MONTHLY NEWSLETTER

In this issue, read various engineering topics:

- Design of Zerin Pond in Erbil, Iraq, involving survey, hydrology, and hydraulic studies using software
- Measurement of horizontal movements using Extensometers
- Intelligence Irrigation System (IIS)
- Integrating Internet of Things (IoT) and Artificial Intelligence (AI) into water management
- The CFD data generation process
- Moving from Vicious Cycle to Virtuous in Groundwater Management

To submit a subject for publication with us, kindly get in contact through the following contact information

Email: water.resources.dept23@gmail.com

https://www.linkedin.com/in/water-resources-department-7525252a5/

May 31, 2024 ISSUE 6

Water Resources Engineering Department

MONTHLY NEWSLETTER

Editor in Chief: Assistant Prof. Dr. Bestun J. Shwan

College of Engineering Salahaddin University

Khalil Hamadamin[1], Helen Hasan[2], Saman Hasan[3]

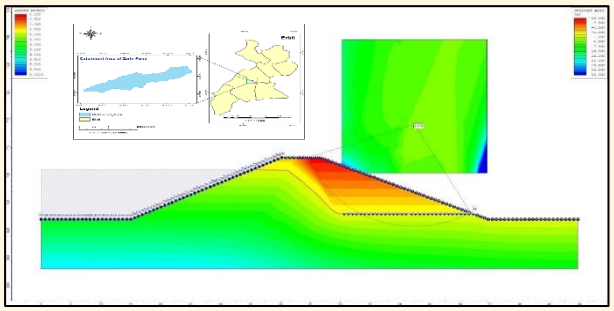
---

[1]Assistant Professor
[2] and [3]- 4th Year Student

Design of Zerin Pon

A pond is a small body of still water that supports wildlife, aids in irrigation, and helps manage runoff.

This final year project details the comprehensive design of Zerin Pond in Mala Omar, Erbil, Iraq encompassing survey investigations, hydrology studies, and hydraulic designs. Surveying, which involves measuring and mapping the physical features of the land, was crucial. Hydrology, the study of the movement, distribution, and quality of water, informed the water management aspects. Hydraulics, focused on the practical applications of fluid mechanics, guided the design of water control structures. The work involved extensive use of software applications such as AutoCAD, Civil 3D, Slide 6.0, GIS, and Google Earth Pro to complete and perform these studies.



Sarkawt H. Muhammad
Assistant Lecturer

Extensometers Device in Earth Dams

Extensometers are used to measure horizontal movements in soil embankments over the desire length in order to suit the magnitude and direction of the movement in the embankment bodies. Mainly, extensometers are used for varies purposes such as: Lateral strains beneath earth and rock fill dams or embankments, foundation movements, control of natural and cut slopes, quarry and mining excavations. the elements of extensometers are shown in the figure and the recorded data transmitted via cable to acquisition system out of the embankment body.

Before installing the embankment extensometer, mark its location on the soil. Then, dig a trench there with 60 centimeters wide at the bottom and 60 centimeters deep, and the bottom of the trench must be level and fill it with a 20-centimeter layer of sand or clay. Extensometers devices are recommended to assembly in site after excavating trench.

Shawnm M. Saleh
Assistant Lecturer

Intelligent Irrigation System

Intelligence Irrigation System (IIS) is an automatic water supply according to their crops. The automating irrigation scheduling usually implemented with sprinkle and drip irrigation systems. This system is useful during water shortage. Soil moisture, air humidity, temperature and water level in the soil are wirelessly transmitted using wireless technology for better production. The objects of Intelligence irrigation system are: 1) Increase crop quality and yield 2) Save water and energy 3) Save money on pesticides and fertilizers Save time and labor 4) Control irrigation uniformity by monitoring flow rates and pressures 5) Reduce human work 6) You can water your plants regularly when you are out for vacation

May 31, 2024 ISSUE 6

Water Resources Engineering Department
MONTHLY NEWSLETTER

Editor in Chief: Assistant Prof. Dr. Bestun J. Shwan

College of Engineering Salahaddin University

Arkan Ibrahim
PhD Student

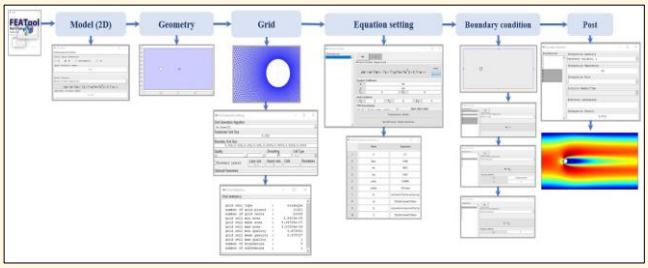
Smart Water Management Systems Using IoT and AI: A Solution for Efficient Water Management

Integrating Internet of Things (IoT) and Artificial Intelligence (AI) into water management is revolutionizing the way we handle our precious water resources. These cutting-edge technologies allow for real-time monitoring and data analysis, leading to smarter decisions that greatly improve water distribution, detect leaks early, and maintain high water quality. For instance, Barcelona's smart water management system has cut water losses by 25% and reduced energy consumption by 20%. Similarly, Singapore's Public Utilities Board (PUB) uses AI to optimize water treatment, boosting efficiency by 15%. For the Kurdistan region of Iraq, adopting such smart systems is vital. The region faces unique challenges like limited water resources, a growing population, and the impacts of climate change. By leveraging IoT and AI, Kurdistan can achieve: 1) Better Water Conservation: IoT sensors can pinpoint leaks and inefficiencies, helping to save water.2) Enhanced Water Quality: AI can predict and mitigate water quality issues, ensuring safe drinking water.3) Efficient Resource Use: Data insights enable better planning and allocation of water, reducing waste. 4) Cost Savings: Smarter water management lowers operational costs and energy use, freeing up funds for other needs.

Binahi M. Ali
Assistant Lecturer

FEATool Multiphysics in MATLAB

The CFD data generation process is an essential step in the implementation of deep learning algorithms in computational fluid dynamics. The process typically involves the three steps : 1.Random obstacle generation: The first step is to generate random obstacles using the MATLAB FEATool solver. This involves defining the geometry of the obstacles and setting up the simulation environment in the software. 2. Resolution of Navier-Stokes equations: The Navier-Stokes equations, which describe the behavior of fluid flow, is then resolved using the immersed method. This involves solving the equations numerically to obtain the fluid velocity, pressure, and other flow parameters. 3. Acquisition of CFD fluid fields: The final step is to obtain the CFD fluid fields, which include the coordinates (x, y), velocities (u, v), and pressure (p). These fluid fields provide detailed information about the fluid flow patterns and can be used to train deep learning models, Fig 1.



Shuwan J. Barzanjy
PhD Student

Moving from Vicious Cycle to Virtuous in Groundwater Management

Traditional water management and conservation measures have not been effective in adapting to new situations and challenges. Research is needed to understand the synergistic mechanism of human activities and the water cycle, and to develop comprehensive water resource management, environment, and ecology. Groundwater resources management should be based on reality while respecting natural laws and utilization rules.