May 2025

ECHO-BASED HERITAGE DIGITAL TWIN (EH-DT) TOOL MANUAL

Content:

1. OVERVIEW

The Echo-based Heritage Digital Twin (EH-DT) Prompt Generator is a research tool that enables the reconstruction of lost or partially lost architectural heritage using oral histories and plain language descriptions. It automatically converts qualitative data into a structured architectural prompt called the Standardised Heritage Prompt Template (SHePT), which can be used with AI text-to-image generation tools like DALL·E, Midjourney, or Stable Diffusion.

This tool is part of a PhD research framework that extends traditional Heritage Building Information Modelling (HBIM) by incorporating intangible heritage and artificial intelligence.

2. TOOL COMPONENTS

i. **Web Form Interface** – For entering descriptions of a heritage building.
ii. **Ontology (AHT_Ontology.rdf)** – Connects plain language responses to formal architectural terms.
iii. **Python Backend Script (ontology_script.py)** – Matches and assembles the terms into a prompt.
iv. **Flask App (app.py)** – Runs the local web application and handles user input/output.
v. **SHePT Output** – A standardised AI-ready prompt used to visualise buildings.

3. STEP 1: INSTALLATION AND SETUP

1. **Download or clone the repository**
   Open your terminal and run:

   ```
   git clone
   https://github.com/HordArsalan/ArchitecturalHeritage
   Transformer.git
   cd ArchitecturalHeritageTransformer
   ```

2. **Install the required Python libraries**
   Run:

   ```
   pip install -r requirements.txt
   ```

3. **Start the application**
   In your terminal:

```
python app.py
```

4. **Open your browser**
   Go to: `http://127.0.0.1:5000`

4. STEP 2: FILLING THE FORM

- The form contains 14 **Heritage Questions** designed to capture oral or written descriptions of a building.
- Each question allows up to 10 individual responses.
- Respondents may be:

  Experts (e.g., architects, building surveyors)

  Non-experts (e.g., locals, past visitors)

  Online or archival sources (optional)

- Once completed, click **Submit**.

5. STEP 3: HOW THE TOOL WORKS (BEHIND THE SCENES)

- The tool collects your answers and passes them to the backend script.
- The script uses fuzzy logic to match each answer to a standardised architectural term using the ontology.
- The most common and relevant terms are selected.
- A complete prompt is assembled using a predefined template (SHePT).
- Any "Unknown" or unclear data is automatically removed for clarity.

6. STEP 4: VIEWING THE OUTPUT

Once submitted, you'll see a complete prompt displayed on your screen.

Example Output:

```
Generate a front view facade of a 2-storey church, styled
in the Gothic.
The building is constructed of red brick and sandstone.
Architectural elements include arched windows and a west
tower made of ashlar.
Situated in rural Shropshire, the building was designed
by AE Lloyd Oswell.
It underwent restoration: roof and gutter repairs.
Currently, it is used for religious services. Plans for
the future include conservation works.
```

You can copy this prompt and paste it directly into your preferred AI image generator to visualise the building.

7. NOTES

- This tool is **technology-agnostic**, meaning it works with any visual language model (VLM) that accepts text prompts.
- The ontology is **extensible** and can be expanded to include more styles, materials, or cultural references over time.
- The system supports **iterative refinement**, where prompts and outputs can be adjusted based on user feedback.

8. CONTACT

For more information or support, please contact:

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GitHub: github.com/HordArsalan/ArchitecturalHeritageTransformer