wolframBeta

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Final project

Overview:

     Our goal is to make a tool that would be both useful and intuitive. Our idea is to make a linear algebra calculator that will give the user step-by-step solutions to otherwise time-consuming and tedious calculations. What makes it particularly intuitive to use is that the calculator will take input in three easy ways: LaTeX source code, uploaded pictures, and canvas drawings. Moreover, the calculator will not only display the steps in the solution, but it will also provide the LaTeX source code for each.

Tools:
- Backend Image Parser
    - http://docs.mathpix.com/#introduction
    - used to convert uploaded photo to LaTeX (takes an image file and returns a JSON, with key "latex" and value of image content in LaTeX format)
- Front End LaTex to HTML Converter
    - https://www.mathjax.org/
    - takes string in LaTeX format and renders in web page (either in HTML or SVG)
    - Mathjax.org-hosted CDN has been taken down but mathjax has presented alternative CDNs
        - https://www.mathjax.org/cdn-shutting-down/
        - CDNs:
            - https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.1/MathJax.js?...
            - https://cdn.rawgit.com/mathjax/MathJax/2.7.1/MathJax.js
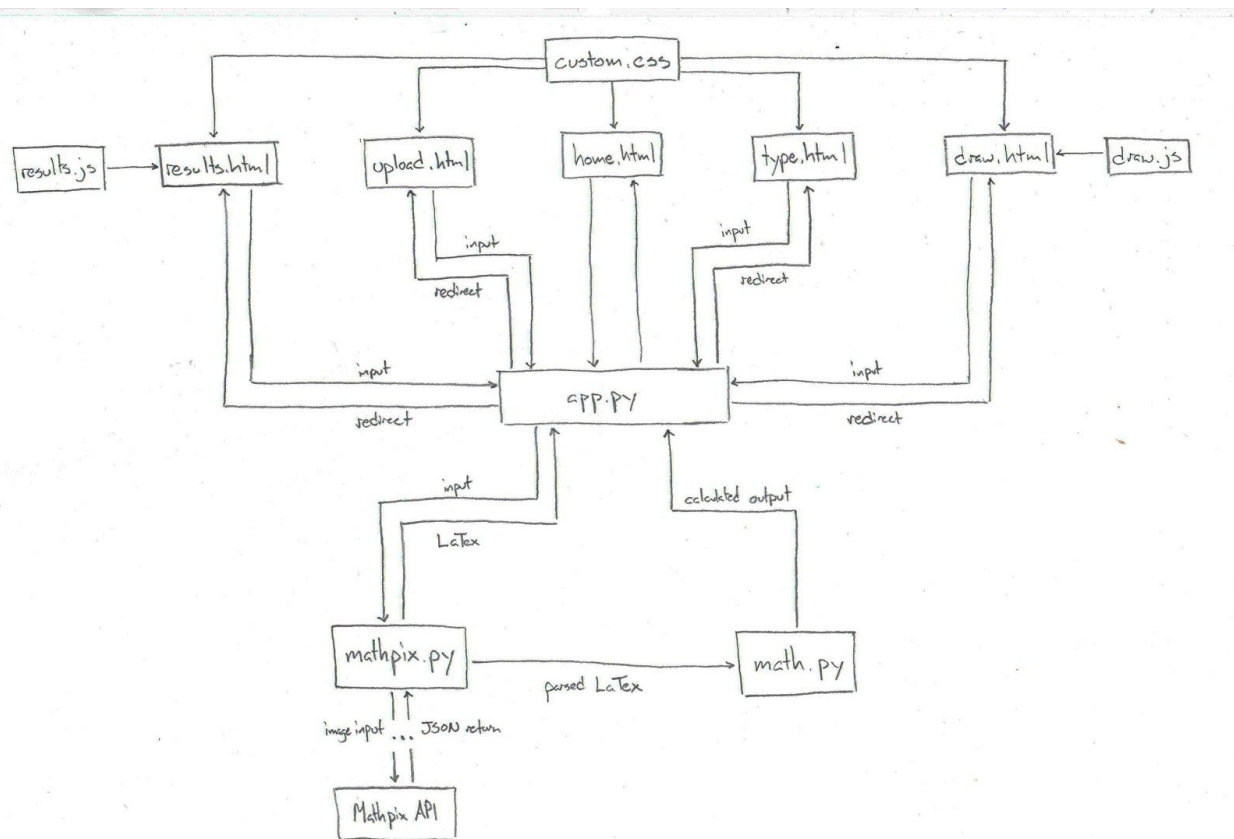
Component Breakdown:
- app.py
    - Flask App
