal of the

harmonic velocity control can be obtained from the measurement speed of machine. Fuzzy logic Current-based controller is proposed to minimize dominance of torsion harmonics [38]

In this study, Prediction monitors the quality of hydroponic nutritional water that is good for plants seen from the acidity (pH), electrical conductivity (EC) and also use turbidity sensor to see the turbidity of water in the tank. reuse of water can be monitored by looking at the state of water quality when the water with normal, stable, abnormal turbidity can be monitored with. water quality in a hydroponic tank becomes a factor in the growth of plants with water nutrition, moisture in a tank effect ecosystem on plants because of the occurrence of precipitation or moisture and temperature relationships that result in water quality becomes unstable if the water condition is not good then the plant will die so that containers that already contain nutrients will experience turbidity. This study aims to predict when water change back to hydroponics assistant with a fuzzy logic method with some normal, less normal, abnormal parameters with turbidity value of NTU different from the above journal that is using LDR sensor method as light emitter there is also replace water with fuzzy and AHP.

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