Ground Water Lab Application using MATLAB App Designer

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This application solves steady state groundwater flow in 2-dimensions.

Guidelines:

To open the app user should need MATLAB to be installed in their device. The app is compatible with windows and mac operating systems.

* The first step is to open the installation file, it will direct user to MATLAB.

A picture containing text, sign, screenshot

Description automatically generated

* Then install the app, by clicking install (as shown in below figure).

Graphical user interface, application

Description automatically generated

* After installation user can access the app from apps section in MATLAB. As shown in the below figure

Graphical user interface, application

Description automatically generated

* After opening the app, the first tab user come across is input tab, where user can enter Hydraulic, geometry properties and Boundary conditions.

Graphical user interface

Description automatically generated

* There is a dropdown tab in boundary conditions where user can select Dirichlet, or Neumann based conditions.

Graphical user interface

Description automatically generated

* In Wells tab, there is a numeric edit field called num\_well. Where user can enter number of wells. (Note: In this app, user can only enter up to 5 wells)
* After giving the num\_well value, user can access the 3 different numeric boxes which popup after entering the num\_well. In which user can enter values (q, Xw, and Yw)of a specific well.

A picture containing table

Description automatically generated

* In patches tab, there are line patches and polygon patches. where you can enter the properties of the patches based on user requirement.

Graphical user interface

Description automatically generated

* After entering all the necessary inputs, now user must go to the Input tab and press the button tab. That is when the app run the code based on the user inputs.

Graphical user interface

Description automatically generated

* After pressing the button tab, code executes and user can see the hydraulic head contour plot in the output tab.

Chart, surface chart

Description automatically generated

Geometry:

Lx: size of domain in the x-direction (m)

Ly: size of domain in the y-direction (m)

nx: number of grid points in the x direction

ny: number of grid points in the y direction

Hydraulic properties:

mu: mean of hydraulic conductivity in m/d

Sigma: variance

Thickness: thickness of aquifer in (m)

Boundary conditions:

Lval: boundary condition values (head values for dirichlet, flux values for Neumann)

Left(dropdown): boundary condition types (dirichlet or fixed head, Neumann or fixed flux)

Rval: boundary condition values (head values for dirichlet, flux values for Neumann)

Right(dropdown): boundary condition types (dirichlet or fixed head, Neumann or fixed flux)

Tval: boundary condition values (head values for dirichlet, flux values for Neumann)

Top(dropdown): boundary condition types (dirichlet or fixed head, Neumann or fixed flux)

Bval: boundary condition values (head values for dirichlet, flux values for Neumann)

Bottom(dropdown): boundary condition types (dirichlet or fixed head, Neumann or fixed flux)

Wells section:

num\_wells: number of wells

Q: pumping rate at wells

Xw: well coordinate in x-direction

Yw: well coordinate in y-direction

Patches section:

Line patches:

Lpx: line vertices in x-direction

Lpy: line vertices in y-direction

H-value\_l: head value

Polygon patches:

Xv: polygon vertices in x-direction

Yv: polygon vertices in y-direction

H-value\_p: head value