    - Connects HTML
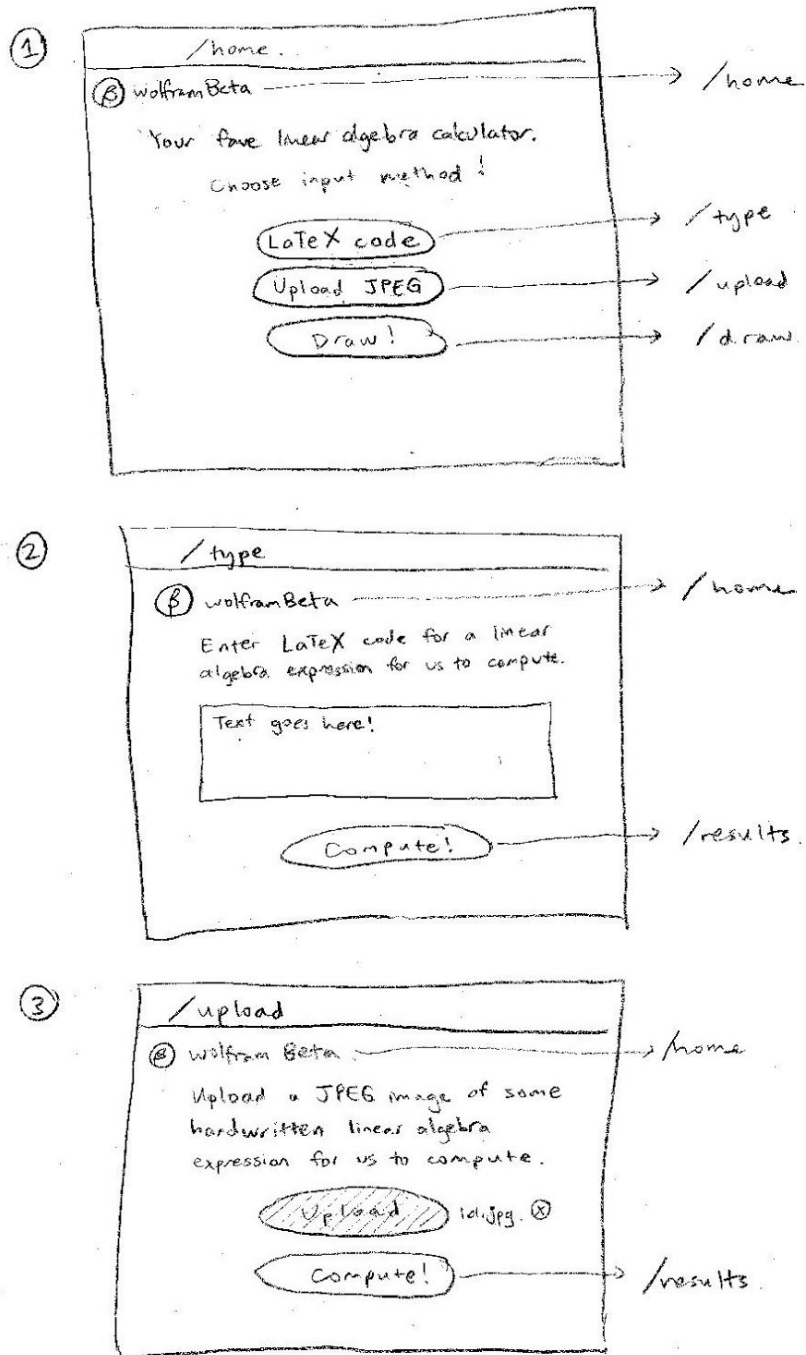
- Facilitates image transfer between frontend and
  backend
- utils/
    - mathpix.py
        - Deals with Mathpix API
        - Checks if input is actually math
        - Sends images to API, parses returned JSON/LaTeX
    - math.py
        - Takes parsed LaTeX from JSON and calculates value
          or expression, then returns LaTeX back to Flask
          App (does this recursively to show the
          step-by-step solution)
        - Checks if input is calculable
        - function to convert LaTeX into HTML using mathjax
        - can use functional programming!
- static/
    - js/
        - draw.js
            - script for draw.html
            - canvas so that the user can draw on
              touchscreen
        - results.js
            - script for steps displaying LaTeX source
              codes
    - css/
        - custom.css
            - Makes things pretty
            - Using Bootstrap framework
            - Note: Creative Tim has some really pretty
              stuff! Should totally consider using it.
- templates/
    - Home.html
        - Links to upload.html, type.html, draw.html
        - Link to draw.html deactivated if it isn't on a
          mobile browser
    - upload.html
        - Single page for uploading images
    - draw.html
        - Page for drawing on canvas

