Project 3:

Solving systems of linear algebraic equations using iterative methods

CMPT 439 - 02 Numerical Computation

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Solving Systems of Linear Equations Using...

- **Jacobi Method**

  The ith iteration finds the new approximation based on the previous approximation.

- **Gauss Seidel Method**

  The ith iteration finds the new approximations based on the latest currently available approximations.

- **True Mean Absolute Error**

  Verify the accuracy of the overall solutions after the methods have been completed.

$$MAE = \frac{\sum_{i=1}^{n} \left| \sum_{j=1}^{n} a_{ij} x_j^{(k)} - b_i \right|}{n}$$

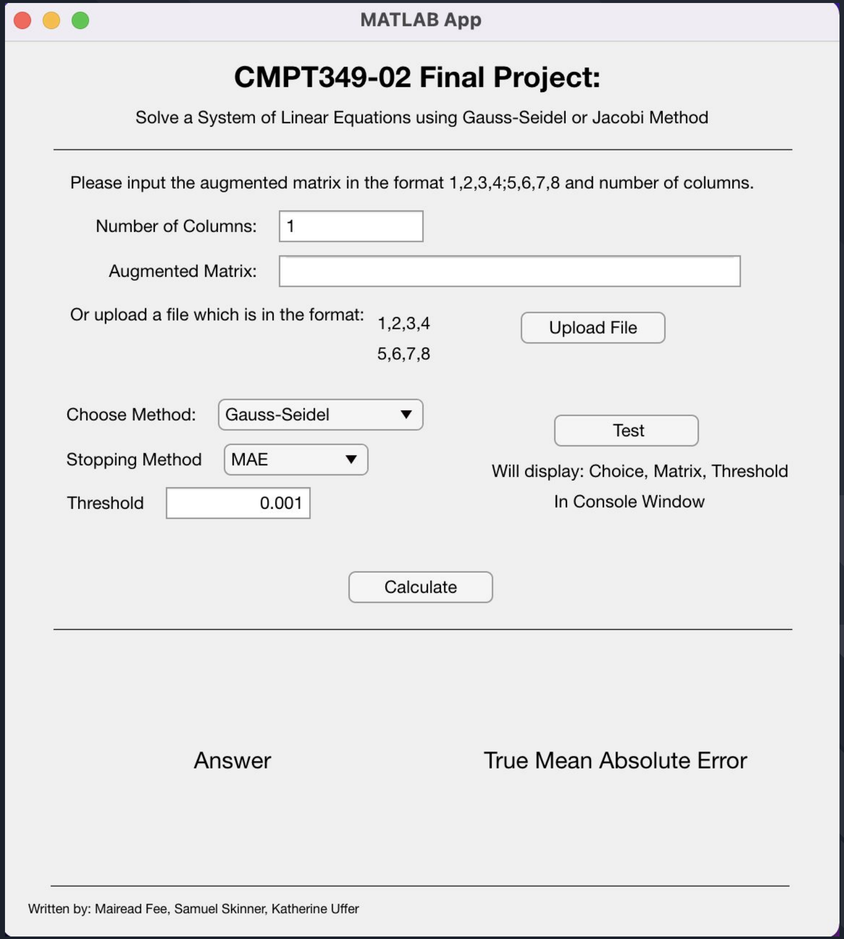
Design of Applet

The User May Enter:

- Matrix
  - From a File
  - Manually
- Iterative Method
- Stopping Criterion
- Error Threshold

Defaults Set by the Program

- Starting Approximation



CMPT349-02 Final Project:

Solve a System of Linear Equations using Gauss-Seidel or Jacobi Method

Please input the augmented matrix in the format 1,2,3,4;5,6,7,8 and number of columns.

Number of Columns: 1

Augmented Matrix:

