Cable Knitting Simulation Development Summary

1. Initial Development

Choices Made:

- Started with a local FastAPI + Pygame setup to handle knitting grid simulation.
- Used HTMX for frontend interactivity, allowing real-time updates without reloading the page.
- Implemented sliders for "Rows" and "Columns", with a range of (10-50) and (15-60), respectively.

Obstacles Overcome:

- HTMX updates not working properly - Fixed by ensuring that the 'src' of the '<img>' tag updates dynamically using JavaScript ('time' query parameter).
- FastAPI initially returned text instead of an image - Fixed by ensuring responses were in 'image/png' format.

2. Debugging Local Development

Choices Made:

- Used FastAPI's 'Response(content, media_type="image/png")' to serve knitting grid images correctly.
- Rewrote 'index.html' to improve HTMX event triggers, ensuring sliders updated the image dynamically.

Obstacles Overcome:

- HTMX only sent 2 updates and then stopped - Fixed by using 'hx-vals="js:{rows: ..., columns: ..., time: new Date().getTime()}"' to force fresh requests.
- Grid not displaying when moving sliders - Fixed by ensuring HTMX swapped the entire '<img>' tag instead of just the 'src' attribute.

3. Preparing for Deployment

Choices Made:

- Decided to deploy using Render for free, easy hosting.
- Chose GitHub for version control, making deployment automated.

Obstacles Overcome:

- "Git is not recognized" error on Windows - Fixed by installing Git and configuring authentication via GitHub CLI.
- GitHub authentication issues - Fixed by logging in with 'gh auth login' and using a Personal Access Token if needed.

4. Deploying on Render

Choices Made:

- Used 'pip install -r requirements.txt' for dependencies.
- Used 'uvicorn main:app --host 0.0.0.0 --port $PORT' as the start command.

Obstacles Overcome:

- Render failed to find 'requirements.txt' - Fixed by ensuring it was committed to GitHub.
- Pillow installation errors - Fixed by specifying 'pillow==9.0.0' in 'requirements.txt'.
- FastAPI crashed due to missing 'static/' directory - Fixed by manually creating 'static/' and adding a '.keep' file.
- ALSA and 'XDG_RUNTIME_DIR' errors from Pygame - Fixed by disabling sound and display in 'simulation.py':

```
os.environ["SDL_AUDIODRIVER"] = "dummy"
os.environ["SDL_VIDEODRIVER"] = "dummy"
```

5. Successful Deployment & Testing

Choices Made:

- Manually cleared Render build cache to ensure proper deployment.
- Verified successful deployment using the Render-generated URL.
- Tested dynamic grid updates via sliders on the live app.

Obstacles Overcome:

- Couldn't find Render's live link - Resolved by guiding you to the Render dashboard where the URL is displayed.

Current Status & Next Steps

- Your app is now live on Render!

- Users can dynamically adjust the knitting grid size using sliders.
- The FastAPI backend correctly generates and serves images.

Possible Next Features:
- Improve UI with better styling (CSS, Tailwind).
- Add pattern customization (e.g., different stitch designs).
- Allow exporting the knitting grid as an image file.
- Implement a database to save user-generated patterns.

Congratulations on successfully building and deploying the Cable Knitting Simulation App!