- submit => turns canvas drawing into a jpeg to run through mathpix
- type.html
    - Page for typing LaTeX as input
- Results.html
    - Displays interpreted input from user
    - Displays step-by-step solution (card format: each step has a card, has option to display LaTeX source code). Or if an error has occurred, then state the error (either not math or not calculable).

Component Map:

custom.css

results.js → results.html   upload.html   home.html   type.html   draw.html ← draw.js

input

redirect

input   app.py   input

redirect   redirect

input

LaTex

calculated output

mathpix.py —— parsed LaTex —— math.py

image input ... JSON return

Mathpix API

Site Map:

① /home

β wolframBeta ----------------------------→ /home

Your fave linear algebra calculator.

Choose input method!

(LaTeX code) ----------------------→ /type

(Upload JPEG) --------------------→ /upload

(Draw!) --------------------------→ /draw

② /type

β wolframBeta ----------------------------→ /home

Enter LaTeX code for a linear algebra expression for us to compute.

┌─────────────────────────────────┐
│ Text goes here!   │
│   │
│   │
└─────────────────────────────────┘

(Compute!) ----------------------→ /results

③ /upload

β wolfram Beta ----------------------------→ /home

Upload a JPEG image of some handwritten linear algebra expression for us to compute.

(Upload) ld.jpg ⊗

(Compute!) ----------------------→ /results

④ **/ draw**

Ⓟ **wolfram Beta** ——————→ / home

Click and drag to draw on this canvas a linear algebra expression for us to compute.

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

(Compute!) ——————→ / results.

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⑤ **/ results**

③ **wolfram Beta** ——————→ / home

You gave us:

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

[See LaTeX]

Step-by-step solution:

See LaTeX

See LaTeX

The answer:

See LaTeX

(Go back to home) ——————→ / home.

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Task Delegation:
    - Steph (Project Manager)
        - math.py
    - Alan
        - *.html
        - custom.css
        - math.py
    - Julius
        - mathpix.py
        - app.py
    - Angela
        - results.js
        - draw.js


Timeline:
(By) May 12:
    - Julius + Angela: Design Doc
May 14:
    - Alan: *.html, setup Bootstrap
    - Angela: start on draw.js
    - Julius: basic app.py, start on mathpix.py
        - redirections, calls
    - Steph: basic operations ()
May 22:
    - Alan: finished *.html, custom.css
    - Angela: finished draw.js, start on results.js
    - Julius: full structure app.py, finished mathpix.py
    - Steph: more operations ()
May 28:
    - Alan: any additional css, help with math.py
    - Angela: finish results.js
    - Julius: optimizing app.py & mathpix.py
    - Steph: begin integration with mathpix.py
        - Parsing data, display
June 7: (soft deadline)
    - All: integration, optimization, and debugging of all parts
June 10: (hard deadline)
    - All: finishing touches
```