Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 10, October 2021: 5657-5664

Water Level & Quality Monitoring using AI

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Abstract:
It is predicted that third world war will take place for control of portable water resources. This shows that monitoring of portable water, its quality and predictions of both the parameters are important areas of the study. Automatic controlled Artificial Intelligence based systems may be an effective tool for monitoring & prediction of water level and quality checking. On the basis of this various countries can avoid conflicts by managing water resources properly.
Artificial Neural Networks (ANNs) were utilized in this research in order to construct and compare forecasting models regarding groundwater predictions. Artificial Neural Networks are computing systems that their construction simulates the neural structure of the human brain (Basheer and Hajmeer, 2000; Suykens et al., 2012). Artificial Neural Networks process the input data and the information traverses the neural network connections so as to produce the output values according to the input. Their advantage is that they can be used also at non-linear relationships between the input and the output.
Key words: AI, IOT, ANN,Raspberry Pi,GP.

1. Introduction:

The effects of population growth and the creation of horticultural and mechanical exercises have led to an expansion of water interest in this region. This has therefore caused an unsustainable withdrawal of groundwater reserves, causing tremendous declines in water levels and corruption in the quality of groundwater. Changes in the consistency of groundwater may be brought about by changing groundwater stream characteristics that can trigger the disintegration and transport of different minerals within springs. Vacillations in the arrangement of groundwater substances are triggered by the effects of various geochemical steps that may be difficult to identify[1][5].
In any case, it is important to understand the geochemical measures that affect the quality of groundwater for the powerful management of water assets and for the administration and assurance of amphibian conditions, and these elements can have a significant impact on the feasible advancement of nations.
There are various benefits to demonstrating water quality limits, the most important of which are: usually reserve funds for help or then advancement costs again; in addition, activities and the ability to retrieve lost knowledge are suitable in different circumstances. Computer-based Intelligence techniques are enormously suited to complex nonlinear system demonstration .
Nevertheless, the earlier information or multiple sources of information are not effectively used by a significant portion of the above keen evaluation techniques. They experience the adverse effects of dependency on systems that affect outcomes[7]. When used with large datasets, these

techniques often work gradually and require huge CPU assets. Then again, when there is restricted knowledge, their accuracy decreases. In addition, they typically do not have a distinct ability to calculate yield variables using the estimates of the results.

2. Monitoring Techniques Involved:

Research on groundwater is of great importance due the reason that surface water is scarce in arid and semi-arid regions. These waters, which are naturally filtered, often appear as good quality drinking and running water. Multivariate modeling is an important issue because the planning, design, and operation of water resources systems often involve meteorological and hydrological (precipitation, flow, temperature, etc.) methods. In recent years, the use of Artificial Intelligence techniques such as Genetic Programming (GP) is highly recommended. Genetic programming (GP) is a technique of man-made reasoning, relying on the erratic iterative pursuit to achieve an effective link between the autonomous,subordinate variables. In addition, GP has a high capacity for learning and an exceptional capacity and adaptability to cope with complex problems. This is finished by describing a bunch of unambiguous meanings to explain the relations between factors of knowledge and yield using various administrators. It has been implemented in various hydrological sources.

In the sense of groundwater, the performance of aquifer planning and management requires adequate and adequate data.[8] Therefore, groundwater monitoring is closely related to aquifer management, as the outcomes of monitoring can involve adjustments or changes in management practice. Deficient or redundant information may be expressed in the data obtained from the aquifer monitoring network. Several attempts are currently being made to reduce the distance between the data obtained by the monitoring networks and the information.Fig 1 shows the water monitoring cycle.