Or upload a file which is in the format: 1,2,3,4
5,6,7,8

Choose Method: Gauss-Seidel

Stopping Method MAE

Threshold 0.001

Will display: Choice, Matrix, Threshold
In Console Window

Answer

True Mean Absolute Error

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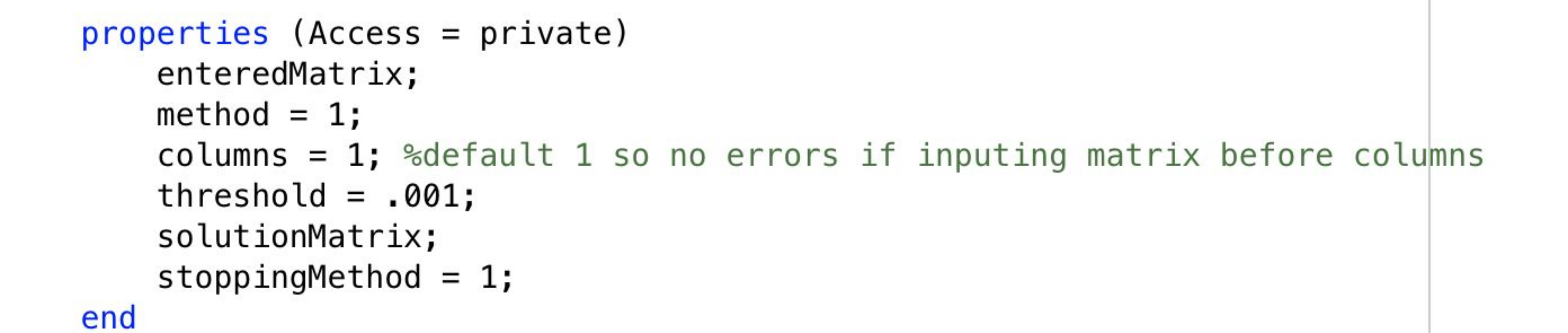
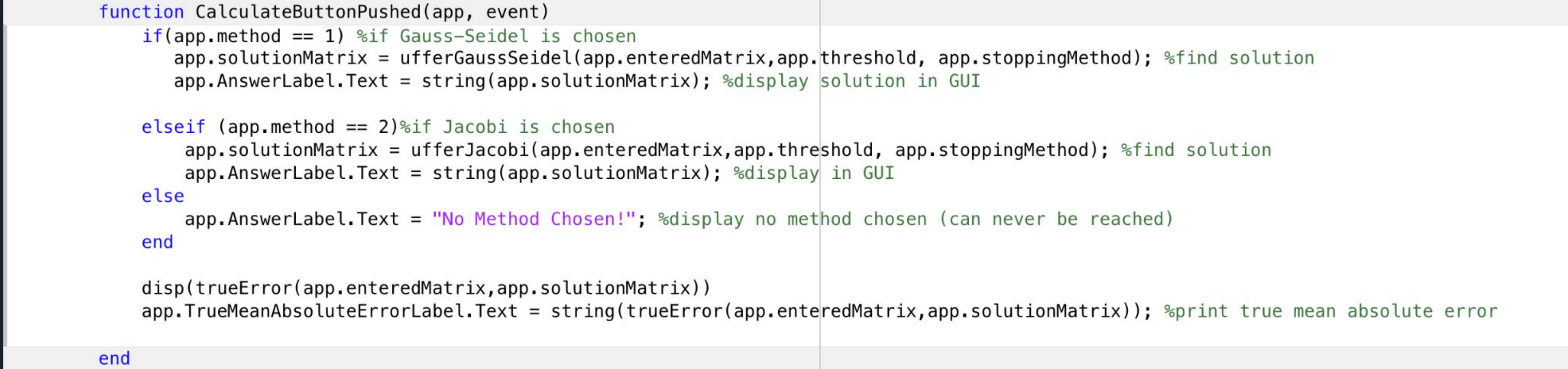
Architecture of Applet



```
    properties (Access = private)
        enteredMatrix;
        method = 1;
        columns = 1; %default 1 so no errors if inputing matrix before columns
        threshold = .001;
        solutionMatrix;
        stoppingMethod = 1;
    end
```

Architecture of Applet cont.



```
function CalculateButtonPushed(app, event)
    if(app.method == 1) %if Gauss-Seidel is chosen
       app.solutionMatrix = ufferGaussSeidel(app.enteredMatrix,app.threshold, app.stoppingMethod); %find solution
       app.AnswerLabel.Text = string(app.solutionMatrix); %display solution in GUI

    elseif (app.method == 2)%if Jacobi is chosen
        app.solutionMatrix = ufferJacobi(app.enteredMatrix,app.threshold, app.stoppingMethod); %find solution
        app.AnswerLabel.Text = string(app.solutionMatrix); %display in GUI
    else
        app.AnswerLabel.Text = "No Method Chosen!"; %display no method chosen (can never be reached)
    end

    disp(trueError(app.enteredMatrix,app.solutionMatrix))
    app.TrueMeanAbsoluteErrorLabel.Text = string(trueError(app.enteredMatrix,app.solutionMatrix)); %print true mean absolute error

end
```

Challenges...

- **Learning Matlab App Designer**
  - Drag-and-drop with a splash of programming
- **Importing a file and reading it as desired in Matlab**
  - uigetfile() and readtable() and table2array(), oh my!
- **Updating private variables as the user makes changes**
  - valueChanged callbacks vs getting values on CalculatePush
- **Printing results to text boxes on the GUI**
  - .Text vs .Value with labels
- **Comparing the results from our individual Gauss-Seidel and Jacobi functions**
  - Was there something wrong with the new code that we wrote?
  - Standardizing code using the same partial-pivoting code