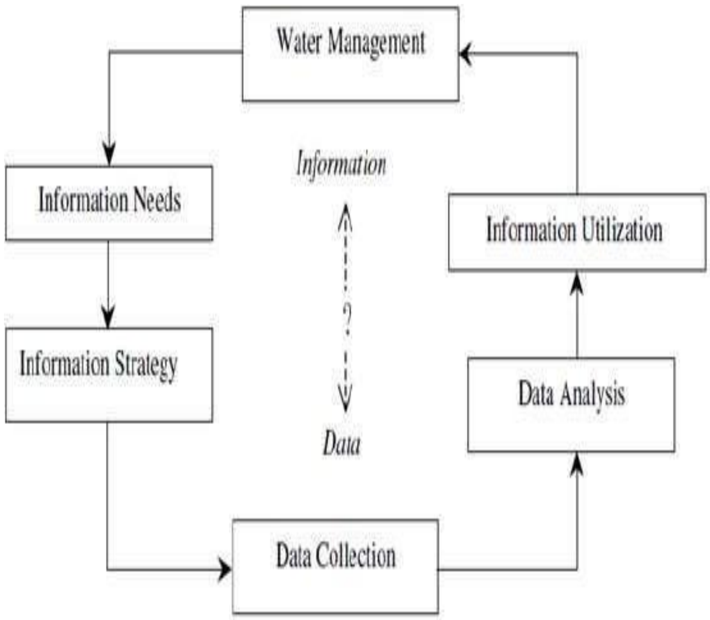

Fig 1: Water Monitoring Cycle

3. Research Work:

Artificial Neural Networks (ANNs) were utilized in this research in order to construct and compare forecasting models regarding groundwater predictions. Artificial Neural Networks are computing systems that their construction simulates the neural structure of the human brain. Artificial Neural Networks process the input data and the information traverses the neural network connections so as to produce the output values according to the input. Their advantage is that they can be used also at non-linear relationships between the input and the output. The frame of research work is shown in fig 2.

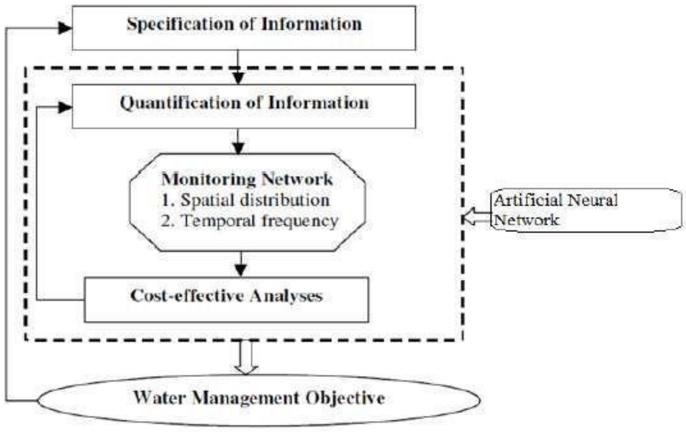

Fig 2: Research Framework

3.1 Methodology:

The exploration philosophy that was followed, comprises of five phases: information assortment and planning, neural organization expectation models advancement, examination of the created neural network models in order to find the ideal one as per the presentation, testing the ideal created neural organization model in groundwater determining lastly evaluating results.Figure 3 shows a review of the phases of the followed research procedure:

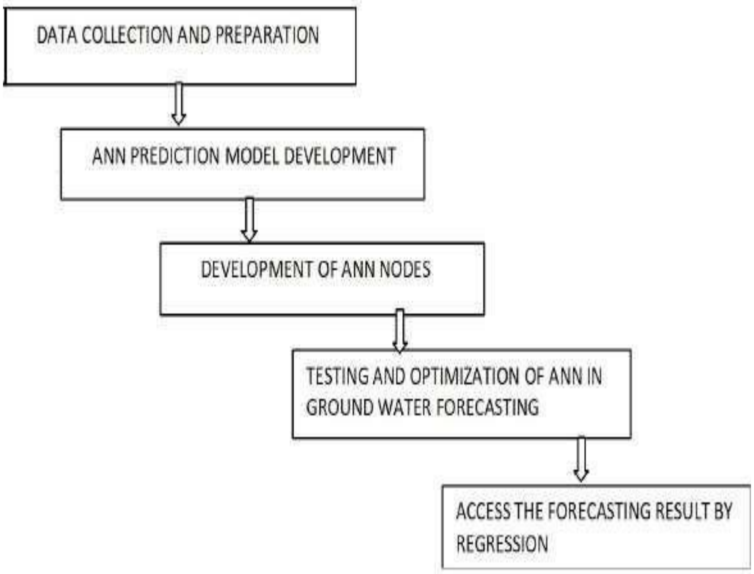

Fig.3: Different Phases of Research work

3.2 Workflow

PSUBOT, used in the experimental validation, is a 1/10 scale autonomous car platform built on a Tamiya RC TT02 Chassis with a set of components installed. The NVIDIA Jetson TX2 embedded computer is installed on the chassis of the robot as the main processor.

In our proposed work we will use a smart robot which will be controlled by Raspberry Pi. This controller will have different types of sensors that will measure the level of ground water and its quality at different distances and will store the different types of water qualities. The sensors send the data through the cloud using IoT. The storage element will be transmitted through the transmitter. The transmitted data will now be received by the control unit and the processor processed the data using machine learning software, whose graph of prediction will be visible on our mobile or laptop.Fig 4 represents the flow diagram of PSUBOT.

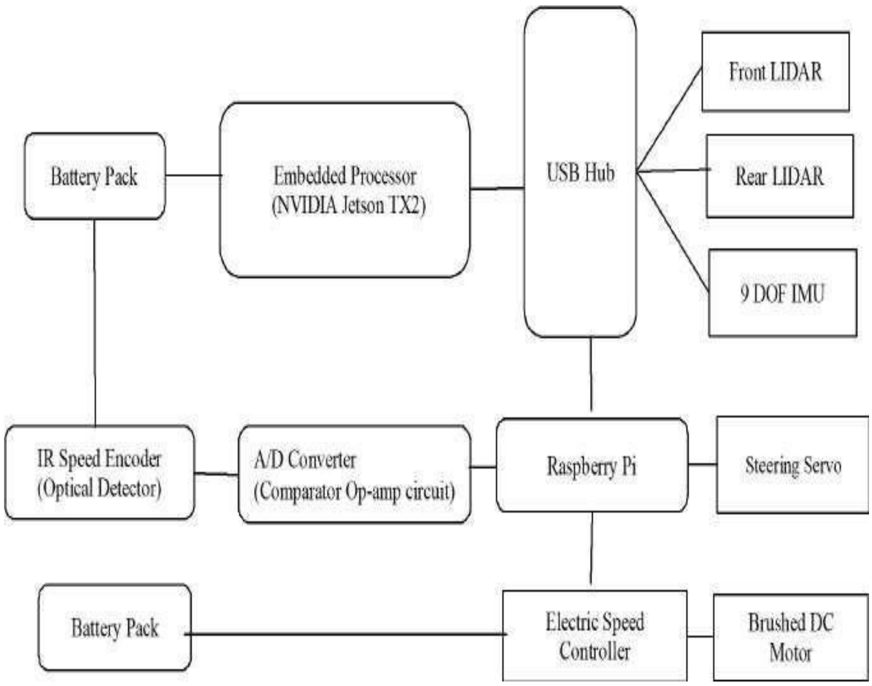

Fig 4: Flow Diagram of PSUBOT ROBOT

4. Computational Analysis

Data taken by robot from the bore well was processed through KR C4 controller and analyzed by artificial intelligence machine learning based critical systematic implementation on advanced brain rooting.

Fig 5. Water Level Prediction

Fig 6: Groundwater Levels & Characteristic

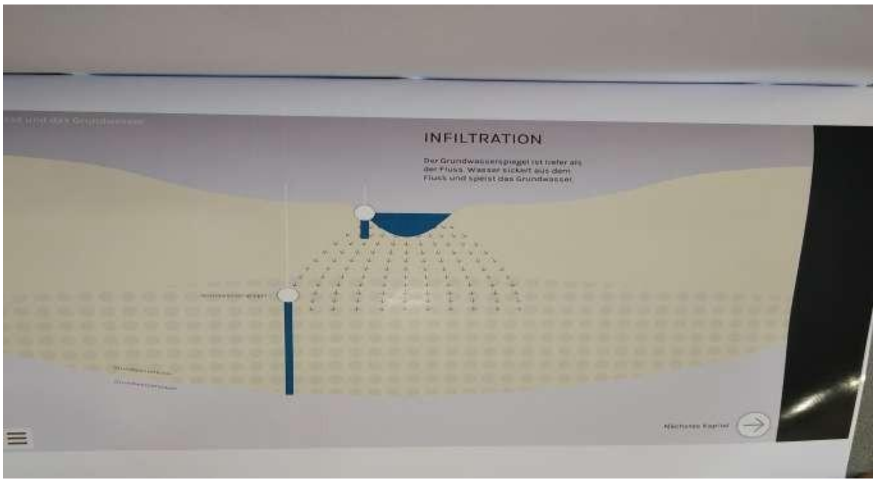

Fig 7: Infiltration

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Fig 8: Used Groundwater Analysis

5. Conclusion

In this research work we used a smart robot which was controlled by Raspberry Pi. This controller had different types of sensors that were used to measure the level of ground water and its quality on the basis of pH values, Electrical Conductivity, Hardness and Calcium components at different distances and was stored in the memory of the microcontroller. The Wi-Fi device of the controller sends the data through the cloud using IoT. The sent data will now be received by the control unit and the processor processed the data using machine learning software, whose graph of prediction is visible on our mobile and laptop.

On the basis of data gathered by our robotic automatic IOT and artificial intelligence based ground water monitoring and quality checking system we can get live information related to above mentioned parameters which can help us to manage water resources and help us to take proper measures to maintain water level and quality of potable water. This will definitely guide us to resolve potable water related problems and conflicts among various geographical boundaries.

It has been observed that the level of potable water varies in different months and years and decreases continuously. With the help of observed data and graphs we can predict its future trend and take remedial methodologies to avoid conflicts of the future.

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